System Identification VIs

June 2008, 370805D-01

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the System Identification VIs to create and estimate mathematical models of dynamic systems. You can use the VIs to estimate accurate models of systems based on observed input-output data.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

aw o d to
)
5)
uist, pute
it into ign X, or
ion S

Model Validation VIs	Use the Model Validation VIs to analyze and validate a system model.
Nonparametric Model Estimation VIs	Use the Nonparametric Model Estimation VIs to estimate the impulse response or frequency response of an unknown, linear, time-invariant system from an input and corresponding output signal.
Parametric Model Estimation VIs	Use the Parametric Model Estimation VIs to estimate a parametric mathematical model for an unknown, linear, time-invariant system.
Partially Known Model Estimation VIs	Use the Partially Known Model Estimation VIs to create and estimate partially known models for the plant in a system.
Recursive Model Estimation VIs	Use the Recursive Model Estimation VIs to recursively estimate the parametric mathematical model for an unknown system.
<u>Utilities VIs</u>	Use the Utilities VIs to perform miscellaneous tasks on data or the system model, including producing data samples, displaying model equations, merging models, and so on.

 $[\]hfill @ 2004-2008 \end{tabular}$ National Instruments Corporation. All rights reserved.

Data Preprocessing VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Data Preprocessing VIs to preprocess the raw data that you acquired from an unknown system.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
<u>SI</u> <u>Bandpass</u> <u>Filter</u>	Applies a bandpass filter to stimulus and response signals. Wire data to the signal in and stimulus signal in inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Detect Feedback	Detects if feedback exists in a system using the impulse response of the system. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Down Sampling	Reduces the sampling rate of stimulus and response signals using decimation. Wire data to the stimulus signal in and response signal in inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Lowpass Filter	Applies a lowpass filter to stimulus and response signals. Wire data to the stimulus signal in and response signal in inputs to determine the polymorphic instance to use or manually select the instance.
SI Normalize	Normalizes the stimulus and response signals so that their mean and standard deviation are 0 and 1 respectively. Wire data to the stimulus signal in and response signal in inputs to determine the polymorphic instance to use or manually select the instance.
SI Rebuild	Rebuilds corrupted or missing parts of stimulus and response signals. Wire data to the stimulus signal in and response

Missing Data	signal in inputs to determine the polymorphic instance to use or manually select the instance.
SI Remove Trend	Removes mean and linear steady-state trends from stimulus and response signals. Wire data to the stimulus signal in and response signal in inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Split Signal	Splits stimulus and response signals into two parts. Use one set of signals for model estimation and one for model validation. Wire data to the stimulus signal in and response signal in inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

SI Bandpass Filter VI

Owning Palette: Data Preprocessing VIs

Installed With: System Identification Toolkit

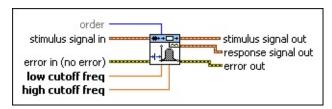
Applies a bandpass filter to stimulus and response signals. Wire data to the **signal in** and **stimulus signal in** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

The bandpass filter is an elliptic infinite impulse response (IIR) filter and has no phase lag.

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

Select an instance	▼
■ Place on the block diagram	■ Find on the Functions palette

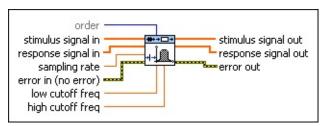
SI Bandpass Filter (SISO Waveform)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signal in is the input waveform of the stimulus signal.
- response signal in is the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- low cutoff freq specifies the low cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate.

- high cutoff freq specifies the high cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate and greater than the low cutoff freq.
- stimulus signal out returns the filtered waveform of the stimulus signal.
- response signal out returns the filtered waveform of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Bandpass Filter (SISO Array)

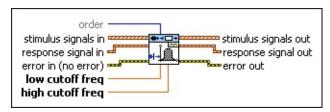


- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signal in is the input array of the stimulus signal.
- response signal in is the input array of the response signal.
- **sampling rate** is the sampling rate of the stimulus and response signals. The default is 1.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- low cutoff freq specifies the low cutoff frequency of the bandpass

filter. The cutoff frequency must be less than half the sampling rate.

- high cutoff freq specifies the high cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate and greater than the low cutoff freq.
- **stimulus signal out** returns the filtered array of the stimulus signal.
- response signal out returns the filtered array of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Bandpass Filter (MISO Waveform)

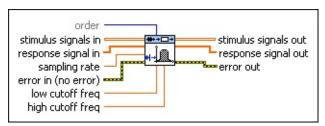


- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal in is the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- low cutoff freq specifies the low cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling

rate.

- high cutoff freq specifies the high cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate and greater than the low cutoff freq.
- stimulus signals out returns the filtered waveform array of the stimulus signals.
- response signal out returns the filtered waveform of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

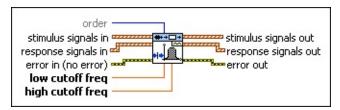
SI Bandpass Filter (MISO Array)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal in is the input array of the response signal.
- **sampling rate** is the sampling rate of the stimulus and response signals. The default is 1.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- low cutoff freq specifies the low cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate.
- high cutoff freq specifies the high cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate and greater than the low cutoff freq.
- stimulus signals out returns the filtered array of the stimulus signals.
- response signal out returns the filtered array of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

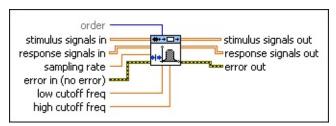
SI Bandpass Filter (MIMO Waveform)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals in is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- low cutoff freq specifies the low cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate.
- high cutoff freq specifies the high cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate and greater than the low cutoff freq.
- stimulus signals out returns the filtered waveform array of the stimulus signals.
- response signals out returns the filtered waveform array of the response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Bandpass Filter (MIMO Array)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals in is the input array of the response signals. Each row in the array is one response signal.
- **sampling rate** is the sampling rate of the stimulus and response signals. The default is 1.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- low cutoff freq specifies the low cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate.
- high cutoff freq specifies the high cutoff frequency of the bandpass filter. The cutoff frequency must be less than half the sampling rate and greater than the **low cutoff freq**.
- stimulus signals out returns the filtered array of the stimulus signals.
- response signals out returns the filtered array of the response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Detect Feedback VI

Owning Palette: Data Preprocessing VIs

Installed With: System Identification Toolkit

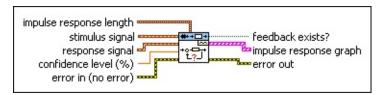
Detects if feedback exists in a system using the impulse response of the system. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

<u>Details</u> <u>Example</u>

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

Select an instance	-
■ Place on the block diagram	■ Find on the Functions palette

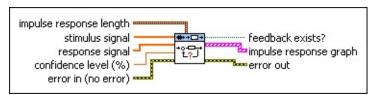
SI Detect Feedback (Waveform)



- impulse response length specifies the number of points for which to compute the impulse response.
 - num of points (t<0) determines the number of data points at the negative lag for which to compute the impulse response.
 - num of points (t>=0) determines the number of data points starting from t=0 for which to compute the impulse response.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- confidence level (%) specifies the percentage level of confidence to use when computing the upper and lower limits in an impulse response graph. The default is 99.5. A larger confidence level results in a wider insignificant region.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- feedback exists? indicates if feedback exists in the system.
- **impulse response graph** returns the estimated impulse response of the system in a graph.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Detect Feedback (Array)



- impulse response length specifies the number of points for which to compute the impulse response.
 - num of points (t<0) determines the number of data points at the negative lag for which to compute the impulse response.
 - num of points (t>=0) determines the number of data points starting from t=0 for which to compute the impulse response.
- stimulus signal is the input array of the stimulus signal.
- response signal is the input array of the response signal.
- confidence level (%) specifies the percentage level of confidence to use when computing the upper and lower limits in an impulse response graph. The default is 99.5. A larger confidence level results in a wider insignificant region.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- feedback exists? indicates if feedback exists in the system.
- **impulse response graph** returns the estimated impulse response of the system in a graph.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Detect Feedback Details

The SI Detect Feedback VI first estimates the impulse response of an unknown system using the least squares method. This VI then calculates upper and lower limits according to the **confidence level** you set. Any value in the impulse response at a negative lag that is outside the upper and lower limit range is considered significant, or nonzero. Significant values at negative lags indicate that the current stimulus signal correlates with the previous response signal. Thus, feedback exists in the system.

The process of estimating the impulse response contains an inversion operation on the autocorrelation matrix of the **stimulus signal**. Thus, the autocorrelation matrix of the stimulus signal must be well conditioned. In other words, the stimulus signal must be as white as possible. Otherwise, the result of the feedback detection might be unreliable.

This VI supports only single-input single-output (SISO) systems. For multiple-input single-out (MISO) and multiple-input multiple-output (MIMO) systems, you must run this VI between any possible input-output signal pairs to detect if feedback exists.

Example

Refer to the Feedback Detection VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Detect Feedback VI.

■ Open example ■ Browse related examples

SI Down Sampling VI

Owning Palette: Data Preprocessing VIs

Installed With: System Identification Toolkit

Reduces the sampling rate of stimulus and response signals using decimation. Wire data to the **stimulus signal in** and **response signal in** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.



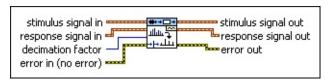
Note The length of stimulus signal in and response signal in each must be greater than 25 times the value of decimation factor.

Example

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

Select an instance	
■ Place on the block diagram	■ Find on the Functions palette

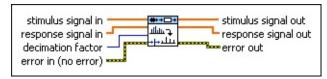
SI Down Sampling (SISO Waveform)



- stimulus signal in is the input waveform of the stimulus signal.
- response signal in is the input waveform of the response signal.
- decimation factor specifies the reduction ratio for the stimulus and response signals. The value of decimation factor must be greater than or equal to 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus signal out returns the decimated waveform of the stimulus signal.
- response signal out returns the decimated waveform of the response signal.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

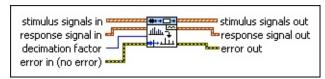
SI Down Sampling (SISO Array)



- stimulus signal in is the input array of the stimulus signal.
- response signal in is the input array of the response signal.
- decimation factor specifies the reduction ratio for the stimulus and response signals. The value of decimation factor must be greater than or equal to 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **stimulus signal out** returns the decimated array of the stimulus signal.
- response signal out returns the decimated array of the response signal.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

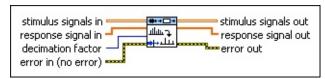
SI Down Sampling (MISO Waveform)



- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal in is the input waveform of the response signal.
- decimation factor specifies the reduction ratio for the stimulus and response signals. The value of decimation factor must be greater than or equal to 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus signals out returns the decimated waveform array of the stimulus signals.

- response signal out returns the decimated waveform of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

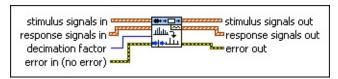
SI Down Sampling (MISO Array)



- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal in is the input array of the response signal.
- decimation factor specifies the reduction ratio for the stimulus and response signals. The value of decimation factor must be greater than or equal to 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus signals out returns the decimated array of the stimulus signals.
- response signal out returns the decimated array of the response signal.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Down Sampling (MIMO Waveform)

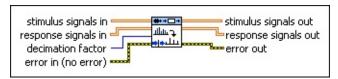


- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals in is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal.
- decimation factor specifies the reduction ratio for the stimulus and response signals. The value of decimation factor must be greater than or equal to 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus signals out returns the decimated waveform array of the

stimulus signals.

- response signals out returns the decimated waveform array of the response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Down Sampling (MIMO Array)



- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals in is the input array of the response signals. Each row in the array is one response signal.
- decimation factor specifies the reduction ratio for the stimulus and response signals. The value of decimation factor must be greater than or equal to 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus signals out returns the decimated array of the stimulus signals.

- response signals out returns the decimated array of the response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Down Sampling VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Down Sampling VI.

 \blacksquare Open example \blacksquare Browse related examples

SI Lowpass Filter VI

Owning Palette: Data Preprocessing VIs

Installed With: System Identification Toolkit

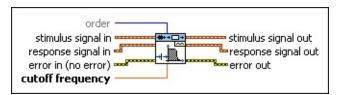
Applies a lowpass filter to stimulus and response signals. Wire data to the **stimulus signal in** and **response signal in** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

The lowpass filter is an elliptic infinite impulse response (IIR) filter and has no phase lag.

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

Select an instance	
■ Place on the block diagram	■ Find on the Functions palette

SI Lowpass Filter (SISO Waveform)

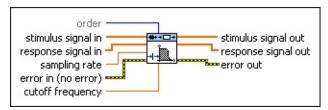


- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signal in is the input waveform of the stimulus signal.
- response signal in is the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- cutoff frequency specifies the cutoff frequency of the lowpass filter. The cutoff frequency must be less than half the sampling rate. The default is 0.125.
- stimulus signal out returns the filtered waveform of the stimulus

signal.

- response signal out returns the filtered waveform of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

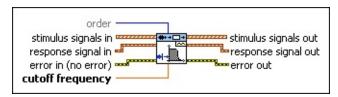
SI Lowpass Filter (SISO Array)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signal in is the input array of the stimulus signal.
- response signal in is the input array of the response signal.
- **sampling rate** is the sampling rate of the stimulus and response signals. The default is 1.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- cutoff frequency specifies the cutoff frequency of the lowpass filter. The cutoff frequency must be less than half the sampling

- rate. The default is 0.125.
- **stimulus signal out** returns the filtered array of the stimulus signal.
- response signal out returns the filtered array of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

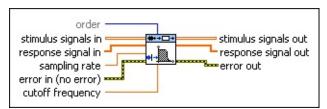
SI Lowpass Filter (MISO Waveform)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal in is the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- cutoff frequency specifies the cutoff frequency of the lowpass filter. The cutoff frequency must be less than half the sampling rate. The default is 0.125.

- stimulus signals out returns the filtered waveform array of the stimulus signals.
- response signal out returns the filtered waveform of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

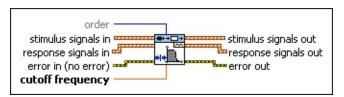
SI Lowpass Filter (MISO Array)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal in is the input array of the response signal.
- **sampling rate** is the sampling rate of the stimulus and response signals. The default is 1.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- cutoff frequency specifies the cutoff frequency of the lowpass

- filter. The cutoff frequency must be less than half the sampling rate. The default is 0.125.
- stimulus signals out returns the filtered array of the stimulus signals.
- response signal out returns the filtered array of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

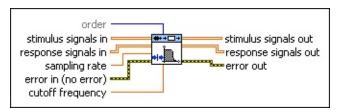
SI Lowpass Filter (MIMO Waveform)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals in is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- cutoff frequency specifies the cutoff frequency of the lowpass

- filter. The cutoff frequency must be less than half the sampling rate. The default is 0.125.
- stimulus signals out returns the filtered waveform array of the stimulus signals.
- response signals out returns the filtered waveform array of the response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Lowpass Filter (MIMO Array)



- order specifies the filter order. The default is 6. The value of order must be greater than 0. Increasing the order value generates a sharper transition band from the filter.
- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals in is the input array of the response signals. Each row in the array is one response signal.
- **sampling rate** is the sampling rate of the stimulus and response signals. The default is 1.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- cutoff frequency specifies the cutoff frequency of the lowpass filter. The cutoff frequency must be less than half the sampling rate. The default is 0.125.
- **stimulus signals out** returns the filtered array of the stimulus signals.
- response signals out returns the filtered array of the response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Normalize VI

Owning Palette: Data Preprocessing VIs

Installed With: System Identification Toolkit

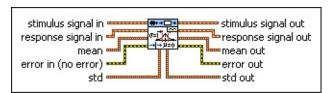
Normalizes the stimulus and response signals so that their mean and standard deviation are 0 and 1 respectively. Wire data to the **stimulus signal in** and **response signal in** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

If you know the mean and standard deviation of the signals, set **mean** and **std** to those values. If you do not provide values for **mean** and **std**, this VI estimates the mean and standard deviation of the signals automatically.

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

Select an instance	▼	
■ Place on the block diagram	■ Find on the Functions palett	e

SI Normalize (SISO Waveform)



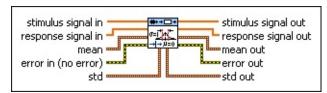
- stimulus signal in is the input waveform of the stimulus signal.
- response signal in is the input waveform of the response signal.
- mean contains the mean values you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for mean, this VI uses the actual signal to calculate the mean to use.
 - stimulus mean in is the mean value of the stimulus signal.
 - response mean in is the mean value of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- std contains the standard deviations you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for std, this VI uses the actual signal to calculate the standard deviation to use.
 - **stimulus std in** is the standard deviation of the stimulus signal.
 - response std in is the standard deviation of the response signal.
- stimulus signal out returns the normalized waveform of the stimulus signal.
- response signal out returns the normalized waveform of the response signal.
- mean out returns the mean values that this VI uses to normalize the stimulus and response signals.
 - stimulus mean out returns the mean value that this VI uses to normalize the stimulus signal.
 - response mean out returns the mean value that this VI uses to normalize the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- std out returns the standard deviations that this VI uses to

normalize the stimulus and response signals.

- stimulus std out returns the standard deviation that this VI uses to normalize the stimulus signal.
- response std out returns the standard deviation that this VI uses to normalize the response signal.

SI Normalize (SISO Array)



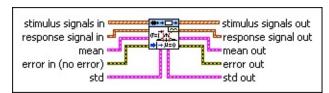
- stimulus signal in is the input array of the stimulus signal.
- response signal in is the input array of the response signal.
- mean contains the mean values you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for mean, this VI uses the actual signal to calculate the mean to use.
 - stimulus mean in is the mean value of the stimulus signal.
 - response mean in is the mean value of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- std contains the standard deviations you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for std, this VI uses the actual signal to calculate the standard deviation to use.
 - **stimulus std in** is the standard deviation of the stimulus signal.
 - response std in is the standard deviation of the response signal.
- stimulus signal out returns the normalized array of the stimulus signal.
- response signal out returns the normalized array of the response signal.
- mean out returns the mean values that this VI uses to normalize the stimulus and response signals.
 - stimulus mean out returns the mean value that this VI uses to normalize the stimulus signal.
 - response mean out returns the mean value that this VI uses to normalize the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- std out returns the standard deviations that this VI uses to

normalize the stimulus and response signals.

- stimulus std out returns the standard deviation that this VI uses to normalize the stimulus signal.
- response std out returns the standard deviation that this VI uses to normalize the response signal.

SI Normalize (MISO Waveform)



- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal in is the input waveform of the response signal.
- mean contains the mean values you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for mean, this VI uses the actual signals to calculate the mean to use.
 - stimulus mean in is the mean values of the stimulus signals.
 - response mean in is the mean value of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

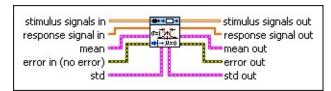
- std contains the standard deviations you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for std, this VI uses the actual signals to calculate the standard deviation to use.
 - stimulus std in is the standard deviations of the stimulus signals.
 - response std in is the standard deviation of the response signal.
- stimulus signals out returns the normalized waveform array of the stimulus signals.
- response signal out returns the normalized waveform of the response signal.
- mean out returns the mean values that this VI uses to normalize the stimulus and response signals.
 - **stimulus mean out** returns the mean values that this VI uses to normalize the stimulus signals.
 - response mean out returns the mean value that this VI uses to normalize the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning.

std out returns the standard deviations that this VI uses to normalize the stimulus and response signals.

- stimulus std out returns the standard deviations that this VI uses to normalize the stimulus signals.
- response std out returns the standard deviation that this VI uses to normalize the response signal.

SI Normalize (MISO Array)



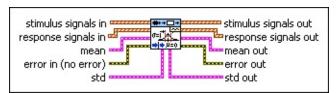
- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal in is the input array of the response signal.
- mean contains the mean values you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for mean, this VI uses the actual signals to calculate the mean to use.
 - stimulus mean in is the mean values of the stimulus signals.
 - response mean in is the mean value of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- std contains the standard deviations you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for std, this VI uses the actual signals to calculate the standard deviation to use.
 - stimulus std in is the standard deviations of the stimulus signals.
 - **response std in** is the standard deviation of the response signal.
- stimulus signals out returns the normalized array of the stimulus signals.
- response signal out returns the normalized array of the response signal.
- mean out returns the mean values that this VI uses to normalize the stimulus and response signals.
 - stimulus mean out returns the mean values that this VI uses to normalize the stimulus signals.
 - response mean out returns the mean value that this VI uses to normalize the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

- **std out** returns the standard deviations that this VI uses to normalize the stimulus and response signals.
 - **stimulus std out** returns the standard deviations that this VI uses to normalize the stimulus signals.
 - response std out returns the standard deviation that this VI uses to normalize the response signal.

SI Normalize (MIMO Waveform)

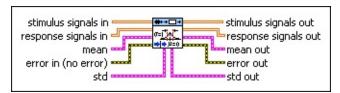


- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals in is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal.
- mean contains the mean values you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for mean, this VI uses the actual signals to calculate the mean to use.
 - stimulus mean in is the mean values of the stimulus signals.
 - response mean in is the mean values of the response signals.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

- **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- std contains the standard deviations you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for std, this VI uses the actual signals to calculate the standard deviation to use.
 - stimulus std in is the standard deviations of the stimulus signals.
 - response std in is the standard deviations of the response signals.
- stimulus signals out returns the normalized waveform array of the stimulus signals.
- response signals out returns the normalized waveform array of the response signals.
- mean out returns the mean values that this VI uses to normalize the stimulus and response signals.
 - stimulus mean out returns the mean values that this VI uses to normalize the stimulus signals.
 - response mean out returns the mean values that this VI uses to normalize the response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- **std out** returns the standard deviations that this VI uses to normalize the stimulus and response signals.
 - stimulus std out returns the standard deviations that this VI uses to normalize the stimulus signals.
 - response std out returns the standard deviations that this VI uses to normalize the response signals.

SI Normalize (MIMO Array)



- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals in is the input array of the response signals. Each row in the array is one response signal.
- mean contains the mean values you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for mean, this VI uses the actual signals to calculate the mean to use.
 - stimulus mean in is the mean values of the stimulus signals.
 - response mean in is the mean values of the response signals.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- std contains the standard deviations you want this VI to use to normalize the stimulus and response signals. If you do not provide a value for std, this VI uses the actual signals to calculate the standard deviation to use.
 - stimulus std in is the standard deviations of the stimulus signals.
 - response std in is the standard deviations of the response signals.
- stimulus signals out returns the normalized array of the stimulus signals.
- response signals out returns the normalized array of the response signals.
- mean out returns the mean values that this VI uses to normalize the stimulus and response signals.
 - **stimulus mean out** returns the mean values that this VI uses to normalize the stimulus signals.
 - response mean out returns the mean values that this VI uses to normalize the response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning.

- **std out** returns the standard deviations that this VI uses to normalize the stimulus and response signals.
 - stimulus std out returns the standard deviations that this VI uses to normalize the stimulus signals.
 - response std out returns the standard deviations that this VI uses to normalize the response signals.

SI Rebuild Missing Data VI

Owning Palette: Data Preprocessing VIs

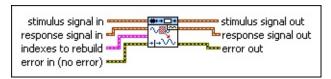
Installed With: System Identification Toolkit

Rebuilds corrupted or missing parts of stimulus and response signals. Wire data to the **stimulus signal in** and **response signal in** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

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

Select an instance	\
■ Place on the block diagram	■ Find on the Functions palette

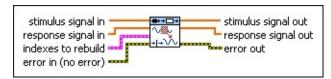
SI Rebuild Missing Data (SISO Waveform)



- stimulus signal in is the input waveform of the stimulus signal.
- response signal in is the input waveform of the response signal.
- indexes to rebuild specifies the index of the stimulus signal and the index of the response signal. This VI rebuilds the stimulus signal and response signal values at these indexes.
 - stimulus specifies the index of the stimulus signal to rebuild.
 - response specifies the index of the response signal to rebuild.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- **stimulus signal out** returns the waveform of the rebuilt stimulus signal.
- response signal out returns the waveform of the rebuilt response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Rebuild Missing Data (SISO Array)

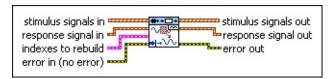


- stimulus signal in is the input array of the stimulus signal.
- response signal in is the input array of the response signal.
- indexes to rebuild specifies the index of the stimulus signal and the index of the response signal. This VI rebuilds the stimulus signal and response signal values at these indexes.
 - stimulus specifies the index of the stimulus signal to rebuild.
 - response specifies the index of the response signal to rebuild.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

stimulus signal out returns the array of the rebuilt stimulus signal.

- response signal out returns the array of the rebuilt response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

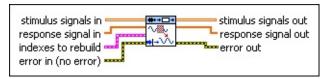
SI Rebuild Missing Data (MISO Waveform)



- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal in is the input waveform of the response signal.
- indexes to rebuild specifies the indexes of the stimulus signals and the index of the response signal to rebuild.
 - stimulus specifies the indexes of the stimulus signals to rebuild.
 - response specifies the index of the response signal to rebuild.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- stimulus signals out returns the waveform array of the rebuilt stimulus signals.
- response signal out returns the waveform of the rebuilt response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

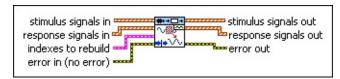
SI Rebuild Missing Data (MISO Array)



- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal in is the input array of the response signal.
- indexes to rebuild specifies the indexes of the stimulus signals and the index of the response signal to rebuild.
 - stimulus specifies the indexes of the stimulus signals to rebuild.
 - response specifies the index of the response signal to rebuild.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- **stimulus signals out** returns the array of the rebuilt stimulus signals.
- response signal out returns the array of the rebuilt response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Rebuild Missing Data (MIMO Waveform)

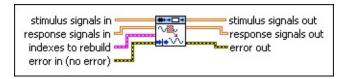


- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals in is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal.
- indexes to rebuild specifies the indexes of the stimulus signals and the indexes of the response signals to rebuild.
 - stimulus specifies the indexes of the stimulus signals to rebuild.
 - response specifies the indexes of the response signals to rebuild.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- stimulus signals out returns the waveform array of the rebuilt stimulus signals.
- response signals out returns the waveform array of the rebuilt response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Rebuild Missing Data (MIMO Array)



- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals in is the input array of the response signals. Each row in the array is one response signal.
- indexes to rebuild specifies the indexes of the stimulus signals and the indexes of the response signals to rebuild.
 - stimulus specifies the indexes of the stimulus signals to rebuild.
 - response specifies the indexes of the response signals to rebuild.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- **stimulus signals out** returns the array of the rebuilt stimulus signals.
- response signals out returns the array of the rebuilt response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Remove Trend VI

Owning Palette: Data Preprocessing VIs

Installed With: System Identification Toolkit

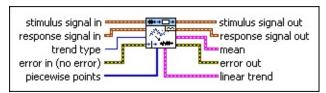
Removes mean and linear steady-state trends from stimulus and response signals. Wire data to the **stimulus signal in** and **response signal in** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Example

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

Select an instance	
■ Place on the block diagram	■ Find on the Functions palette

SI Remove Trend (SISO Waveform)

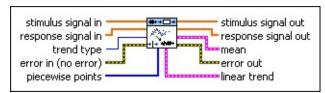


- stimulus signal in is the input waveform of the stimulus signal.
- response signal in is the input waveform of the response signal.
- **trend type** specifies the method to use to remove steady-state trends from the stimulus and response signals.
 - 0 mean (default)—Removes the mean from the signals. If piecewise points contains breakpoints at sample numbers, this VI removes the mean from each piece of data. Otherwise, this VI removes the mean from the entire set of data samples.
 - 1 **linear**—Removes first-order linear trends from the signals after a least squares fit. If **piecewise points** contains breakpoints at sample numbers, this VI removes continuous, piecewise, linear trends. Otherwise, this VI removes a single linear trend from the entire set of data samples.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

- code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- piecewise points specifies breakpoints at sample numbers in the stimulus and response signals.
- stimulus signal out returns the detrended waveform of the stimulus signal.
- response signal out returns the detrended waveform of the response signal.
- mean returns the mean of the signals before removing trend. This option is available only when you use mean as the trend type.
 - **stimulus** returns the mean of each piece of the stimulus signal.
 - response returns the mean of each piece of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- linear trend returns the linear trend of the signals before removing trend. This option is available only when you use linear as the trend type.
 - **stimulus slope** returns the slope of each piece of the

- stimulus signal.
- **stimulus intercept** returns the intercept of each piece of the stimulus signal.
- response slope returns the slope of each piece of the response signal.
- response intercept returns the intercept of each piece of the response signal.

SI Remove Trend (SISO Array)

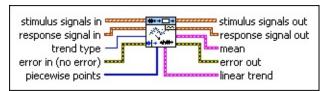


- stimulus signal in is the input array of the stimulus signal.
- response signal in is the input array of the response signal.
- trend type specifies the method to use to remove steady-state trends from the stimulus and response signals.
 - 0 mean (default)—Removes the mean from the signals. If piecewise points contains breakpoints at sample numbers, this VI removes the mean from each piece of data. Otherwise, this VI removes the mean from the entire set of data samples.
 - 1 **linear**—Removes first-order linear trends from the signals after a least squares fit. If **piecewise points** contains breakpoints at sample numbers, this VI removes continuous, piecewise, linear trends. Otherwise, this VI removes a single linear trend from the entire set of data samples.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

- **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- piecewise points specifies breakpoints at sample numbers in the stimulus and response signals.
- stimulus signal out returns the detrended array of the stimulus signal.
- response signal out returns the detrended array of the response signal.
- mean returns the mean of the signals before removing trend. This option is available only when you use mean as the trend type.
 - **stimulus** returns the mean of each piece of the stimulus signal.
 - response returns the mean of each piece of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- linear trend returns the linear trend of the signals before removing trend. This option is available only when you use linear as the trend type.
 - **stimulus slope** returns the slope of each piece of the

- stimulus signal.
- **stimulus intercept** returns the intercept of each piece of the stimulus signal.
- response slope returns the slope of each piece of the response signal.
- response intercept returns the intercept of each piece of the response signal.

SI Remove Trend (MISO Waveform)



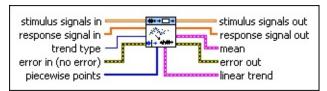
- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal in is the input waveform of the response signal.
- trend type specifies the method to use to remove steady-state trends from the stimulus and response signals.
 - o mean (default)—Removes the mean from the signals. If piecewise points contains breakpoints at sample numbers, this VI removes the mean from each piece of data. Otherwise, this VI removes the mean from the entire set of data samples.
 - Iinear—Removes first-order linear trends from the signals after a least squares fit. If piecewise points contains breakpoints at sample numbers, this VI removes continuous, piecewise, linear trends. Otherwise, this VI removes a single linear trend from the entire set of data samples.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- piecewise points specifies breakpoints at sample numbers in the stimulus and response signals.
- stimulus signals out returns the detrended waveform array of the stimulus signals.
- response signal out returns the detrended waveform of the response signal.
- mean returns the mean of the signals before removing trend. This option is available only when you use mean as the trend type.
 - **stimulus** returns the mean of each piece of the stimulus signals. The value in the *i*th row, *j*th column of this output is the mean of the *i*th stimulus signal at the *i*th piece.
 - response returns the mean of each piece of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- linear trend returns the linear trend of the signals before removing

trend. This option is available only when you use **linear** as the **trend type**.

- stimulus slope returns the slope of each piece of the stimulus signal. The value in the *j*th row, *j*th column of this output is the slope of the *j*th stimulus signal at the *j*th piece.
- stimulus intercept returns the intercept of each piece of the stimulus signal. The value in the *i*th row, *j*th column of this output is the intercept of the *i*th stimulus signal at the *j*th piece.
- response slope returns the slope of each piece of the response signal.
- response intercept returns the intercept of each piece of the response signal.

SI Remove Trend (MISO Array)



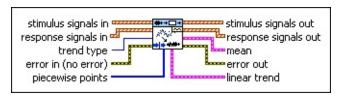
- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal in is the input array of the response signal.
- trend type specifies the method to use to remove steady-state trends from the stimulus and response signals.
 - 0 mean (default)—Removes the mean from the signals. If piecewise points contains breakpoints at sample numbers, this VI removes the mean from each piece of data. Otherwise, this VI removes the mean from the entire set of data samples.
 - 1 **linear**—Removes first-order linear trends from the signals after a least squares fit. If **piecewise points** contains breakpoints at sample numbers, this VI removes continuous, piecewise, linear trends. Otherwise, this VI removes a single linear trend from the entire set of data samples.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- piecewise points specifies breakpoints at sample numbers in the stimulus and response signals.
- **stimulus signals out** returns the detrended array of the stimulus signals.
- response signal out returns the detrended array of the response signal.
- mean returns the mean of the signals before removing trend. This option is available only when you use mean as the trend type.
 - stimulus returns the mean of each piece of the stimulus signals. The value in the *i*th row, *j*th column of this output is the mean of the *i*th stimulus signal at the *j*th piece.
 - response returns the mean of each piece of the response signal.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- linear trend returns the linear trend of the signals before removing trend. This option is available only when you use linear as the

trend type.

- stimulus slope returns the slope of each piece of the stimulus signal. The value in the *j*th row, *j*th column of this output is the slope of the *j*th stimulus signal at the *j*th piece.
- **stimulus intercept** returns the intercept of each piece of the stimulus signal. The value in the *i*th row, *j*th column of this output is the intercept of the *i*th stimulus signal at the *j*th piece.
- response slope returns the slope of each piece of the response signal.
- response intercept returns the intercept of each piece of the response signal.

SI Remove Trend (MIMO Waveform)



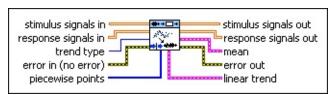
- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals in is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal.
- **trend type** specifies the method to use to remove steady-state trends from the stimulus and response signals.
 - 0 mean (default)—Removes the mean from the signals. If piecewise points contains breakpoints at sample numbers, this VI removes the mean from each piece of data. Otherwise, this VI removes the mean from the entire set of data samples.
 - 1 **linear**—Removes first-order linear trends from the signals after a least squares fit. If **piecewise points** contains breakpoints at sample numbers, this VI removes continuous, piecewise, linear trends. Otherwise, this VI removes a single linear trend from the entire set of data samples.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or

- that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- piecewise points specifies breakpoints at sample numbers in the stimulus and response signals.
- stimulus signals out returns the detrended waveform array of the stimulus signals.
- response signals out returns the detrended waveform array of the response signals.
- mean returns the mean of the signals before removing trend. This option is available only when you use mean as the trend type.
 - **stimulus** returns the mean of each piece of the stimulus signals. The value in the *i*th row, *j*th column of this output is the mean of the *j*th stimulus signal at the *j*th piece.
 - response returns the mean of each piece of the response signals. The value in the *j*th row, *j*th column of this output is the mean of the *j*th response signal at the *j*th piece.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

- linear trend returns the linear trend of the signals before removing trend. This option is available only when you use linear as the trend type.
 - **stimulus slope** returns the slope of each piece of the stimulus signal. The value in the *j*th row, *j*th column of this output is the slope of the *j*th stimulus signal at the *j*th piece.
 - stimulus intercept returns the intercept of each piece of the stimulus signal. The value in the *i*th row, *j*th column of this output is the intercept of the *i*th stimulus signal at the *j*th piece.
 - response slope returns the slope of each piece of the response signal. The value in the *i*th row, *j*th column of this output is the slope of the *i*th response signal at the *i*th piece.
 - response intercept returns the intercept of each piece of the response signal. The value in the *j*th row, *j*th column of this output is the intercept of the *j*th response signal at the *j*th piece.

SI Remove Trend (MIMO Array)



- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals in is the input array of the response signals. Each row in the array is one response signal.
- trend type specifies the method to use to remove steady-state trends from the stimulus and response signals.
 - 0 mean (default)—Removes the mean from the signals. If piecewise points contains breakpoints at sample numbers, this VI removes the mean from each piece of data. Otherwise, this VI removes the mean from the entire set of data samples.
 - Iinear—Removes first-order linear trends from the signals after a least squares fit. If piecewise points contains breakpoints at sample numbers, this VI removes continuous, piecewise, linear trends. Otherwise, this VI removes a single linear trend from the entire set of data samples.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- piecewise points specifies breakpoints at sample numbers in the stimulus and response signals.
- **stimulus signals out** returns the detrended array of the stimulus signals.
- response signals out returns the detrended array of the response signals.
- mean returns the mean of the signals before removing trend. This option is available only when you use mean as the trend type.
 - stimulus returns the mean of each piece of the stimulus signals. The value in the *i*th row, *j*th column of this output is the mean of the *i*th stimulus signal at the *i*th piece.
 - response returns the mean of each piece of the response signals. The value in the *i*th row, *j*th column of this output is the mean of the *i*th response signal at the *i*th piece.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

- linear trend returns the linear trend of the signals before removing trend. This option is available only when you use linear as the trend type.
 - stimulus slope returns the slope of each piece of the stimulus signal. The value in the *j*th row, *j*th column of this output is the slope of the *j*th stimulus signal at the *j*th piece.
 - **stimulus intercept** returns the intercept of each piece of the stimulus signal. The value in the *i*th row, *j*th column of this output is the intercept of the *i*th stimulus signal at the *j*th piece.
 - response slope returns the slope of each piece of the response signal. The value in the *i*th row, *j*th column of this output is the slope of the *i*th response signal at the *i*th piece.
 - response intercept returns the intercept of each piece of the response signal. The value in the *i*th row, *j*th column of this output is the intercept of the *i*th response signal at the *j*th piece.

Example

Refer to the Remove Trend VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Remove Trend VI.

 \blacksquare Open example \blacksquare Browse related examples

SI Split Signal VI

Owning Palette: Data Preprocessing VIs

Installed With: System Identification Toolkit

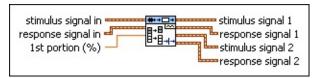
Splits stimulus and response signals into two parts. Use one set of signals for model estimation and one for model validation. Wire data to the **stimulus signal in** and **response signal in** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Example

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

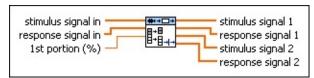


SI Split Signal (SISO Waveform)



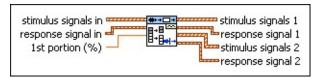
- stimulus signal in is the input waveform of the stimulus signal.
- response signal in is the input waveform of the response signal.
- **1st portion (%)** specifies the length of the first portion of the stimulus and response signals as a percentage of the length of the original signals. The default is 66.
- stimulus signal 1 returns the waveform of the first portion of the stimulus signal.
- response signal 1 returns the waveform of the first portion of the response signal.
- stimulus signal 2 returns the waveform of the second portion of the stimulus signal.
- response signal 2 returns the waveform of the second portion of the response signal.

SI Split Signal (SISO Array)



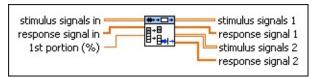
- stimulus signal in is the input array of the stimulus signal.
- response signal in is the input array of the response signal.
- **1st portion (%)** specifies the length of the first portion of the stimulus and response signals as a percentage of the length of the original signals. The default is 66.
- **stimulus signal 1** returns the array of the first portion of the stimulus signal.
- response signal 1 returns the array of the first portion of the response signal.
- **stimulus signal 2** returns the array of the second portion of the stimulus signal.
- response signal 2 returns the array of the second portion of the response signal.

SI Split Signal (MISO Waveform)



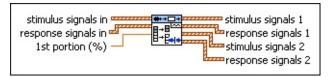
- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal in is the input waveform of the response signal.
- **1st portion (%)** specifies the length of the first portion of the stimulus and response signals as a percentage of the length of the original signals. The default is 66.
- stimulus signals 1 returns the waveform array of the first portion of the stimulus signals.
- response signal 1 returns the waveform of the first portion of the response signal.
- stimulus signals 2 returns the waveform array of the second portion of the stimulus signals.
- response signal 2 returns the waveform of the second portion of the response signal.

SI Split Signal (MISO Array)



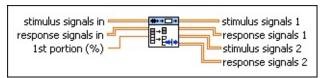
- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal in is the input array of the response signal.
- **1st portion (%)** specifies the length of the first portion of the stimulus and response signals as a percentage of the length of the original signals. The default is 66.
- **stimulus signals 1** returns the array of the first portion of the stimulus signals.
- response signal 1 returns the array of the first portion of the response signal.
- stimulus signals 2 returns the array of the second portion of the stimulus signals.
- response signal 2 returns the array of the second portion of the response signal.

SI Split Signal (MIMO Waveform)



- stimulus signals in is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals in is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal.
- **1st portion (%)** specifies the length of the first portion of the stimulus and response signals as a percentage of the length of the original signals. The default is 66.
- stimulus signals 1 returns the waveform array of the first portion of the stimulus signals.
- response signals 1 returns the waveform array of the first portion of the response signals.
- stimulus signals 2 returns the waveform array of the second portion of the stimulus signals.
- response signals 2 returns the waveform array of the second portion of the response signals.

SI Split Signal (MIMO Array)



- stimulus signals in is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals in is the input array of the response signals. Each row in the array is one response signal.
- **1st portion (%)** specifies the length of the first portion of the stimulus and response signals as a percentage of the length of the original signals. The default is 66.
- **stimulus signals 1** returns the array of the first portion of the stimulus signals.
- response signals 1 returns the array of the first portion of the response signals.
- stimulus signals 2 returns the array of the second portion of the stimulus signals.
- response signals 2 returns the array of the second portion of the response signals.

Example

Refer to the Four-Stage Evaporator VI in the labview\examples\System Identification\Industry Applications\Process Industry Systems.llb for an example of using the SI Split Signal VI.

■ Open example ■ Browse related examples

Frequency-Domain Model Estimation VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Frequency-Domain Model Estimation VIs to estimate the <u>frequency response function (FRF)</u> and to identify a <u>transfer function (TF)</u> or a <u>state-space (SS)</u> model of an unknown system.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Estimate FRF	Estimates the <u>frequency response function</u> (FRF) of an unknown system. Use the FRF to estimate a <u>transfer function</u> (TF) model or a <u>state-space</u> (SS) model of the system.
SI Estimate State- Space Model from FRF	Estimates the parameters of a discrete state-space (SS) model for an unknown system by using a frequency response function (FRF). Wire data to the FRF magnitude and FRF phase inputs to determine the polymorphic instance to use or manually select the instance.
SI Estimate Transfer Function Model from FRF	Estimates the parameters of a continuous or discrete transfer function (TF) model for an unknown system by using a frequency response function (FRF). You must manually select the polymorphic instance to use.

SI Estimate FRF VI

Owning Palette: Frequency-Domain Model Estimation VIs

Installed With: System Identification Toolkit

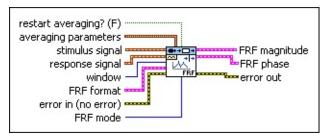
Estimates the <u>frequency response function (FRF)</u> of an unknown system. Use the FRF to estimate a <u>transfer function (TF) model</u> or a <u>state-space (SS) model</u> of the system.

Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

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

Select an instance	
■ Place on the block diagram	■ Find on the Functions palette

SI Estimate SISO FRF (Waveform)



- restart averaging? specifies whether to restart the averaging process. The default is FALSE. When you call this VI for the first time, the averaging process restarts automatically. You might need to restart averaging if a major input change occurs in the middle of the averaging process.
- **averaging parameters** specifies how this VI computes the averaged FRF.
 - averaging mode specifies the averaging mode.



Note If averaging mode is **No averaging**, this VI ignores the weighting mode, number of averages, and **FRF mode** parameters.

- No averaging (default)Vector averagingRMS averaging
- weighting mode specifies the weighting mode for RMS and vector averaging.
 - 0 Linear1 Exponential (default)
- number of averages specifies the number of averages that this VI uses for RMS and vector averaging. If weighting mode is Exponential, the averaging process is continuous. If weighting mode is Linear, the averaging process stops after this VI computes the number of averages you specify.

stimulus signal specifies the input waveform of the stimulus signal.

- response signal specifies the input waveform of the response signal.
- window specifies the time-domain window to apply to the stimulus signal and response signal.

0	Rectangle
1	Hanning (default)
2	Hamming
3	Blackman-Harris
4	Exact Blackman
5	Blackman
6	Flat Top
7	4-Term B-Harris
8	7-Term B-Harris
9	Low Sidelobe
11	Blackman Nutall
30	Triangle
31	Bartlett-Hanning
32	Bohman
33	Parzen
34	Welch
60	Kaiser
61	Dolph-Chebyshev
62	Gaussian

FRF format specifies the format of the FRF magnitude and the FRF phase.

dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.

unwrap phase? specifies whether to unwrap the **phase**. Unwrapping the phase eliminates discontinuities with an absolute value greater than pi. When the value is FALSE, this VI wraps the phase. When the value is TRUE, this VI unwraps the phase. The default is FALSE.

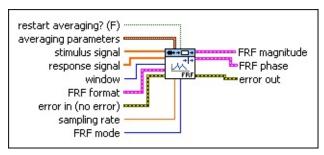
- **convert to degree?** specifies whether the unit of **phase** is in radians or degrees. The default is FALSE, which means the phase is in radians.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- FRF mode specifies how this VI computes the <u>frequency response</u> <u>function (FRF)</u>. The mode you choose depends on the signal(s) that contain noise.
 - D

Note This parameter applies to RMS averaging only.

⁰ **H1** (default)—Minimizes errors in the FRF when noise contaminates the output signal.

- 1 **H2**—Minimizes errors in the FRF when noise contaminates the input signal.
- 2 **H3**—Minimizes errors in the FRF when noise contaminates both the input signals and the output signals.
- **FRF magnitude** returns the magnitude of the averaged frequency response and frequency scale.
 - **frequency** returns the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - magnitude returns the magnitude of the averaged frequency response. The value of dB on? determines the unit of magnitude.
- **FRF phase** returns the phase of the averaged frequency response and frequency scale.
 - **frequency** returns the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - phase returns the phase of the averaged frequency response. The values of unwrap phase? and convert to degrees? determine the unit of phase.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate SISO FRF (Array)



- restart averaging? specifies whether to restart the averaging process. The default is FALSE. When you call this VI for the first time, the averaging process restarts automatically. You might need to restart averaging if a major input change occurs in the middle of the averaging process.
- **averaging parameters** specifies how this VI computes the averaged FRF.
 - averaging mode specifies the averaging mode.



Note If averaging mode is **No averaging**, this VI ignores the weighting mode, number of averages, and **FRF mode** parameters.

- No averaging (default)Vector averagingRMS averaging
- weighting mode specifies the weighting mode for RMS and vector averaging.
 - 0 Linear
 1 Exponential (default)
- number of averages specifies the number of averages that this VI uses for RMS and vector averaging. If weighting mode is Exponential, the averaging process is continuous. If weighting mode is Linear, the averaging process stops after this VI computes the number of averages you specify.

- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- window specifies the time-domain window to apply to the stimulus signal and response signal.

0	Rectangle
1	Hanning (default)
2	Hamming
3	Blackman-Harris
4	Exact Blackman
5	Blackman
6	Flat Top
7	4-Term B-Harris
8	7-Term B-Harris
9	Low Sidelobe
11	Blackman Nutall
30	Triangle
31	Bartlett-Hanning
32	Bohman
33	Parzen
34	Welch
60	Kaiser
61	Dolph-Chebyshev
62	Gaussian

FRF format specifies the format of the FRF magnitude and the FRF phase.

- dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
- **unwrap phase?** specifies whether to unwrap the **phase**. Unwrapping the phase eliminates discontinuities with an

absolute value greater than pi. When the value is FALSE, this VI wraps the phase. When the value is TRUE, this VI unwraps the phase. The default is FALSE.

convert to degree? specifies whether the unit of **phase** is in radians or degrees. The default is FALSE, which means the phase is in radians.

error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.

FRF mode specifies how this VI computes the <u>frequency response</u> <u>function (FRF)</u>. The mode you choose depends on the signal(s) that contain noise.

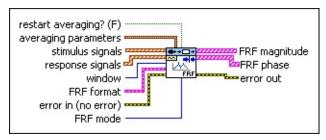
M

Note This parameter applies to RMS averaging only.

	contaminates the output signal.	
	H2 —Minimizes errors in the FRF when noise contaminates the input signal.	
	H3 —Minimizes errors in the FRF when noise contaminates both the input signals and the output signals.	

- **FRF magnitude** returns the magnitude of the averaged frequency response and frequency scale.
 - frequency returns the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - magnitude returns the magnitude of the averaged frequency response. The value of dB on? determines the unit of magnitude.
- **FRF phase** returns the phase of the averaged frequency response and frequency scale.
 - frequency returns the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - phase returns the phase of the averaged frequency response. The values of unwrap phase? and convert to degrees? determine the unit of phase.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate MIMO FRF (Waveform)



- restart averaging? specifies whether to restart the averaging process. The default is FALSE. When you call this VI for the first time, the averaging process restarts automatically. You might need to restart averaging if a major input change occurs in the middle of the averaging process.
- **averaging parameters** specifies how to compute the averaging process.
 - averaging mode specifies the averaging mode.



Note If averaging mode is **No averaging**, this VI ignores the weighting mode, number of averages, and **FRF mode** parameters.

- 0 No averaging (default)1 RMS averaging
- weighting mode specifies the weighting mode for RMS averaging.
 - 0 Linear1 Exponential (default)
- number of averages specifies the number of averages that this VI uses for RMS averaging. If weighting mode is Exponential, the averaging process is continuous. If weighting mode is Linear, the averaging process stops after this VI computes the number of averages you specify.
- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one

- stimulus signal.
- response signals specifies the input waveform array of the response signals. Each element of the array is the waveform of one response signal.
- window specifies the time-domain window to apply to the stimulus signals and response signals.

0	Rectangle
1	Hanning (default)
2	Flat Top
3	Exponential

- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - unwrap phase? specifies whether to unwrap the phase. Unwrapping the phase eliminates discontinuities with an absolute value greater than pi. When the value is FALSE, this VI wraps the phase. When the value is TRUE, this VI unwraps the phase. The default is FALSE.
 - convert to degree? specifies whether the unit of phase is in radians or degrees. The default is FALSE, which means the phase is in radians.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or

function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- FRF mode specifies how this VI computers the frequency response function (FRF). If you know that noise contaminates the input or output signals of the unknown system, you can select the mode this VI uses to compute the FRF to minimize the measurement error.

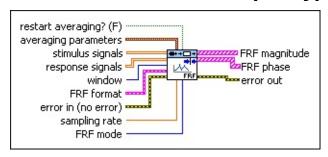


Note This control applies to RMS averaging only.

- 0 **H1** (default)—Minimizes errors in the result when noise contaminates the output signal.
- 1 **H2**—Minimizes errors in the result when noise contaminates the input signal.
- 2 **H3**—Minimizes errors in the result when noise contaminates both the input signals and the output signals.
- **FRF magnitude** returns the magnitude of the averaged frequency response and frequency scale.
 - frequency returns the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - magnitude returns the magnitude of the averaged frequency response. The value of dB on? determines the unit of magnitude.
- **FRF phase** specifies the phase of the averaged frequency response and frequency scale.
 - **frequency** returns the frequencies, in hertz, at which this VI evaluates the averaged frequency response.

- phase returns the phase of the averaged frequency response. The values of unwrap phase? and convert to degrees? determine the unit of phase.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate MIMO FRF (Array)



- restart averaging? specifies whether to restart the averaging process. The default is FALSE. When you call this VI for the first time, the averaging process restarts automatically. You might need to restart averaging if a major input change occurs in the middle of the averaging process.
- **averaging parameters** specifies how to compute the averaging process.
 - averaging mode specifies the averaging mode.



Note If averaging mode is **No averaging**, this VI ignores the weighting mode, number of averages, and **FRF mode** parameters.

- 0 No averaging (default)1 RMS averaging
- weighting mode specifies the weighting mode for RMS averaging.
 - 0 Linear1 Exponential (default)
- number of averages specifies the number of averages that this VI uses for RMS averaging. If weighting mode is Exponential, the averaging process is continuous. If weighting mode is Linear, the averaging process stops after this VI computes the number of averages you specify.
- stimulus signals specifies the input array of the stimulus signals.

Each row in the array is one stimulus signal.

- response signals specifies the input array of the response signals. Each row in the array is one response signal.
- window specifies the time-domain window to apply to the stimulus signals and response signals.

0	Rectangle
1	Hanning (default)
2	Flat Top
3	Exponential

- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - unwrap phase? specifies whether to unwrap the phase. Unwrapping the phase eliminates discontinuities with an absolute value greater than pi. When the value is FALSE, this VI wraps the phase. When the value is TRUE, this VI unwraps the phase. The default is FALSE.
 - **convert to degree?** specifies whether the unit of **phase** is in radians or degrees. The default is FALSE, which means the phase is in radians.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or

that no error occurred before this VI or function ran. The default is FALSE.

- 132 **code** is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, code is 0 or a warning code.
- **source** specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- DBL sampling rate specifies the sampling frequency in hertz. The value of **sampling rate** must be greater than 0. The default is 1.
- FRF mode specifies how this VI computers the frequency response function (FRF). If you know that noise contaminates the input or output signals of the unknown system, you can select the mode this VI uses to compute the FRF to minimize the measurement error.



Note This control applies to RMS averaging only.

- 0 H1 (default)—Minimizes errors in the result when noise contaminates the output signal.
- 1 **H2**—Minimizes errors in the result when noise contaminates the input signal.
- 2 **H3**—Minimizes errors in the result when noise contaminates both the input signals and the output signals.
- FRF magnitude returns the magnitude of the averaged frequency response and frequency scale.
 - **frequency** returns the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - [DBL] magnitude returns the magnitude of the averaged frequency response. The value of dB on? determines the unit of **magnitude**.
- FRF phase specifies the phase of the averaged frequency response and frequency scale. [DBL]

- **frequency** returns the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
- phase returns the phase of the averaged frequency response. The values of unwrap phase? and convert to degrees? determine the unit of phase.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate State-Space Model from FRF VI

Owning Palette: Frequency-Domain Model Estimation VIs

Installed With: System Identification Toolkit

Estimates the parameters of a discrete <u>state-space (SS) model</u> for an unknown system by using a <u>frequency response function (FRF)</u>. Wire data to the **FRF magnitude** and **FRF phase** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

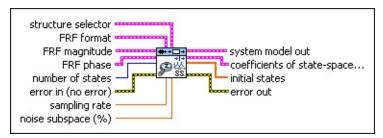
You can obtain the FRF of a plant by using the <u>SI Estimate FRF</u> VI. You can wire the **FRF magnitude** and **FRF phase** outputs of the SI Estimate FRF VI to the **FRF magnitude** and **FRF phase** inputs of the SI Estimate State-Space Model from FRF VI.

Details Examples

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



SI Estimate Discrete State-Space Model from FRF (SISO Arbitrary)



- structure selector specifies whether this VI computes the **D** matrix and the **initial states** of the state-space model you want to estimate.
 - **D matrix?** specifies whether this VI estimates the **D** matrix of the model. If **D matrix?** is TRUE, this VI estimates the **D** matrix. If **D matrix?** is FALSE, the **D** matrix is 0. The default is FALSE.
 - initial states? specifies whether this VI estimates the initial states of the model. If initial states? is TRUE, this VI estimates the initial states. If initial states? is FALSE, this VI sets the value of initial states to 0. The default is FALSE.
- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - Note If you use the <u>SI Estimate FRF</u> VI to estimate the FRF, specify the same **FRF format** settings for this parameter as you do for the SI Estimate FRF VI.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - **unwrap phase?** specifies whether the **phase** is unwrapped. The default is FALSE, which specifies that the **phase** is wrapped.
 - convert to degree? specifies whether the unit of phase is in radians or degrees. The default is FALSE, which means the phase is in radians.

- **FRF magnitude** specifies the magnitude of the averaged frequency response and frequency scale.
 - **frequency** specifies the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - magnitude specifies the magnitude of the averaged frequency response. Use dB on? to specify the unit of magnitude.
- FRF phase specifies the phase of the averaged frequency response and frequency scale.
 - **frequency** specifies the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - phase specifies the phase of the averaged frequency response. Use unwrap phase? to specify whether the phase is unwrapped. Use convert to degrees? to specify the unit of phase.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency, in hertz, of the estimated discrete system model. The value of sampling rate must be greater than 0. The default value is twice the highest frequency of the FRF data.
- noise subspace specifies the percentage of the noise subspace in the whole space, which is the combination of the signal subspace and the noise subspace. The default is 50.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the
- **coefficients of state-space model** returns the coefficients of the state-space model.

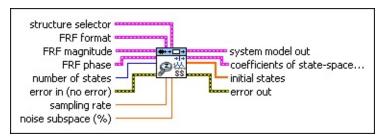
shortcut menu to use the system model probe.

- **A** returns the *A* coefficients of the system model.
- **B** returns the *B* coefficients of the system model.
- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficient of the system model.
- initial states returns the initial states of the state-space model. The length of initial states equals the number of states of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu

for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete State-Space Model from FRF (SISO Uniform)



- structure selector specifies whether this VI computes the **D** matrix and the **initial states** of the state-space model you want to estimate.
 - **D matrix?** specifies whether this VI estimates the **D** matrix of the model. If **D matrix?** is TRUE, this VI estimates the **D** matrix. If **D matrix?** is FALSE, the **D** matrix is 0. The default is FALSE.
 - initial states? specifies whether this VI estimates the initial states of the model. If initial states? is TRUE, this VI estimates the initial states. If initial states? is FALSE, this VI sets the value of initial states to 0. The default is FALSE.
- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - Note If you use the <u>SI Estimate FRF</u> VI to estimate the FRF, specify the same **FRF format** settings for this parameter as you do for the SI Estimate FRF VI.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - **unwrap phase?** specifies whether the **phase** is unwrapped. The default is FALSE, which specifies that the **phase** is wrapped.
 - **convert to degree?** specifies whether the unit of **phase** is in radians or degrees. The default is FALSE, which means the phase is in radians.

- **FRF magnitude** specifies the magnitude of the averaged frequency response and frequency scale.
 - **f0** specifies the starting frequency of the spectrum, in hertz.
 - **df** specifies the frequency increment of the spectrum, in hertz.
 - magnitude specifies the magnitude of the averaged frequency response. Use dB on? to specify the unit of magnitude.
- **FRF phase** specifies the phase of the averaged frequency response and frequency scale.
 - **f0** specifies the starting frequency of the spectrum, in hertz.
 - **df** specifies the frequency increment of the spectrum, in hertz.
 - phase specifies the phase of the averaged frequency response. Use unwrap phase? to specify whether the phase is unwrapped. Use convert to degrees? to specify the unit of phase.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency, in hertz, of the estimated discrete system model. The value of sampling rate must be greater than 0. The default value is twice the highest frequency of the FRF data.
- noise subspace specifies the percentage of the noise subspace in the whole space, which is the combination of the signal subspace and the noise subspace. The default is 50.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.



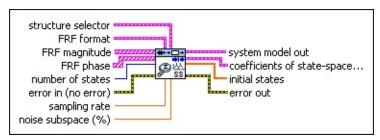
Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of state-space model returns the coefficients of the state-space model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficient of the system model.
- initial states returns the initial states of the state-space model. The length of initial states equals the number of states of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status

that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete State-Space Model from FRF (MIMO Arbitrary)



- structure selector specifies whether this VI computes the **D** matrix and the **initial states** of the state-space model you want to estimate.
 - **D matrix?** specifies whether this VI estimates the **D** matrix of the model. If **D matrix?** is TRUE, this VI estimates the **D** matrix. If **D matrix?** is FALSE, the **D** matrix is 0. The default is FALSE.
 - initial states? specifies whether this VI estimates the initial states of the model. If initial states? is TRUE, this VI estimates the initial states. If initial states? is FALSE, this VI sets the value of initial states to 0. The default is FALSE.
- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - Note If you use the <u>SI Estimate FRF</u> VI to estimate the FRF, specify the same **FRF format** settings for this parameter as you do for the SI Estimate FRF VI.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - **unwrap phase?** specifies whether the **phase** is unwrapped. The default is FALSE, which specifies that the **phase** is wrapped.
 - convert to degree? specifies whether the unit of phase is in radians or degrees. The default is FALSE, which means the phase is in radians.

- **FRF magnitude** specifies the magnitude of the averaged frequency response and frequency scale.
 - **frequency** specifies the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - magnitude specifies the magnitude of the averaged frequency response. Use dB on? to specify the unit of magnitude.
- **FRF phase** specifies the phase of the averaged frequency response and frequency scale.
 - **frequency** specifies the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - phase specifies the phase of the averaged frequency response. Use unwrap phase? to specify whether the phase is unwrapped. Use convert to degrees? to specify the unit of phase.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency, in hertz, of the estimated discrete system model. The value of sampling rate must be greater than 0. The default value is twice the highest frequency of the FRF data.
- noise subspace specifies the percentage of the noise subspace in the whole space, which is the combination of the signal subspace and the noise subspace. The default is 50.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the
- **coefficients of state-space model** returns the coefficients of the state-space model.

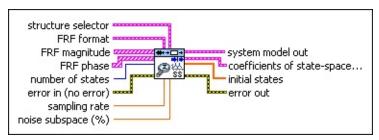
shortcut menu to use the system model probe.

- **A** returns the *A* coefficients of the system model.
- **B** returns the *B* coefficients of the system model.
- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficient of the system model.
- initial states returns the initial states of the state-space model. The length of initial states equals the number of states of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu

for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete State-Space Model from FRF (MIMO Uniform)



- structure selector specifies whether this VI computes the **D** matrix and the **initial states** of the state-space model you want to estimate.
 - **D matrix?** specifies whether this VI estimates the **D** matrix of the model. If **D matrix?** is TRUE, this VI estimates the **D** matrix. If **D matrix?** is FALSE, the **D** matrix is 0. The default is FALSE.
 - initial states? specifies whether this VI estimates the initial states of the model. If initial states? is TRUE, this VI estimates the initial states. If initial states? is FALSE, this VI sets the value of initial states to 0. The default is FALSE.
- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - Note If you use the <u>SI Estimate FRF</u> VI to estimate the FRF, specify the same **FRF format** settings for this parameter as you do for the SI Estimate FRF VI.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - **unwrap phase?** specifies whether the **phase** is unwrapped. The default is FALSE, which specifies that the **phase** is wrapped.
 - convert to degree? specifies whether the unit of phase is in radians or degrees. The default is FALSE, which means the phase is in radians.

- **FRF magnitude** specifies the magnitude of the averaged frequency response and frequency scale.
 - **f0** specifies the starting frequency of the spectrum, in hertz.
 - **df** specifies the frequency increment of the spectrum, in hertz.
 - magnitude specifies the magnitude of the averaged frequency response. Use dB on? to specify the unit of magnitude.
- **FRF phase** specifies the phase of the averaged frequency response and frequency scale.
 - **f0** specifies the starting frequency of the spectrum, in hertz.
 - **df** specifies the frequency increment of the spectrum, in hertz.
 - phase specifies the phase of the averaged frequency response. Use unwrap phase? to specify whether the phase is unwrapped. Use convert to degrees? to specify the unit of phase.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency, in hertz, of the estimated discrete system model. The value of sampling rate must be greater than 0. The default value is twice the highest frequency of the FRF data.
- noise subspace specifies the percentage of the noise subspace in the whole space, which is the combination of the signal subspace and the noise subspace. The default is 50.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of state-space model returns the coefficients of the state-space model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficient of the system model.
- initial states returns the initial states of the state-space model. The length of initial states equals the number of states of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status

that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate State-Space Model from FRF Details

If the frequency-domain data you wire to the **FRF magnitude** and **FRF phase** inputs is spaced uniformly, use the Uniform polymorphic instance of this VI. In this situation, you must specify the starting frequency **f0** and the frequency increment **df**. If this data is spaced arbitrarily, use the Arbitrary polymorphic instance of this VI.



Note You also can use the Arbitrary polymorphic instance if the frequency-domain data you wire to the **FRF magnitude** and **FRF phase** inputs is spaced uniformly.

Examples

Refer to the following VIs for examples of using the SI Estimate State-Space Model from FRF VI:

- Estimate State-Space Model from FRFs VI: labview\examples\System Identification\Getting Started\Frequency Domain Identification.llb
 - Open example Browse related examples
- Flexible Arm (Frequency Domain) VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

SI Estimate Transfer Function Model from FRF VI

Owning Palette: Frequency-Domain Model Estimation VIs

Installed With: System Identification Toolkit

Estimates the parameters of a continuous or discrete <u>transfer function</u> (TF) model for an unknown system by using a <u>frequency response</u> <u>function</u> (FRF). You must <u>manually select</u> the polymorphic instance to use.

You can obtain the FRF of a plant by using the <u>SI Estimate FRF</u> VI. You can wire the **FRF magnitude** and **FRF phase** outputs of the SI Estimate FRF VI to the **FRF magnitude** and **FRF phase** inputs of the SI Estimate Transfer Function Model from FRF VI.

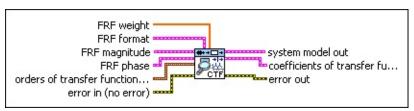
Details Example

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

Select an instance

■ Place on the block diagram ■ Find on the Functions palette

SI Estimate Continuous Transfer Function Model from FRF (SISO Arbitrary)



- FRF weight specifies the frequency-domain weight of the estimation error. The estimation error is the difference between the original FRF and the FRF that the system model out generates. As you increase the FRF weight at a certain frequency, the estimation error at that frequency decreases.
- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - Note If you use the SI Estimate FRF VI to estimate the FRF, specify the same FRF format settings for this parameter as you do for the SI Estimate FRF VI.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - **unwrap phase?** specifies whether the **phase** is unwrapped. The default is FALSE, which specifies that the **phase** is wrapped.
 - convert to degree? specifies whether the unit of phase is in radians or degrees. The default is FALSE, which means the phase is in radians.
- **FRF magnitude** specifies the magnitude of the averaged frequency response and frequency scale.
 - **frequency** specifies the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - magnitude specifies the magnitude of the averaged frequency response. Use dB on? to specify the unit of magnitude.
- FRF phase specifies the phase of the averaged frequency

response and frequency scale.

- **frequency** specifies the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
- phase specifies the phase of the averaged frequency response. Use unwrap phase? to specify whether the phase is unwrapped. Use convert to degrees? to specify the unit of phase.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - **num order** specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2. The value of den order must be greater than the value of num order.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure,

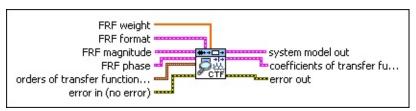
nominal or estimated parameters, identification result, and so on. Use the <u>Model Management</u> VIs to retrieve the information **system model out** contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 S + b_m S^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Continuous Transfer Function Model from FRF (SISO Uniform)



- FRF weight specifies the frequency-domain weight of the estimation error. The estimation error is the difference between the original FRF and the FRF that the system model out generates. As you increase the FRF weight at a certain frequency, the estimation error at that frequency decreases.
- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - Note If you use the SI Estimate FRF VI to estimate the FRF, specify the same FRF format settings for this parameter as you do for the SI Estimate FRF VI.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - **unwrap phase?** specifies whether the **phase** is unwrapped. The default is FALSE, which specifies that the **phase** is wrapped.
 - convert to degree? specifies whether the unit of phase is in radians or degrees. The default is FALSE, which means the phase is in radians.
- **FRF magnitude** specifies the magnitude of the averaged frequency response and frequency scale.
 - **f0** specifies the starting frequency of the spectrum, in hertz.
 - **df** specifies the frequency increment of the spectrum, in hertz.
 - magnitude specifies the magnitude of the averaged frequency response. Use dB on? to specify the unit of magnitude.

- **FRF phase** specifies the phase of the averaged frequency response and frequency scale.
 - **f0** specifies the starting frequency of the spectrum, in hertz.
 - **df** specifies the frequency increment of the spectrum, in hertz.
 - phase specifies the phase of the averaged frequency response. Use unwrap phase? to specify whether the phase is unwrapped. Use convert to degrees? to specify the unit of phase.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2. The value of den order must be greater than the value of num order.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

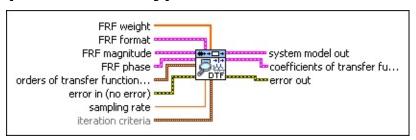
Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1S} + b_{mS}^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_{1S} + a_{nS}^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete Transfer Function Model from FRF (SISO Arbitrary)



- FRF weight specifies the frequency-domain weight of the estimation error. The estimation error is the difference between the original FRF and the FRF that the system model out generates. As you increase the FRF weight at a certain frequency, the estimation error at that frequency decreases.
- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - Note If you use the SI Estimate FRF VI to estimate the FRF, specify the same FRF format settings for this parameter as you do for the SI Estimate FRF VI.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - **unwrap phase?** specifies whether the **phase** is unwrapped. The default is FALSE, which specifies that the **phase** is wrapped.
 - convert to degree? specifies whether the unit of phase is in radians or degrees. The default is FALSE, which means the phase is in radians.
- **FRF magnitude** specifies the magnitude of the averaged frequency response and frequency scale.
 - **frequency** specifies the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - magnitude specifies the magnitude of the averaged frequency response. Use dB on? to specify the unit of magnitude.

- **FRF phase** specifies the phase of the averaged frequency response and frequency scale.
 - **frequency** specifies the frequencies, in hertz, at which this VI evaluates the averaged frequency response.
 - phase specifies the phase of the averaged frequency response. Use unwrap phase? to specify whether the phase is unwrapped. Use convert to degrees? to specify the unit of phase.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - **num order** specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency, in hertz, of the

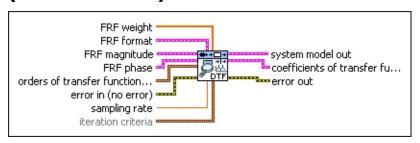
estimated discrete system model. The value of **sampling rate** must be greater than 0. The default value is twice the highest frequency of the FRF data.

- iteration criteria specifies the iteration number and tolerance.
 - iteration num specifies the maximum number of iterations to estimate the model.
 - **tolerance** specifies the upper bound of the estimation error under which the iteration stops.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1Z} + b_{mZ}^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 z + a_n z^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete Transfer Function Model from FRF (SISO Uniform)



- FRF weight specifies the frequency-domain weight of the estimation error. The estimation error is the difference between the original FRF and the FRF that the system model out generates. As you increase the FRF weight at a certain frequency, the estimation error at that frequency decreases.
- FRF format specifies the format of the FRF magnitude and the FRF phase.
 - Note If you use the SI Estimate FRF VI to estimate the FRF, specify the same FRF format settings for this parameter as you do for the SI Estimate FRF VI.
 - dB on? specifies whether magnitude is in decibels or in a linear scale. The default is FALSE, which specifies that this VI expresses magnitude in a linear scale.
 - unwrap phase? specifies whether the phase is unwrapped. The default is FALSE, which specifies that the phase is wrapped.
 - **convert to degree?** specifies whether the unit of **phase** is in radians or degrees. The default is FALSE, which means the phase is in radians.
- **FRF magnitude** specifies the magnitude of the averaged frequency response and frequency scale.
 - **f0** specifies the starting frequency of the spectrum, in hertz.
 - **df** specifies the frequency increment of the spectrum, in hertz.
 - magnitude specifies the magnitude of the averaged frequency response. Use dB on? to specify the unit of

magnitude.

- **FRF phase** specifies the phase of the averaged frequency response and frequency scale.
 - **f0** specifies the starting frequency of the spectrum, in hertz.
 - **df** specifies the frequency increment of the spectrum, in hertz.
 - phase specifies the phase of the averaged frequency response. Use unwrap phase? to specify whether the phase is unwrapped. Use convert to degrees? to specify the unit of phase.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - **num order** specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

- sampling rate specifies the sampling frequency, in hertz, of the estimated discrete system model. The value of sampling rate must be greater than 0. The default value is twice the highest frequency of the FRF data.
- iteration criteria specifies the iteration number and tolerance.
 - iteration num specifies the maximum number of iterations to estimate the model.
 - **tolerance** specifies the upper bound of the estimation error under which the iteration stops.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 z + b_m z^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 z + a_n z^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Transfer Function Model from FRF Details

If the frequency-domain data you wire to the **FRF magnitude** and **FRF phase** inputs is spaced uniformly, use the Uniform polymorphic instance of this VI. In this situation, you must specify the starting frequency **f0** and the frequency increment **df**. If this data is spaced arbitrarily, use the Arbitrary polymorphic instance of this VI.



Note You also can use the Arbitrary polymorphic instance if the frequency-domain data you wire to the **FRF magnitude** and **FRF phase** inputs is spaced uniformly.

Example

Refer to the Flexible Arm (Frequency Domain) VI in the labview\examples\System Identification\Industry Applications\Mechanical Systems.llb for an example of using the SI Estimate Transfer Function Model from FRF VI.

■ Open example ■ Browse related examples

Model Analysis VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Model Analysis VIs to perform a Bode, Nyquist, or pole-zero analysis of a system model and to compute the standard deviation of the results.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Bode Plot	Produces the Bode magnitude and Bode phase plots of the system model on an XY graph.
SI Model Presentation	Plots the Bode, Nyquist, or pole-zero diagram of the transfer function between one response-stimulus pair or response-noise pair of a system model.
SI Nyquist Plot	Produces the Nyquist plot of a system model on an XY graph.
SI Pole-Zero Plot	Produces the pole-zero plot of a system model on an XY graph.

SI Bode Plot VI

Owning Palette: Model Analysis VIs

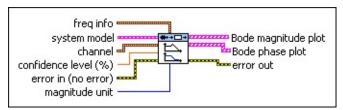
Installed With: System Identification Toolkit

Produces the Bode magnitude and Bode phase plots of the system

model on an XY graph.

This VI computes the transfer function and frequency response function (FRF) for one input-output pair of a system model. This VI then presents the FRF as Bode magnitude and Bode phase plots. Bode magnitude plots display magnitude versus frequency, and Bode phase plots display phase versus frequency. Use the <u>SI Bode Plot Indicator</u> to display the Bode plots on the front panel window.

Examples



- Place on the block diagram Find on the Functions palette
- freq info specifies the frequency information for the data plot.
 - start frequency specifies the start frequency of the data plot. The value of start frequency must be in a normalized frequency range of 0–0.5 times the real sampling rate.
 - end frequency specifies the end frequency of the data plot. The value of end frequency must be in a normalized frequency range of 0–0.5 times the real sampling rate and greater than the value of start frequency.
 - num of freq bins specifies the number of frequency bins between start frequency and end frequency for the data plot.
 - interval type determines how the frequency points of the FRF increase from start frequency to end frequency. For a logarithmic interval type, the frequency points are the following:

$$f_0$$
, f_0*df , $f_0*(df)^2$, $f_0*(df)^3$, ..., f_{Final}
where f_0 = start frequency
 f_{Final} = end frequency
 df = (log₁₀(end frequency) – log₁₀(start frequency)) / (num of freq bins – 1)

For a linear interval type, the frequency points are the following:

$$f_0$$
, f_0 + df , f_0 + $2df$, f_0 + $3df$, ..., f_{Final}
where f_0 = start frequency
 f_{Final} = end frequency
 df = (end frequency – start frequency) / (num of freq bins – 1)

- 0 logarithmic (default) logarithmic (default)
- 1 linear
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- **channel** selects the signal pair with which to compute the transfer function.
 - type specifies whether to compute the transfer function between a stimulus signal and a response signal or the transfer function between a noise signal and a response signal.

- o stimulus (default)—Computes the transfer function between a stimulus signal and a response signal. Use input index and output index to select the stimulus and response signals to use.
- 1 **noise**—Computes the transfer function between a noise signal and a response signal. Use **input index** and **output index** to select the noise and response signals to use.
- input index specifies the index of the system input channel with which to compute the transfer function. input index applies only for MISO or MIMO system models.
- output index specifies the index of the system output channel with which to compute the transfer function. output index applies only for MIMO system models.
- confidence level (%) specifies the percentage confidence interval for the FRF.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- magnitude unit specifies the type of scaling to use for the magnitude axis, or the y-axis.
 - 0 dB (default)
 1 linear
- Bode magnitude plot returns the Bode magnitude plot of the input signal. Bode magnitude plot is a plot on an XY graph that shows the linear or decibel magnitude of the given model plotted against a set of frequencies. Use the SI Bode Plot Indicator to display the Bode magnitude plot.
 - **frequency** returns the frequency points for the Bode magnitude plot.
 - magnitude returns the magnitude values of corresponding frequency points.
- Bode phase plot returns the Bode phase plot of the input signal.

 Bode phase plot is a plot on an XY graph that shows the phase, in degrees, of the model plotted against a set of frequency values. Use the SI Bode Plot Indicator to display the Bode phase plot.
 - **frequency** returns the frequency points for the Bode phase plot.
 - **phase** returns the phase values of corresponding frequency points.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a

warning code.

abc

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Examples

Refer to the following VIs for examples of using the SI Bode Plot VI:

- Model Presentation VI: labview\examples\System Identification\Getting Started\General.llb
 - \blacksquare Open example \blacksquare Browse related examples
- Flexible Arm VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

SI Model Presentation Express VI

Owning Palette: Model Analysis VIs

Installed With: System Identification Toolkit

Plots the Bode, Nyquist, or pole-zero diagram of the transfer function between one response-stimulus pair or response-noise pair of a system model.

Dialog Box Options

Block Diagram Inputs

Block Diagram Outputs

■ Place on the block diagram ■ Find on the **Functions** palette

Dialog Box Options

Parameter	Description
Select Type of Plot	Specifies the type of plot to display and shows a sample result for the selected plot type. Select Type of Plot contains the following options: • Bode Plot • Nyquist Plot • Pole-Zero Plot (default)
Legend of Plots	Displays the plot legend for the selected plot type.
Channel	 Type—Specifies whether to compute the Bode, Nyquist, or pole-zero plot of the transfer function between the response and the stimulus or between the response and the noise. You can choose from the following sources: stimulus (default)—Computes the Bode, Nyquist, or pole-zero plot of the transfer function between the response and the stimulus. noise—Computes the Bode, Nyquist, or pole-zero plot of the transfer function between the response and the noise. Input index—Specifies the input channel index of the transfer function. This index is zero-based. Output index—Specifies the output channel index of the transfer function. This index is zero-based.
Frequency Info	 Start frequency—Specifies the normalized start frequency of the data plot. The default is 0.0001. End frequency—Specifies the normalized end frequency of the data plot. The default is 0.5. Num of freq bins—Specifies the number of frequency bins between Start frequency and End

	 frequency for the data plot. The default is 1000. Interval type—Specifies the type of scaling used for the frequency axis, or x-axis. You can choose from the following scaling types: logarithmic (default) linear
Other Info	 Confidence level—Specifies the percentage confidence level of the confidence bound of the frequency response. The default is 99.00. Magnitude unit—Specifies the type of scaling used for the magnitude axis. You can choose from the following scaling types: dB (default) linear

Block Diagram Inputs

Parameter	Description
system model	Contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.
	Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
error in (no error)	Describes error conditions that occur before this VI or function runs.

Block Diagram Outputs

Parameter	Description
Pole-Zero plot	Returns the pole-zero plot of system model. Pole-Zero plot is a plot of the poles and zeros of the system model on the complex plane, where the real values are on the x-axis, and imaginary values are on the y-axis. Use the SI Pole-Zero Plot Indicator to display the pole-zero plot. • real—Returns the real part of zeros and poles. • imaginary—Returns the imaginary part of zeros and poles.
Nyquist plot	Returns the Nyquist plot of system model. Nyquist plot returns the imaginary part of the complex frequency response of the input system plotted against its real part. Use the SI Nyquist Plot Indicator to display the Nyquist plot. • real—Returns the real part of the frequency response of the system. • imaginary—Returns the imaginary part of the frequency response of the system.
Bode magnitude plot	Returns the Bode magnitude plot of system model. Bode magnitude plot is a plot on an XY graph that shows the linear or decibel magnitude of the given model plotted against a set of frequencies. Use the SI Bode Plot Indicator to display the Bode magnitude plot. • frequency—Returns the frequency points for the Bode magnitude—Returns the magnitude for the Bode magnitude plot.
Bode phase plot	Returns the Bode phase plot of system model. Bode phase plot is a plot on an XY graph that shows the phase, in degrees, of the model plotted against a set of frequency values. Use the SI Bode Plot Indicator to display the Bode phase plot. • frequency—Returns the frequency points for the Bode phase plot.

	 phase—Returns the phase values of corresponding frequency points.
error out	Contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces.

This Express VI operates similarly to the following VIs and functions:

SI Bode Plot SI Nyquist Plot SI Pole-Zero Plot

SI Nyquist Plot VI

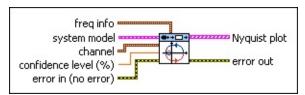
Owning Palette: Model Analysis VIs

Installed With: System Identification Toolkit

Produces the Nyquist plot of a system model on an XY graph.

This VI computes the transfer function and frequency response function (FRF) for one input-output pair of a system model. This VI then presents the FRF as a real part versus imaginary part, or Nyquist plot. Use the SI Nyquist Plot Indicator to display the Nyquist plot on the front panel window.

Examples



■ Place on the block diagram ■ Find on the **Functions** palette

freq info specifies the frequency information for the data plot.

- start frequency specifies the start frequency of the data plot. The value of start frequency must be in a normalized frequency range of 0–0.5 times the real sampling rate.
- end frequency specifies the end frequency of the data plot. The value of end frequency must be in a normalized frequency range of 0–0.5 times the real sampling rate and greater than the value of start frequency.
- num of freq bins specifies the number of frequency bins between start frequency and end frequency for the data plot.
- interval type determines how the frequency points of the FRF increase from start frequency to end frequency. For a logarithmic interval type, the frequency points are the following:

$$f_0$$
, f_0*df , $f_0*(df)^2$, $f_0*(df)^3$, ..., f_{Final}
where f_0 = **start frequency**

$$f_{Final}$$
 = end frequency
 $df = (\log_{10}(\text{end frequency}) - \log_{10}(\text{start frequency})) / (\text{num of freq bins} - 1)$

For a linear interval type, the frequency points are the following:

$$f_0$$
, f_0 + df , f_0 + $2df$, f_0 + $3df$, ..., f_{Final}
where f_0 = start frequency
 f_{Final} = end frequency
 df = (end frequency – start frequency) / (num of freq bins – 1)

- 0 logarithmic (default) logarithmic (default)
- 1 linear
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- **channel** selects the signal pair with which to compute the transfer function.
 - type specifies whether to compute the transfer function between a stimulus signal and a response signal or the transfer function between a noise signal and a response signal.
 - 0 **stimulus** (default)—Computes the transfer function

between a stimulus signal and a response signal. Use **input index** and **output index** to select the stimulus and response signals to use.

- 1 **noise**—Computes the transfer function between a noise signal and a response signal. Use **input index** and **output index** to select the noise and response signals to use.
- input index specifies the index of the system input channel with which to compute the transfer function. input index applies only for MISO or MIMO system models.
- output index specifies the index of the system output channel with which to compute the transfer function. output index applies only for MIMO system models.
- confidence level (%) specifies the percentage confidence interval for the FRF.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- Nyquist plot returns the Nyquist plot of the input signal. Nyquist plot returns the imaginary part of the complex frequency response of the input system plotted against its real part. Use the SI Nyquist Plot Indicator to display the Nyquist plot.
 - **real** returns the real part of the frequency response of the system.
 - **imaginary** returns the imaginary part of the frequency response of the system.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Examples

Refer to the following VIs for examples of using the SI Nyquist Plot VI:

- Model Presentation VI: labview\examples\System Identification\Getting Started\General.llb
 - \blacksquare Open example \blacksquare Browse related examples
- Flexible Arm VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

SI Pole-Zero Plot VI

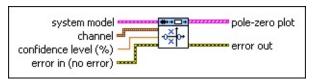
Owning Palette: Model Analysis VIs

Installed With: System Identification Toolkit

Produces the pole-zero plot of a system model on an XY graph.

This VI computes the zeros and poles of the transfer function for one input-output pair of a system model. Use the <u>SI Pole-Zero Plot Indicator</u> to display the pole-zero plot on the front panel window.

Examples



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.



- **channel** selects the signal pair with which to compute the transfer function.
 - type specifies whether to compute the transfer function between a stimulus signal and a response signal or the transfer function between a noise signal and a response signal.
 - o stimulus (default)—Computes the transfer function between a stimulus signal and a response signal. Use input index and output index to select the stimulus and response signals to use.

- 1 noise—Computes the transfer function between a noise signal and a response signal. Use input index and output index to select the noise and response signals to use.
- input index specifies the index of the system input channel with which to compute the transfer function. input index applies only for MISO or MIMO system models.
- output index specifies the index of the system output channel with which to compute the transfer function. output index applies only for MIMO system models.
- confidence level (%) specifies the percentage confidence interval for the poles and zeros.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- pole-zero plot returns the pole-zero plot of the input signal. pole-zero plot is a plot of the poles and zeros of the system model on the complex plane, where the real values are on the x-axis, and

imaginary values are on the y-axis. Use the <u>SI Pole-Zero Plot</u> <u>Indicator</u> to display the pole-zero plot.

- real returns the real part of zeros and poles.
- imaginary returns the imaginary part of zeros and poles.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Examples

Refer to the following VIs for examples of using the SI Pole-Zero Plot VI:

- Model Presentation VI: labview\examples\System Identification\Getting Started\General.llb
 - Open example Browse related examples
- Flexible Arm VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

Model Conversion VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Model Conversion VIs to convert models created in the LabVIEW System Identification Toolkit into models you can use with the LabVIEW Control Design and Simulation Module. You can convert an AR, ARX, ARMAX, output-error, Box-Jenkins, general-linear, or state-space model into a transfer function, zero-pole-gain, or state-space model. You also can convert a continuous model to a discrete model or convert a discrete model to a continuous model.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Convert Continuous to Discrete Model	Converts a continuous model to a discrete model using the sampling rate you specify. You can use this VI to convert continuous <u>transfer function</u> , <u>state-space</u> , and <u>zero-pole-gain</u> models to discrete transfer function, state-space, and zero-pole-gain models, respectively.
SI Convert Discrete to Continuous Model	Converts a discrete model to a continuous model. You can use this VI to convert discrete <u>transfer function</u> , <u>state-space</u> , and <u>zero-pole-gain</u> models to continuous transfer function, state-space, and zero-pole-gain models, respectively.
SI Convert to Models of CDT	Converts a model you created in the LabVIEW System Identification Toolkit into a transfer function, zero-pole-gain, or state-space model that you can use with the LabVIEW Control Design and Simulation Module. You must manually select the polymorphic instance to use.
SI Model Conversion	Converts an AR, ARX, ARMAX, output-error, Box-Jenkins, or general-linear model into a state-space, transfer function, or zero-pole-gain model; a state-space model into a transfer function or zero-pole-gain model; a transfer function model into a state-space or zero-pole-gain model; and a zero-pole-

gain model into a transfer function or state-space model.

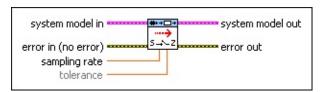
SI Convert Continuous to Discrete Model VI

Owning Palette: Model Conversion VIs

Installed With: System Identification Toolkit

Converts a continuous model to a discrete model using the **sampling rate** you specify. You can use this VI to convert continuous <u>transfer</u> <u>function</u>, <u>state-space</u>, and <u>zero-pole-gain</u> models to discrete transfer function, state-space, and zero-pole-gain models, respectively.

Details



- Place on the block diagram Find on the Functions palette
- system model in contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model in contains.



- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or

- that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate is the sampling frequency, in hertz, of the corresponding discrete model to which this VI converts the continuous model.
- tolerance determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the tolerance, this VI removes the zero-pole pair.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - D
- **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Convert Continuous to Discrete Model Details

This VI accepts only continuous transfer function, state-space, and zero-pole-gain models and converts these continuous models to their discrete equivalents. For ARX, ARMAX, output-error, Box-Jenkins, and general-linear models, use the SI Model Conversion VI to convert these models to transfer function, state-space, or zero-pole-gain models.

SI Convert Discrete to Continuous Model VI

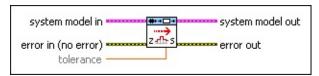
Owning Palette: Model Conversion VIs

Installed With: System Identification Toolkit

Converts a discrete model to a continuous model. You can use this VI to convert discrete <u>transfer function</u>, <u>state-space</u>, and <u>zero-pole-gain</u> models to continuous transfer function, state-space, and zero-pole-gain models, respectively.

For an <u>ARX</u>, <u>ARMAX</u>, <u>output-error</u>, <u>Box-Jenkins</u>, or <u>general-linear</u> model, this VI converts the discrete model to a continuous transfer function model.

Example



- Place on the block diagram Find on the Functions palette
- system model in contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model in contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by

wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- tolerance determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the tolerance, this VI removes the zero-pole pair.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - D

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

Pabe

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Model Conversion VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Convert Discrete to Continuous Model VI.

■ Open example ■ Browse related examples

SI Convert to Models of CDT VI

Owning Palette: Model Conversion VIs

Installed With: System Identification Toolkit

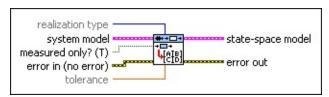
Converts a model you created in the LabVIEW System Identification Toolkit into a <u>transfer function</u>, <u>zero-pole-gain</u>, or <u>state-space</u> model that you can use with the LabVIEW Control Design and Simulation Module. You must <u>manually select the polymorphic instance</u> to use.

Example

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

Select an instance		\	
■ Place on the block diagram	■ Find on the	Functions	palette

SI Convert to Models of CDT (MIMO SS)



- realization type specifies the type of state-space realization to use.
 - o minimum (Default)—Specifies that this VI uses a state-space realization after removing zero-pole cancellations and all states that do not affect the output of the system.
 - 1 **full**—Specifies that this VI uses a state-space realization without reducing any states.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.



- measured only? specifies whether to apply the noise stimulus of the model system to the linear, time-invariant (LTI) system of the Control Design and Simulation Module. By default, the state-space model that the Control Design and Simulation Module uses does not include the disturbance *e*(*t*) of the system. However, the models estimated by the System Identification Toolkit include *e*(*t*). If measured only? is TRUE, this VI ignores *e*(*t*) in the conversion. If measured only? is FALSE, this VI treats *e*(*t*) as an input of the system.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value

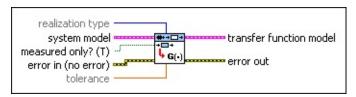
to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- tolerance determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the tolerance, this VI removes the zero-pole pair.
- state-space model returns the state-space representation of the system model.
 - **Model name** returns the name of the model.
 - Sampling Time returns the time period in seconds between two consecutive samples of the signals in the system.

 Sampling Time is the reciprocal of the sampling rate in hertz.
 - A returns the system matrix that describes the dynamics of the states of the system.
 - **B** returns the input matrix that relates the inputs to the states.
 - **C** returns the output matrix that relates the outputs to the states.
 - **D** returns the transmission matrix that relates the inputs to the outputs.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Convert to Models of CDT (MIMO TF)



- realization type specifies the type of state-space realization to use.
 - 0 **minimum** (Default)—Specifies that this VI uses a state-space realization after removing zero-pole cancellations and all states that do not affect the output of the system.
 - 1 **full**—Specifies that this VI uses a state-space realization without reducing any states.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.



- measured only? specifies whether to compute the transfer function between the noise and outputs of the system. If measured only? is TRUE, this VI computes only the transfer function between the stimulus signals and response signals. If measured only? is FALSE, this VI computes the transfer function between the stimulus signals and the response signals as well as the transfer function between the noise and the response signals.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while

this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

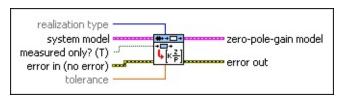
- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- tolerance determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the tolerance, this VI removes the zero-pole pair.
- **transfer function model** returns the transfer function representation of the **system model**.
 - Model name returns the name of the model.
 - Sampling Time returns the time period in seconds between two consecutive samples of the signals in the system.

 Sampling Time is the reciprocal of the sampling rate in hertz.
 - transfer function(s) returns the transfer function(s) of the system model.
 - **numerator** returns the numerator of the transfer function.
 - **denominator** returns the denominator of the transfer function.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front

panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Convert to Models of CDT (MIMO ZPK)



- realization type specifies the type of state-space realization to use.
 - o minimum (Default)—Specifies that this VI uses a state-space realization after removing zero-pole cancellations and all states that do not affect the output of the system.
 - 1 **full**—Specifies that this VI uses a state-space realization without reducing any states.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.



- measured only? specifies how the VI treats the disturbance term of the input system model. If measured only? is TRUE, this VI ignores the disturbance term and converts the transfer function between the stimulus and the response. If measured only? is FALSE, this VI treats the disturbance term as part of the input and converts the transfer function between the noise and the response.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error

status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **tolerance** determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the **tolerance**, this VI removes the zero-pole pair.
- **zero-pole-gain model** returns the zero-pole-gain representation(s) of the **system model**.
 - **Model name** returns the name of the model.
 - Sampling Time returns the time period in seconds between two consecutive samples of the signals in the system.

 Sampling Time is the reciprocal of the sampling rate in hertz.
 - **zero-pole-gain(s)** returns the zero-pole-gain of the **system** model.
 - k returns the gain values of the zero-pole-gain model.
 - **z** returns the zeros of the zero-pole-gain model.
 - **p** returns the poles of the zero-pole-gain model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu

for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Model Conversion VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Convert to Models of CDT VI.

■ Open example ■ Browse related examples

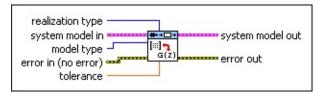
SI Model Conversion VI

Owning Palette: Model Conversion VIs

Installed With: System Identification Toolkit

Converts an AR, ARX, ARMAX, output-error, Box-Jenkins, or generallinear model into a state-space, transfer function, or zero-pole-gain model; a state-space model into a transfer function or zero-pole-gain model; a transfer function model into a state-space or zero-pole-gain model; and a zero-pole-gain model into a transfer function or state-space model.

Example



- Place on the block diagram Find on the Functions palette
- realization type specifies the type of state-space realization to use.
 - 0 **minimum** (Default)—Specifies that this VI uses a state-space realization after removing zero-pole cancellations and all states that do not affect the output of the system.
 - 1 **full**—Specifies that this VI uses a state-space realization without reducing any states.
- system model in contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model in contains.
 - M

Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

model type specifies the type of model to which you want to

convert system model in.

0	State-Space (Default) Transfer Function	
1	Transfer Function	

- 2 Zero-Pole-Gain
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- tolerance determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the tolerance, this VI removes the zero-pole pair.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the

System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Model Conversion VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Model Conversion VI.

■ Open example ■ Browse related examples

Model Management VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Model Management VIs to access information about the system model. Model information includes properties such as the system type, sampling rate, system dimensions, noise covariance, and so on.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Check System Model	Verifies whether the data dimensions are consistent with the model parameters in system model .
SI Create System Model	Creates a model for an unknown system.
SI Get Coefficients from System Model	Returns the coefficients of system model and the standard deviation and covariance of the coefficients. Use the <u>SI Set Coefficients to System Model</u> VI to apply coefficients and the standard deviation and covariance of the coefficients to system model . You must <u>manually select the polymorphic instance</u> to use.
SI Get Delays from System Model	Returns the delay from the system model. You must manually select the polymorphic instance to use.
SI Get Dimensions of System Model	Obtains the number of inputs and outputs for a system model.
SI Get	Reads input and output names from a system model. Use

Names from System Model	the SI Set Names to System Model VI to write input and output names to a system model.
SI Get Noise Covariance from System Model	Obtains noise variance and noise covariance from a system model. Use the SI Set Noise Covariance to System Model VI to apply noise variance and noise covariance to a system model.
SI Get Notes from System Model	Reads comments from a system model. Use the SI Set Notes to System Model VI to write comments to a system model.
SI Get Orders of System Model	Obtains the orders of a system model. You must manually select the polymorphic instance to use.
SI Get Sampling Rate from System Model	Retrieves the sampling rate of a discrete system model. Use the SI Set Sampling Rate to System Model VI to apply a sampling rate to a system model.
SI Get Static Gains from System Model	Returns the static gain from a system model. The system model you wire to the system model input determines the polymorphic instance to use.
SI Get Type of System Model	Reads the model type from system model . The number of inputs and outputs of the model determines its system type.
SI Load System Model from File	Loads a system model from a .sim file. A .sim file is a system identification model file that saves all model coefficients regardless of the model type. Use the SI Save System Model to File VI to save a system model to a .sim file.

SI Save System Model to File	Saves a system model to a .sim file. A .sim file is a system identification model file that saves all model coefficients regardless of the model type. Use the SI Load System Model from File VI to load a system model from a .sim file.
SI Set Coefficients to System Model	Applies coefficients and the standard deviation and covariance of the coefficients to system model . Use the <u>SI</u> <u>Get Coefficients to System Model</u> VI to return the coefficients and the standard deviation and covariance of the coefficients of system model . You must <u>manually</u> <u>select the polymorphic instance</u> to use.
SI Set Names to System Model	Writes input and output names to a system model. Use the SI Get Names from System Model VI to read input and output names from a system model.
SI Set Noise Covariance to System Model	Applies noise variance and noise covariance to a system model. Use the SI Get Noise Covariance from System Model VI to obtain the noise variance and noise covariance from a system model.
SI Set Notes to System Model	Writes comments to a system model. Use the <u>SI Get Notes</u> from System Model VI to read comments from a system model.
SI Set Sampling Rate to System Model	Applies a sampling rate to a system model. Use the SI Get Sampling Rate from System Model VI to retrieve the sampling rate from a system model.

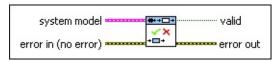
SI Check System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Verifies whether the data dimensions are consistent with the model

parameters in **system model**.



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- valid returns TRUE if the data dimensions are consistent with the model parameters in system model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

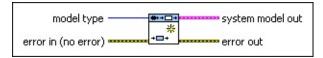
SI Create System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Creates a model for an unknown system.

Examples



 \blacksquare Place on the block diagram \blacksquare Find on the Functions palette

model type specifies the type of model to create.

0	Undefined
1	AR
2	ARX (SISO) (default)
3	ARX (MISO)
4	ARX (MIMO)
5	ARMAX (SISO)
6	ARMAX (MISO)
7	Output-Error (SISO)
8	Output-Error (MISO)
9	Box-Jenkins (SISO)
10	Box-Jenkins (MISO)
11	General-Linear (SISO)
12	General-Linear (MISO)
13	State-Space (SISO)
14	State-Space (MISO)
15	State-Space (MIMO)
16	Transfer Function (SISO)
17	Transfer Function (MISO)
18	Transfer Function (MIMO)

19	Zero-Pole-Gain (SISO)
20	Zero-Pole-Gain (MISO)
21	Zero-Pole-Gain (MIMO)

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **system model out** returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a

warning code.

source des

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Examples

Refer to the following VIs for examples of using the SI Create System Model VI:

- Continuous Transfer Function Model of 1st order RC Circuit VI: labview\examples\System Identification\Getting Started\Continuous Model.llb
 - Open example Browse related examples
- Continuous Transfer Function Model of 2nd order RC Circuit VI: labview\examples\System Identification\Getting Started\Continuous Model.llb
 - Open example Browse related examples

SI Get Coefficients from System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

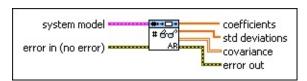
Returns the coefficients of **system model** and the standard deviation and covariance of the coefficients. Use the <u>SI Set Coefficients to System Model</u> VI to apply coefficients and the standard deviation and covariance of the coefficients to **system model**. You must <u>manually select the polymorphic instance</u> to use.

Example

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

Select an instance	▼	
■ Place on the block diagram	n ■ Find on the Functions r	palette

SI Get Coefficients from AR Model

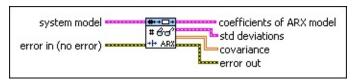


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **coefficients** returns the coefficients of the AR model.
- std deviations returns the standard deviations of coefficients. Each value in std deviations is the standard deviation of the corresponding coefficient in coefficients.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the

same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

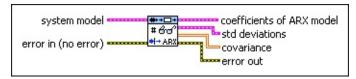
SI Get Coefficients from ARX Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of ARX model.
 - A std dev returns the standard deviations of the A coefficients of the system model.

- **B std dev** returns the standard deviations of the *B* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

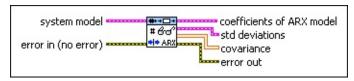
SI Get Coefficients from ARX Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of ARX model.
 - A std dev returns the standard deviations of the A coefficients of the system model.

- **B** std dev returns the standard deviations of the *B* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

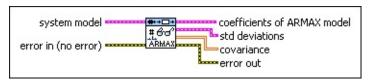
SI Get Coefficients from ARX Model (MIMO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of ARX model.
 - **A std dev** returns the standard deviations of the *A* coefficients of the system model.

- **B std dev** returns the standard deviations of the *B* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

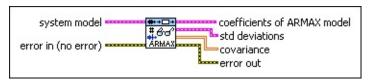
SI Get Coefficients from ARMAX Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of ARMAX model returns the coefficients of the ARMAX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of ARMAX model.

- **A std dev** returns the standard deviations of the *A* coefficients of the system model.
- **B** std dev returns the standard deviations of the *B* coefficients of the system model.
- **C std dev** returns the standard deviations of the *C* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

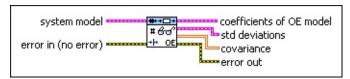
SI Get Coefficients from ARMAX Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of ARMAX model returns the coefficients of the ARMAX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of ARMAX model.

- **A std dev** returns the standard deviations of the *A* coefficients of the system model.
- **B std dev** returns the standard deviations of the *B* coefficients of the system model.
- **C** std dev returns the standard deviations of the *C* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

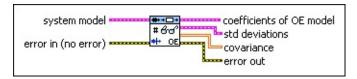
SI Get Coefficients from OE Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of OE model returns the coefficients of the outputerror (OE) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of OE model.
 - **B** std dev returns the standard deviations of the *B* coefficients of the system model.

- **F std dev** returns the standard deviations of the *F* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

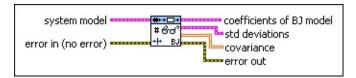
SI Get Coefficients from OE Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of OE model returns the coefficients of the outputerror (OE) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of OE model.
 - **B** std dev returns the standard deviations of the *B* coefficients of the system model.

- **F std dev** returns the standard deviations of the *F* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Coefficients from BJ Model (SISO)

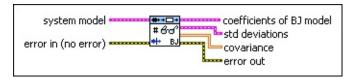


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of BJ model returns the coefficients of the Box-Jenkins (BJ) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of

BJ model.

- **B std dev** returns the standard deviations of the *B* coefficients of the system model.
- **F std dev** returns the standard deviations of the *F* coefficients of the system model.
- **C** std dev returns the standard deviations of the *C* coefficients of the system model.
- **D std dev** returns the standard deviations of the *D* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Coefficients from BJ Model (MISO)

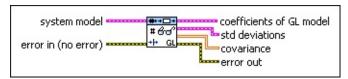


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of BJ model returns the coefficients of the <u>Box</u>-<u>Jenkins (BJ) model</u>.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of

BJ model.

- **B std dev** returns the standard deviations of the *B* coefficients of the system model.
- **F std dev** returns the standard deviations of the *F* coefficients of the system model.
- **C** std dev returns the standard deviations of the *C* coefficients of the system model.
- **D std dev** returns the standard deviations of the *D* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

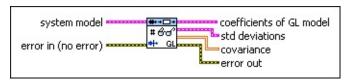
SI Get Coefficients from GL Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.

- std deviations returns the standard deviations of coefficients of GL model.
 - A **std dev** returns the standard deviations of the *A* coefficients of the system model.
 - **B std dev** returns the standard deviations of the *B* coefficients of the system model.
 - **F std dev** returns the standard deviations of the *F* coefficients of the system model.
 - **C std dev** returns the standard deviations of the *C* coefficients of the system model.
 - **D std dev** returns the standard deviations of the *D* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

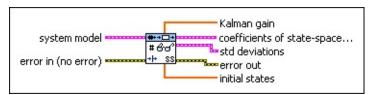
SI Get Coefficients from GL Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - F returns the F coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.

- std deviations returns the standard deviations of coefficients of GL model.
 - A std dev returns the standard deviations of the A coefficients of the system model.
 - **B** std dev returns the standard deviations of the *B* coefficients of the system model.
 - **F std dev** returns the standard deviations of the *F* coefficients of the system model.
 - **C** std dev returns the standard deviations of the *C* coefficients of the system model.
 - **D std dev** returns the standard deviations of the *D* coefficients of the system model.
- **covariance** returns the covariance of the values of the system model coefficients.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

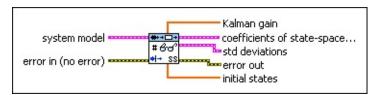
SI Get Coefficients from SS Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **Kalman gain** returns the Kalman gain of the state-space model. The number of rows in **Kalman gain** equals the number of states in the state-space model.
- coefficients of state-space model returns the coefficients of the state-space model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.

- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficient of the system model.
- std deviations returns the standard deviations of coefficients of state-space model.
 - A std dev returns the standard deviations of the A coefficients of the system model.
 - **B** std dev returns the standard deviations of the *B* coefficients of the system model.
 - **C std dev** returns the standard deviations of the *C* coefficients of the system model.
 - **D std dev** returns the standard deviation of the *D* coefficient of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The length of initial states equals the number of states of the system model.

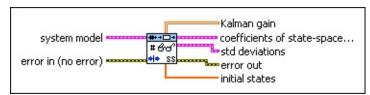
SI Get Coefficients from SS Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **Kalman gain** returns the Kalman gain of the state-space model. The number of rows in **Kalman gain** equals the number of states in the state-space model.
- coefficients of state-space model returns the coefficients of the state-space (SS) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.

- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of state-space model.
 - A std dev returns the standard deviations of the A coefficients of the system model.
 - **B** std dev returns the standard deviations of the *B* coefficients of the system model.
 - **C std dev** returns the standard deviations of the *C* coefficients of the system model.
 - **D std dev** returns the standard deviations of the *D* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The length of initial states equals the number of states of the system model.

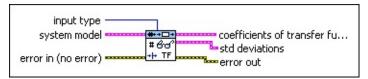
SI Get Coefficients from SS Model (MIMO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **Kalman gain** returns the Kalman gain of the state-space model. The number of rows in **Kalman gain** equals the number of states in the state-space model.
- coefficients of state-space model returns the coefficients of the state-space (SS) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.

- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficients of the system model.
- std deviations returns the standard deviations of coefficients of state-space model.
 - A std dev returns the standard deviations of the A coefficients of the system model.
 - **B** std dev returns the standard deviations of the *B* coefficients of the system model.
 - **C std dev** returns the standard deviations of the *C* coefficients of the system model.
 - **D std dev** returns the standard deviations of the *D* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The length of initial states equals the number of states of the system model.

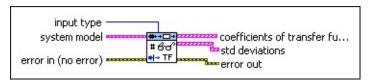
SI Get Coefficients from TF Model (SISO)



- **input type** specifies whether to obtain the coefficients of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - o **stimulus (default)**—Obtains the numerator and denominator coefficients of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the numerator and denominator coefficients of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **coefficients of transfer function model** returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model.
 - **denominator** returns the denominator coefficients of the transfer function model.
- std deviations returns the standard deviations of coefficients of transfer function model.
 - **numerator std dev** returns the standard deviation of the numerator coefficients of the stimulus or noise transfer function.
 - **denominator std dev** returns the standard deviation of the denominator coefficients of the stimulus or noise transfer function.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

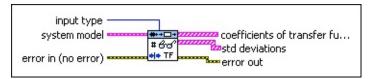
SI Get Coefficients from TF Model (MISO)



- input type specifies whether to obtain the coefficients of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - o **stimulus (default)**—Obtains the numerator and denominator coefficients of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the numerator and denominator coefficients of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- coefficients of transfer function model returns the coefficients of the transfer function (TF) model.
 - **numerator** returns the numerator coefficients of the transfer function model.
 - **denominator** returns the denominator coefficients of the transfer function model.
- std deviations returns the standard deviations of coefficients of transfer function model.
 - numerator std dev returns the standard deviation of the numerator coefficients of the stimulus or noise transfer function.
 - denominator std dev returns the standard deviation of the denominator coefficients of the stimulus or noise transfer function.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

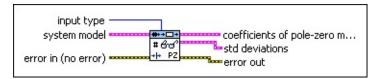
SI Get Coefficients from TF Model (MIMO)



- **input type** specifies whether to obtain the coefficients of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - o **stimulus (default)**—Obtains the numerator and denominator coefficients of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the numerator and denominator coefficients of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **coefficients of transfer function model** returns the coefficients of the <u>transfer function (TF) model</u>.
 - **numerator** returns the numerator coefficients of the transfer function model.
 - **denominator** returns the denominator coefficients of the transfer function model.
- std deviations returns the standard deviations of coefficients of transfer function model.
 - **numerator std dev** returns the standard deviation of the numerator coefficients of the stimulus or noise transfer function.
 - **denominator std dev** returns the standard deviation of the denominator coefficients of the stimulus or noise transfer function.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Coefficients from ZPK Model (SISO)

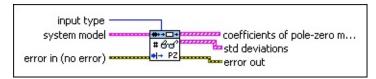


- **input type** specifies whether to obtain the poles and zeros of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - o **stimulus (default)**—Obtains the poles and zeros of G(q), the transfer function between the stimulus and the response. G(q) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the poles and zeros of H(q), the transfer function between the noise and the response. H(q) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler or Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- coefficients of zero-pole-gain model returns the coefficients and gain of the zero-pole-gain (ZPK) model.
 - zeros returns the zeros of the zero-pole-gain model.
 - poles returns the poles of the zero-pole-gain model.
 - gain returns the gain of the zero-pole-gain model.
- std deviations returns the standard deviations of coefficients of zero-pole-gain model.
 - **zeros std dev** returns the standard deviations of the zeros of the zero-pole-gain model.
 - **poles std dev** returns the standard deviations of the poles of the zero-pole-gain model.
 - **gain std dev** returns the standard deviation of the gain of the zero-pole-gain model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Coefficients from ZPK Model (MISO)

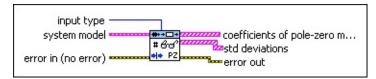


- **input type** specifies whether to obtain the poles and zeros of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - o **stimulus (default)**—Obtains the poles and zeros of G(q), the transfer function between the stimulus and the response. G(q) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the poles and zeros of H(q), the transfer function between the noise and the response. H(q) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- coefficients of zero-pole-gain model returns the coefficients and gain of the zero-pole-gain (ZPK) model.
 - zeros returns the zeros of the zero-pole-gain model.
 - poles returns the poles of the zero-pole-gain model.
 - gain returns the gain of the zero-pole-gain model.
- std deviations returns the standard deviations of coefficients of zero-pole-gain model.
 - **zeros std dev** returns the standard deviations of the zeros of the zero-pole-gain model.
 - **poles std dev** returns the standard deviations of the poles of the zero-pole-gain model.
 - **gain std dev** returns the standard deviation of the gain of the zero-pole-gain model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Coefficients from ZPK Model (MIMO)



- **input type** specifies whether to obtain the poles and zeros of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - o **stimulus (default)**—Obtains the poles and zeros of G(q), the transfer function between the stimulus and the response. G(q) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the poles and zeros of H(q), the transfer function between the noise and the response. H(q) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- coefficients of zero-pole-gain model returns the coefficients and gain of the zero-pole-gain (ZPK) model.
 - zeros returns the zeros of the zero-pole-gain model.
 - poles returns the poles of the zero-pole-gain model.
 - gain returns the gain of the zero-pole-gain model.
- std deviations returns the standard deviations of coefficients of zero-pole-gain model.
 - **zeros std dev** returns the standard deviations of the zeros of the zero-pole-gain model.
 - **poles std dev** returns the standard deviations of the poles of the zero-pole-gain model.
 - **gain std dev** returns the standard deviation of the gain of the zero-pole-gain model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Information from Model VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Get Coefficients from System Model VI.

■ Open example ■ Browse related examples

SI Get Delays from System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Returns the delay from the system model. You must <u>manually select the</u>

polymorphic instance to use.

Details

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

Select an instance			
■ Place on the block diagram	■ Find on the	Functions	palette

SI Get Delays from System Model (SISO)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.

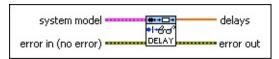


Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **delay** returns the delay of the system model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Delays from System Model (MISO)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **delays** returns the delays of the system model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Delays from System Model (MIMO)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- delays returns the delays of the system model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Delays from System Model Details

The LabVIEW System Identification Toolkit handles delays differently for discrete and continuous systems.

Discrete systems include delays in coefficients. For example, if a system has a delay of 2, the system adjusts the coefficients to 0, 0, a1, a2,. You can use the SI Get Delays from System Model VI to determine delays, in number of samples, of discrete systems. You also can use the SI Get Orders of System Model VI to determine the delays in discrete systems.

Continuous systems save delays separately from coefficients. For example, if a system has a delay of 2, the system saves the information of delay separately and does not modify the coefficients. You can use the SI Get Delays from System Model VI to retrieve delays in seconds for continuous systems.

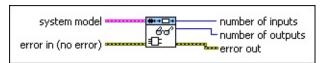
SI Get Dimensions of System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Obtains the number of inputs and outputs for a system model.

Example



- Place on the block diagram Find on the Functions palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- number of inputs returns the number of stimulus signals of the system model.

- number of outputs returns the number of response signals of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Information from Model VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Get Dimensions of System Model VI.

■ Open example ■ Browse related examples

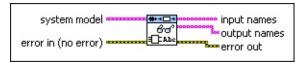
SI Get Names from System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Reads input and output names from a system model. Use the <u>SI Set</u> <u>Names to System Model</u> VI to write input and output names to a system model.

Example



- Place on the block diagram Find on the Functions palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- input names returns the names of the system model stimulus

signals.

- **output names** returns the names of the system model response signals.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Information from Model VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Get Names from System Model VI.

■ Open example ■ Browse related examples

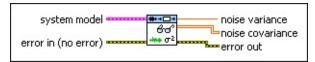
SI Get Noise Covariance from System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Obtains **noise variance** and **noise covariance** from a system model. Use the <u>SI Set Noise Covariance to System Model</u> VI to apply noise variance and noise covariance to a system model.

Example



- Place on the block diagram Find on the Functions palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- noise variance returns the variance of the disturbance for a SISO

- or MISO system. **noise variance** returns **–1** if **system model** contains a MIMO system.
- noise covariance returns the covariance of the disturbances for a MIMO system.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Information from Model VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Get Noise Covariance from System Model VI.

■ Open example ■ Browse related examples

SI Get Notes from System Model VI

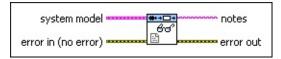
Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Reads comments from a system model. Use the SI Set Notes to System

Model VI to write comments to a system model.

Example



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **notes** returns the information you entered about the system model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Information from Model VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Get Notes from System Model VI.

■ Open example ■ Browse related examples

SI Get Orders of System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Obtains the orders of a system model. You must manually select the

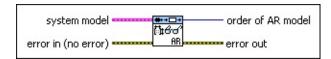
polymorphic instance to use.

Example

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

Select an instance	_
■ Place on the block diagram	■ Find on the Functions palette

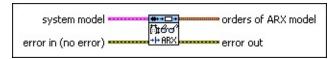
SI Get Orders of AR Model



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- order of AR model returns the order of the AR model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of ARX Model (SISO)

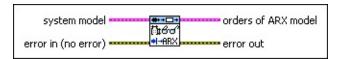


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of ARX model returns the orders and delay of the ARX model.
 - A order returns the order of the A coefficients of the system model.
 - **B order** returns the order of the *B* coefficients of the system model.
 - **delay** returns the delay k of the system model.
- error out contains error information. If error in indicates that an

error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of ARX Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of ARX model returns the orders and delays of the ARX model.
 - **A order** returns the order of the *A* coefficients of the system model.
 - **B orders** returns the orders of the *B* coefficients of the system model.
 - **delays** returns the delays k of the model.
- error out contains error information. If error in indicates that an

error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of ARX Model (MIMO)

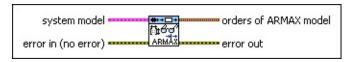


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of ARX model returns the orders and delays of the ARX model.
 - **A orders** returns the orders of the *A* coefficients of the system model.
 - **B orders** returns the orders of the *B* coefficients of the system model.
 - **delays** returns the delays k in the ARX MIMO model.
- error out contains error information. If error in indicates that an

error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

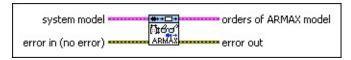
SI Get Orders of ARMAX Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of ARMAX model returns the orders and delay of the ARMAX model.
 - A order returns the order of the A coefficients of the system model.
 - **B order** returns the order of the *B* coefficients of the system model.
 - **C order** returns the order of the *C* coefficients of the system model.

- **delay** returns the delay k of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

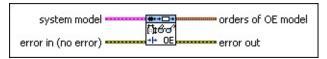
SI Get Orders of ARMAX Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of ARMAX model returns the orders and delay of the ARMAX model.
 - A **order** returns the order of the *A* coefficients of the system model.
 - **B orders** returns the orders of the *B* coefficients of the system model.
 - **C order** returns the order of the *C* coefficients of the system model.

- delays returns the delays k of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of OE Model (SISO)

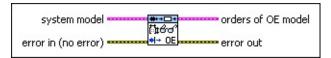


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of OE model returns the orders and delay of the <u>outputerror</u> (OE) model.
 - **B order** returns the order of the *B* coefficients of the system model.
 - **F order** returns the order of the *F* coefficients of the system model.
 - **delay** returns the delay k of the system model.
- error out contains error information. If error in indicates that an

error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of OE Model (MISO)

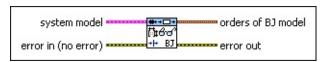


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of OE model returns the orders and delay of the <u>outputerror</u> (OE) model.
 - **B orders** returns the orders of the *B* coefficients of the system model.
 - **F orders** returns the orders of the *F* coefficients of the system model.
 - **delays** returns the delays k of the model.
- error out contains error information. If error in indicates that an

error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

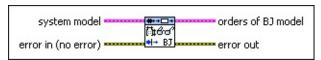
SI Get Orders of BJ Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of BJ model returns the orders and delay of the Box-Jenkins (BJ) model.
 - **B order** returns the order of the *B* coefficients of the system model.
 - **F order** returns the order of the *F* coefficients of the system model.
 - **C order** returns the order of the *C* coefficients of the system model.

- **D order** returns the order of the *D* coefficients of the system model.
- **delay** returns the delay k of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

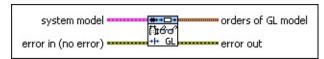
SI Get Orders of BJ Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of BJ model returns the orders and delay of the Box-Jenkins (BJ) model.
 - **B orders** returns the orders of the *B* coefficients of the system model.
 - **F orders** returns the orders of the *F* coefficients of the system model.
 - **C order** returns the order of the *C* coefficients of the system model.

- **D order** returns the order of the *D* coefficients of the system model.
- delays returns the delays k of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

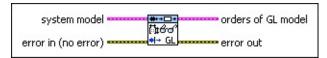
SI Get Orders of GL Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of GL model returns the orders and delay of the generallinear (GL) model.
 - **A order** returns the order of the A coefficients of the system model.
 - **B order** returns the order of the *B* coefficients of the system model.
 - **F order** returns the order of the *F* coefficients of the system model.

- **C order** returns the order of the C coefficients of the system model.
- **D** order returns the order of the *D* coefficients of the system model.
- delay returns the delay k of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of GL Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- orders of GL model returns the orders and delay of the generallinear (GL) model.
 - **A order** returns the order of the *A* coefficients of the system model.
 - **B orders** returns the orders of the *B* coefficients of the system model.
 - **F orders** returns the orders of the *F* coefficients of the system model.

- **C order** returns the order of the C coefficients of the system model.
- **D order** returns the order of the *D* coefficients of the system model.
- delays returns the delays k of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of SS Model (SISO)

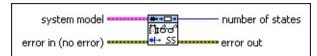


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- number of states returns the number of states in the <u>state-space</u> (SS) system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of SS Model (MISO)

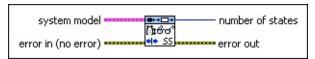


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- number of states returns the number of states in the <u>state-space</u> (SS) system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of SS Model (MIMO)

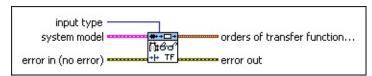


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- number of states returns the number of states in the <u>state-space</u> (SS) system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of TF Model (SISO)

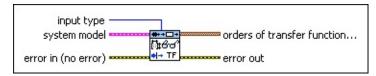


- **input type** specifies whether to obtain the orders of the <u>transfer</u> <u>function</u> between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - orders of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Returns the numerator and denominator orders of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- orders of transfer function model returns the orders of the transfer function (TF) model.
 - **num order** returns the orders of the numerator of the system model.
 - den order returns the orders of the denominator of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of TF Model (MISO)

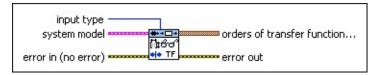


- input type specifies whether to obtain the orders of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - orders of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Returns the numerator and denominator orders of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- orders of transfer function model returns the orders of the transfer function (TF) model.
 - **num order** returns the orders of the numerator of the system model.
 - den order returns the orders of the denominator of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of TF Model (MIMO)

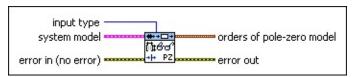


- input type specifies whether to obtain the orders of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - orders of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Returns the numerator and denominator orders of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- orders of transfer function model returns the orders of the transfer function (TF) model.
 - **num order** returns the orders of the numerator of the system model.
 - den order returns the orders of the denominator of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of ZPK Model (SISO)

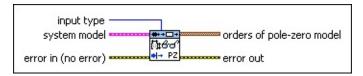


- input type specifies whether to obtain the number of poles and zeros of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - 0 **stimulus** (Default)—Obtains the number of poles and zeros of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the number of poles and zeros of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- orders of zero-pole-gain model returns the orders of the zero-pole-gain (ZPK) model.
 - **zeros order** returns the number of zeros of the system model.
 - **poles order** returns the number of poles of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of ZPK Model (MISO)

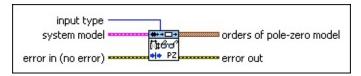


- input type specifies whether to obtain the number of poles and zeros of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - 0 **stimulus** (Default)—Obtains the number of poles and zeros of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the number of poles and zeros of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- orders of zero-pole-gain model returns the orders of the zero-pole-gain (ZPK) model.
 - **zeros order** returns the number of zeros of the system model.
 - poles order returns the number of poles of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Orders of ZPK Model (MIMO)



- input type specifies whether to obtain the number of poles and zeros of the transfer function between the stimulus and the response of the system model or of the transfer function between the noise and the response of the system model.
 - 0 **stimulus** (Default)—Obtains the number of poles and zeros of G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Obtains the number of poles and zeros of H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- orders of zero-pole-gain model returns the orders of the zero-pole-gain (ZPK) model.
 - **zeros order** returns the number of zeros of the system model.
 - poles order returns the number of poles of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Information from Model VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Get Orders of System Model VI.

■ Open example ■ Browse related examples

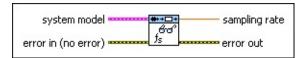
SI Get Sampling Rate from System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Retrieves the sampling rate of a discrete system model. Use the <u>SI Set Sampling Rate to System Model</u> VI to apply a sampling rate to a system model.

Example



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate returns the sampling rate of the discrete system

model. If **sampling rate** returns **0** or a value less than **0**, the system model is continuous.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Information from Model VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Get Sampling Rate from System Model VI.

■ Open example ■ Browse related examples

SI Get Static Gains from System Model VI

Owning Palette: Model Management VIs

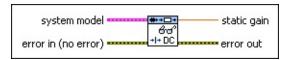
Installed With: System Identification Toolkit

Returns the static gain from a system model. The system model you wire to the **system model** input determines the polymorphic instance to use.

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

	Select an instance	_	
J	■ Place on the block diagram ■ Find on the Fund	tions	palette

SI Get Static Gains from System Model (SISO)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model contains.

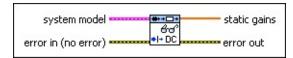


Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- static gain returns the static gain of the model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Static Gains from System Model (MISO)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model contains.

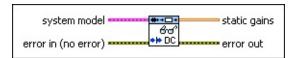


Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- static gains returns the static gain of the model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Static Gains from System Model (MIMO)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- static gains returns the static gain of the model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

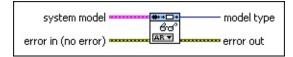
SI Get Type of System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Reads the model type from **system model**. The number of inputs and outputs of the model determines its system type.

Example



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- model type returns the model type and indicates if the system type is SISO, MISO, or MIMO.

0	Undefined (default)
1	AR
2	ARX (SISO)
3	ARX (MISO)
4	ARX (MIMO)
5	ARMAX (SISO)
6	ARMAX (MISO)
7	Output-Error (SISO)
8	Output-Error (MISO)
9	Box-Jenkins (SISO)
10	Box-Jenkins (MISO)
11	General-Linear (SISO)
12	General-Linear (MISO)
13	State-Space (SISO)
14	State-Space (MISO)
15	State-Space (MIMO)
16	Transfer Function (SISO)
17	Transfer Function (MISO)
18	Transfer Function (MIMO)
19	Zero-Pole-Gain (SISO)
20	Zero-Pole-Gain (MISO)
21	Zero-Pole-Gain (MIMO)

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Information from Model VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Get Type of System Model VI.

■ Open example ■ Browse related examples

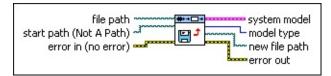
SI Load System Model from File VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Loads a system model from a .sim file. A .sim file is a system identification model file that saves all model coefficients regardless of the model type. Use the <u>SI Save System Model to File</u> VI to save a system model to a .sim file.

Example



- Place on the block diagram Find on the Functions palette
- file path is the path to the file from which you want to load the system model. If you specify a valid path in file path, this VI loads the model from the file whose path is file path. If file path is empty (default) or is <Not A Path>, this VI displays a dialog box from which you can select a file. You receive an error if you do not specify file path.
- start path is the path to the initially displayed directory or folder in the Open a file containing system identification model dialog box. If you do not specify a valid path in file path, the Open a file containing system identification model dialog box opens. You can select the file from which you want to load the system model from this dialog box. The default value is <Not A Path>, which is the path to the last directory or folder shown in the Open a file containing system identification model dialog box.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error

in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- model type returns the model type and indicates if the system type is SISO, MISO, or MIMO.

0	Undefined (default)
1	AR
2	ARX (SISO)
3	ARX (MISO)
4	ARX (MIMO)
5	ARMAX (SISO)
6	ARMAX (MISO)
7	Output-Error (SISO)
8	Output-Error (MISO)
9	Box-Jenkins (SISO)
10	Box-Jenkins (MISO)
11	General-Linear (SISO)
12	General-Linear (MISO)
13	State-Space (SISO)
14	State-Space (MISO)

15	State-Space (MIMO)	
16	Transfer Function (SISO)	
17	Transfer Function (MISO)	
18	Transfer Function (MIMO)	
19	Zero-Pole-Gain (SISO)	
20	Zero-Pole-Gain (MISO)	
21	Zero-Pole-Gain (MIMO)	

- new file path returns the path of the file from which this VI loads the system model. You can use this output to determine the path of the file that you opened using the Open a file containing system identification model dialog box. new file path returns <Not A Path> if you click the Cancel button in the dialog box.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Load Model from File VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Load System Model from File VI.

■ Open example ■ Browse related examples

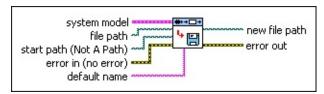
SI Save System Model to File VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Saves a system model to a .sim file. A .sim file is a system identification model file that saves all model coefficients regardless of the model type. Use the <u>SI Load System Model from File</u> VI to load a system model from a .sim file.

Example



- Place on the block diagram Find on the Functions palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- file path is the path to the file to which you want to save the system model. If you specify a valid path in file path, this VI saves the model to the file whose path is file path. If file path is empty (default) or is <Not A Path>, this VI displays a dialog box from which you can select a file. You receive an error if you do not specify file path.
- start path is the path to the initially displayed directory or folder in the Select a file to save system identification model dialog box. If you do not specify a valid path in file path, the Select a file to save system identification model dialog box opens. You can select the file to which you want to save the system model from this dialog box. The default value is <Not A Path>, which is the path to the last directory or folder shown in the Select a file to save system identification model dialog box.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while

this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- default name is the name you want to appear as the initial file or directory name in the Select a file to save system identification model dialog box. The default is an empty string.
- new file path returns the path of the file to which this VI saves the system model. You can use this output to determine the path of the file that you saved using the Select a file to save system identification model dialog box. new file path returns <Not A Path> if you click the Cancel button in the dialog box.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning.

Example

Refer to the Save Model to File VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Save System Model to File VI.

■ Open example ■ Browse related examples

SI Set Coefficients to System Model VI

Owning Palette: Model Management VIs

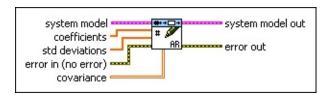
Installed With: System Identification Toolkit

Applies coefficients and the standard deviation and covariance of the coefficients to **system model**. Use the <u>SI Get Coefficients to System Model</u> VI to return the coefficients and the standard deviation and covariance of the coefficients of **system model**. You must <u>manually select the polymorphic instance</u> to use.

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

Select an instance	
■ Place on the block diagram	■ Find on the Functions palette

SI Set Coefficients to AR Model

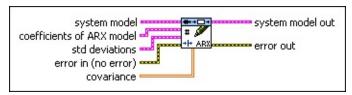


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- **coefficients** specifies the coefficients in the AR model.
- std deviations specifies the standard deviations of the coefficients. Each value in std deviations is the standard deviation of the corresponding coefficient in coefficients.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure,

nominal or estimated parameters, identification result, and so on.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

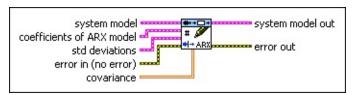
SI Set Coefficients to ARX Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of ARX model specifies the coefficients of the ARX model.
 - **A** specifies the *A* coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of ARX model.
 - A **std dev** specifies the standard deviations of the *A* coefficients of the system model.
 - **B std dev** specifies the standard deviations of the *B* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

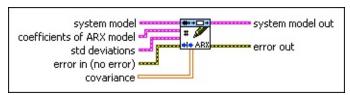
SI Set Coefficients to ARX Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of ARX model specifies the coefficients of the <u>ARX</u> model.
 - **A** specifies the *A* coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of ARX model.
 - A **std dev** specifies the standard deviations of the *A* coefficients of the system model.
 - **B std dev** specifies the standard deviations of the *B* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

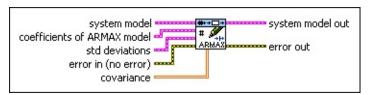
SI Set Coefficients to ARX Model (MIMO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of ARX model specifies the coefficients of the ARX model.
 - **A** specifies the *A* coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of ARX model.
 - A **std dev** specifies the standard deviation of the *A* coefficients of the system model.
 - **B std dev** specifies the standard deviation of the *B* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

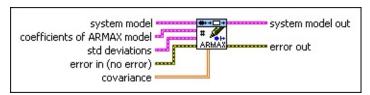
SI Set Coefficients to ARMAX Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of ARMAX model specifies the coefficients of the ARMAX model.
 - **A** specifies the *A* coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of ARMAX model.
 - A **std dev** specifies the standard deviations of the *A* coefficients of the system model.
 - **B** std dev specifies the standard deviations of the *B* coefficients of the system model.
 - **C std dev** specifies the standard deviations of the *C* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

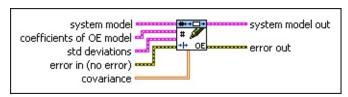
SI Set Coefficients to ARMAX Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of ARMAX model specifies the coefficients of the ARMAX model.
 - **A** specifies the *A* coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of ARMAX model.
 - A **std dev** specifies the standard deviations of the *A* coefficients of the system model.
 - **B std dev** specifies the standard deviations of the *B* coefficients of the system model.
 - **C std dev** specifies the standard deviations of the *C* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

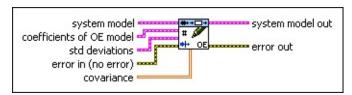
SI Set Coefficients to OE Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of OE model specifies the coefficients of the <u>outputerror</u> (OE) model.
 - **B** specifies the *B* coefficients of the system model.
 - **F** specifies the *F* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of OE model.
 - **B** std dev specifies the standard deviations of the *B* coefficients of the system model.
 - **F std dev** specifies the standard deviations of the *F* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

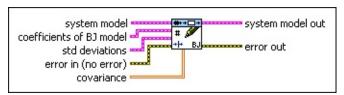
SI Set Coefficients to OE Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of OE model specifies the coefficients of the <u>outputerror</u> (OE) model.
 - **B** specifies the *B* coefficients of the system model.
 - **F** specifies the *F* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of OE model.
 - **B** std dev specifies the standard deviations of the *B* coefficients of the system model.
 - **F std dev** specifies the standard deviations of the *F* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

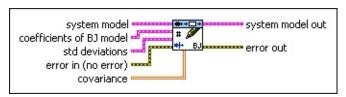
SI Set Coefficients to BJ Model (SISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of BJ model specifies the coefficients of the Box-Jenkins (BJ) model.
 - **B** specifies the *B* coefficients of the system model.
 - **F** specifies the *F* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
 - **D** specifies the *D* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of BJ model.
 - **B std dev** specifies the standard deviations of the *B* coefficients of the system model.
 - **F std dev** specifies the standard deviations of the *F* coefficients of the system model.
 - **C** std dev specifies the standard deviations of the *C* coefficients of the system model.
 - **D std dev** specifies the standard deviations of the *D* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

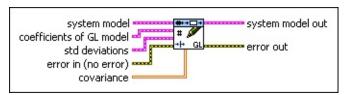
SI Set Coefficients to BJ Model (MISO)



- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of BJ model specifies the coefficients of the Box-Jenkins (BJ) model.
 - **B** specifies the *B* coefficients of the system model.
 - **F** specifies the *F* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
 - **D** specifies the *D* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of BJ model.
 - **B** std dev specifies the standard deviations of the *B* coefficients of the system model.
 - **F std dev** specifies the standard deviations of the *F* coefficients of the system model.
 - **C** std dev specifies the standard deviations of the *C* coefficients of the system model.
 - **D std dev** specifies the standard deviations of the *D* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to GL Model (SISO)

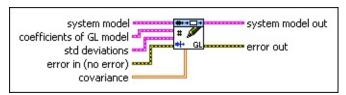


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of GL model specifies the coefficients of the generallinear (GL) model.
 - A specifies the A coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
 - **F** specifies the *F* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
 - **D** specifies the *D* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of GL model.
 - A **std dev** specifies the standard deviations of the *A* coefficients of the system model.
 - **B std dev** specifies the standard deviations of the *B* coefficients of the system model.
 - **F std dev** specifies the standard deviations of the *F* coefficients of the system model.
 - **C std dev** specifies the standard deviations of the *C* coefficients of the system model.
 - **D std dev** specifies the standard deviations of the *D* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error

status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to GL Model (MISO)

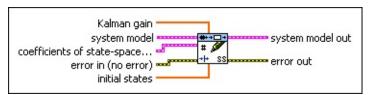


- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of GL model specifies the coefficients of the generallinear (GL) model.
 - A specifies the A coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
 - **F** specifies the *F* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
 - **D** specifies the *D* coefficients of the system model.
- std deviations specifies the standard deviations of coefficients of GL model.
 - A **std dev** specifies the standard deviations of the *A* coefficients of the system model.
 - **B std dev** specifies the standard deviations of the *B* coefficients of the system model.
 - **F std dev** specifies the standard deviations of the *F* coefficients of the system model.
 - **C** std dev specifies the standard deviations of the *C* coefficients of the system model.
 - **D std dev** specifies the standard deviations of the *D* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error

status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **covariance** specifies the covariance of the values of the system model coefficients.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to SS Model (SISO)

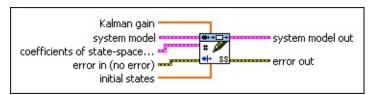


- **Kalman gain** specifies the Kalman gain of the state-space (SS) model.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of state-space model specifies the coefficients of the state-space (SS) model.
 - **A** specifies the *A* coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
 - **D** specifies the *D* coefficient of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

- initial states specifies the initial states of the state-space (SS) model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to SS Model (MISO)

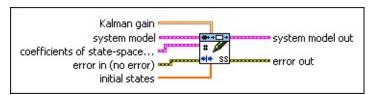


- **Kalman gain** specifies the Kalman gain of the state-space (SS) model.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of state-space model specifies the coefficients of the state-space (SS) model.
 - **A** specifies the *A* coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
 - **D** specifies the *D* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

- initial states specifies the initial states of the state-space (SS) model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to SS Model (MIMO)

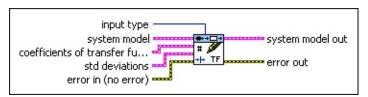


- **Kalman gain** specifies the Kalman gain of the state-space (SS) model.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of state-space model specifies the coefficients of the state-space (SS) model.
 - **A** specifies the *A* coefficients of the system model.
 - **B** specifies the *B* coefficients of the system model.
 - **C** specifies the *C* coefficients of the system model.
 - **D** specifies the *D* coefficients of the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

- initial states specifies the initial states of the state-space (SS) model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to TF Model (SISO)

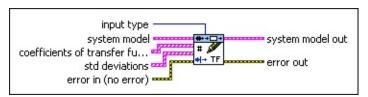


- input type specifies whether to set the coefficients for the transfer function between the stimulus and the response of the system model or for the transfer function between the noise and the response of the system model.
 - o **stimulus** (default)—Sets the coefficients for G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Sets the coefficients for H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of transfer function model specifies the coefficients of the transfer function (TF) model.
 - **numerator** specifies the numerator coefficients of the stimulus or noise transfer function.
 - **denominator** specifies the denominator coefficients of the stimulus or noise transfer function.
- std deviations specifies the standard deviations of coefficients of transfer function model.
 - **numerator std dev** specifies the standard deviation of the numerator coefficients of the transfer function model.
 - denominator std dev specifies the standard deviation of the denominator coefficients of the transfer function model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error

occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **system model out** returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to TF Model (MISO)

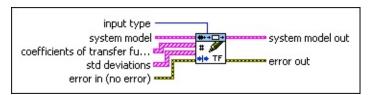


- input type specifies whether to set the coefficients for the transfer function between the stimulus and the response of the system model or for the transfer function between the noise and the response of the system model.
 - o **stimulus** (default)—Sets the coefficients for G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Sets the coefficients for H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of transfer function model specifies the coefficients of the transfer function (TF) model.
 - **numerator** specifies the numerator coefficients of the stimulus or noise transfer function.
 - **denominator** specifies the denominator coefficients of the stimulus or noise transfer function.
- std deviations specifies the standard deviations of coefficients of transfer function model.
 - **numerator std dev** specifies the standard deviation of the numerator coefficients of the transfer function model.
 - denominator std dev specifies the standard deviation of the denominator coefficients of the transfer function model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error

occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **system model out** returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to TF Model (MIMO)

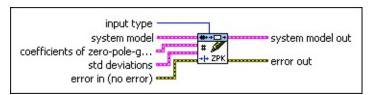


- input type specifies whether to set the coefficients for the transfer function between the stimulus and the response of the system model or for the transfer function between the noise and the response of the system model.
 - o **stimulus** (default)—Sets the coefficients for G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Sets the coefficients for H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of transfer function model specifies the coefficients of the transfer function (TF) model.
 - **numerator** specifies the numerator coefficients of the stimulus or noise transfer function.
 - **denominator** specifies the denominator coefficients of the stimulus or noise transfer function.
- std deviations specifies the standard deviations of coefficients of transfer function model.
 - **numerator std dev** specifies the standard deviation of the numerator coefficients of the transfer function model.
 - **denominator std dev** specifies the standard deviation of the denominator coefficients of the transfer function model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error

occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **system model out** returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to ZPK Model (SISO)

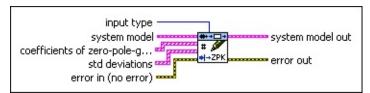


- input type specifies whether to set the poles and zeros for the transfer function between the stimulus and the response of the system model or for the transfer function between the noise and the response of the system model.
 - 0 **stimulus** (default)—Sets the poles and zeros for G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Sets the poles and zeros for H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of zero-pole-gain model specifies the coefficients and gain of the zero-pole-gain (ZPK) model.
 - **zeros** specifies the zeros of the zero-pole-gain model.
 - poles specifies the poles of the zero-pole-gain model.
 - gain specifies the gain of the zero-pole-gain model.
- std deviations specifies the standard deviations of coefficients of zero-pole-gain model.
 - **zeros std dev** specifies the standard deviations of the zeros of the zero-pole-gain model.
 - **poles std dev** specifies the standard deviations of the poles of the zero-pole-gain model.
 - **gain std dev** specifies the standard deviation of the gain of the zero-pole-gain model.
- **error in** describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before

this VI or function runs, the VI or function passes the **error in** value to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **system model out** returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to ZPK Model (MISO)

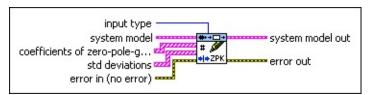


- input type specifies whether to set the poles and zeros for the transfer function between the stimulus and the response of the system model or for the transfer function between the noise and the response of the system model.
 - 0 **stimulus** (default)—Sets the poles and zeros for G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Sets the poles and zeros for H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of zero-pole-gain model specifies the coefficients and gain of the zero-pole-gain (ZPK) model.
 - **zeros** specifies the zeros of the zero-pole-gain model.
 - poles specifies the poles of the zero-pole-gain model.
 - gain specifies the gain of the zero-pole-gain model.
- std deviations specifies the standard deviations of coefficients of zero-pole-gain model.
 - **zeros std dev** specifies the standard deviations of the zeros of the zero-pole-gain model.
 - **poles std dev** specifies the standard deviations of the poles of the zero-pole-gain model.
 - **gain std dev** specifies the standard deviation of the gain of the zero-pole-gain model.
- **error in** describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before

this VI or function runs, the VI or function passes the **error in** value to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **system model out** returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Coefficients to ZPK Model (MIMO)



- **input type** specifies whether to set the poles and zeros for the transfer function between the stimulus and the response of the system model or for the transfer function between the noise and the response of the system model.
 - 0 **stimulus** (default)—Sets the poles and zeros for G(z), the transfer function between the stimulus and the response. G(z) is defined as the stimulus transfer function.
 - 1 **noise**—Sets the poles and zeros for H(z), the transfer function between the noise and the response. H(z) is defined as the noise transfer function.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- coefficients of zero-pole-gain model specifies the coefficients and gain of the zero-pole-gain (ZPK) model. The elements of the *i*th row and *j*th column are the coefficients of the zero-pole-gain model from the *j*th input to the *i*th output.
 - **zeros** specifies the zeros of the zero-pole-gain model.
 - poles specifies the poles of the zero-pole-gain model.
 - **gain** specifies the gain of the zero-pole-gain model.
- std deviations specifies the standard deviations of coefficients of zero-pole-gain model.
 - **zeros std dev** specifies the standard deviations of the zeros of the zero-pole-gain model.
 - **poles std dev** specifies the standard deviations of the poles of the zero-pole-gain model.
 - **gain std dev** specifies the standard deviation of the gain of the zero-pole-gain model.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced

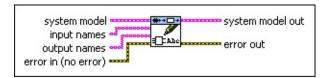
the error or warning.

SI Set Names to System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Writes input and output names to a system model. Use the <u>SI Get Names</u> <u>from System Model</u> VI to read input and output names from a system model.



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- **input names** specifies the names of the stimulus signals for the system model.
- **output names** specifies the names of the response signals for the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

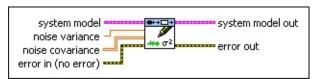
- **system model out** returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Noise Covariance to System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Applies noise variance and noise covariance to a system model. Use the SI Get Noise Covariance from System Model VI to obtain the noise variance and noise covariance from a system model.



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- **noise variance** specifies the variance of the disturbance for a SISO or MISO system model.
- noise covariance specifies the covariance of the disturbances for a MIMO system. This VI ignores noise covariance if the system model is a SISO or MISO system.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

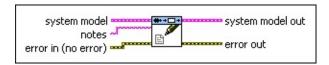
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Notes to System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Writes comments to a system model. Use the <u>SI Get Notes from System</u> Model VI to read comments from a system model.



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- **notes** specifies the comments you want to store with the system model.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure,

nominal or estimated parameters, identification result, and so on.

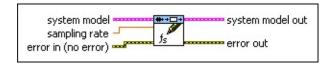
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Set Sampling Rate to System Model VI

Owning Palette: Model Management VIs

Installed With: System Identification Toolkit

Applies a sampling rate to a system model. Use the <u>SI Get Sampling</u> Rate from System Model VI to retrieve the sampling rate from a system model.



- Place on the block diagram Find on the Functions palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- sampling rate specifies the sampling rate to apply to system model. If system model is a continuous system, set sampling rate to a value less than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Model Validation VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Model Validation VIs to analyze and validate a system model.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Model Prediction	Performs <i>k</i> -step-ahead <u>model prediction</u> on a system model. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Model Residual Analysis	Computes and analyzes the prediction error for the response output of a model system. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Model Simulation PtByPt	Simulates the point-by-point response of a system model to an input signal. Wire data to the stimulus signal and noise inputs to determine the polymorphic instance to use or manually select the instance.
SI Model Simulation	Simulates the response of a system model to an input signal. Wire data to the stimulus signal and noise inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

SI Model Prediction VI

Owning Palette: Model Validation VIs

Installed With: System Identification Toolkit

Performs *k*-step-ahead <u>model prediction</u> on a system model. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.



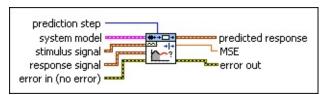
Note This VI does not support the transfer function or zero-polegain models. For AR models, this VI ignores **stimulus signal**.

Examples

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

Select an instance	
■ Place on the block diagram	■ Find on the Functions palette

SI Model Prediction (SISO Waveform)



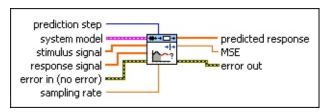
- prediction step specifies the prediction interval. The step-ahead prediction response is estimated by the known stimulus and response data up to the time you estimate the response. If prediction step is less than 0, this VI performs the model simulation without containing a disturbance. You cannot set prediction step to 0.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- predicted response returns the predicted response waveform of the system.
- MSE returns the mean square error (MSE) between response signal and predicted response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Prediction (SISO Array)



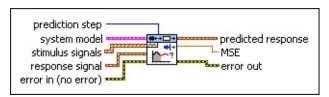
- prediction step specifies the prediction interval. The step-ahead prediction response is estimated by the known stimulus and response data up to the time you estimate the response. If prediction step is less than 0, this VI performs the model simulation without containing a disturbance. You cannot set prediction step to 0.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or

- function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- **predicted response** returns the predicted response output of the system.
- MSE returns the mean square error (MSE) between response signal and predicted response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Prediction (MISO Waveform)



- prediction step specifies the prediction interval. The step-ahead prediction response is estimated by the known stimulus and response data up to the time you estimate the response. If prediction step is less than 0, this VI performs the model simulation without containing a disturbance. You cannot set prediction step to 0.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.

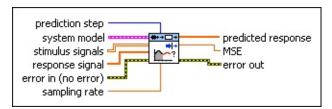


- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by

wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- predicted response returns the predicted response waveform of the system.
- MSE returns the mean square error (MSE) between response signal and predicted response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Prediction (MISO Array)



- prediction step specifies the prediction interval. The step-ahead prediction response is estimated by the known stimulus and response data up to the time you estimate the response. If prediction step is less than 0, this VI performs the model simulation without containing a disturbance. You cannot set prediction step to 0.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model contains.

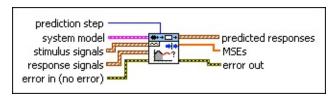


- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- **predicted response** returns the predicted response output of the system.
- **MSE** returns the mean square error (MSE) between **response** signal and predicted response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Prediction (MIMO Waveform)



- prediction step specifies the prediction interval. The step-ahead prediction response is estimated by the known stimulus and response data up to the time you estimate the response. If prediction step is less than 0, this VI performs the model simulation without containing a disturbance. You cannot set prediction step to 0.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.

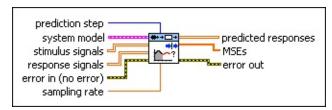


- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signals specifies the input waveform array of the response signals. Each element of the array is the waveform of one response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error

in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- predicted responses returns the predicted response waveform array of the system. Each element of the waveform array is the waveform of one response signal.
- MSEs returns the mean square errors (MSEs) between response signals and predicted responses. Each element of the array is the mean square error of one output.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Prediction (MIMO Array)



- prediction step specifies the prediction interval. The step-ahead prediction response is estimated by the known stimulus and response data up to the time you estimate the response. If prediction step is less than 0, this VI performs the model simulation without containing a disturbance. You cannot set prediction step to 0.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals specifies the input array of the response signals. Each row in the array is one response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- predicted responses returns the predicted response array of the system. Each row in the array is the output of one response signal.
- MSEs returns the mean square errors (MSEs) between response signals and predicted responses. Each element of the array is the mean square error of one output.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Examples

Refer to the following VIs for examples of using the SI Model Prediction VI:

- Model Prediction VI: labview\examples\System Identification\Getting Started\General.llb
 - Open example Browse related examples
- Flexible Arm VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples
- Four-Stage Evaporator VI: labview\examples\System Identification\Industry Applications\Process Industry Systems.llb
 - Open example Browse related examples

SI Model Residual Analysis VI

Owning Palette: Model Validation VIs

Installed With: System Identification Toolkit

Computes and analyzes the prediction error for the response output of a model system. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.



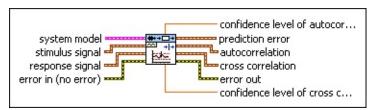
Note This VI does not support the transfer function or zero-polegain models. For AR models, this VI ignores **stimulus signal**.

Examples

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



SI Model Residual Analysis (SISO Waveform)



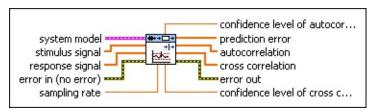
system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- confidence level of autocorrelation returns the confidence level of autocorrelation. The values of autocorrelation between plus and minus confidence level of autocorrelation are insignificant, and you can consider them to be equal to 0.
- **prediction error** returns the waveform of the one-step-ahead prediction error of the system response.
- **autocorrelation** returns the autocorrelation of **prediction error**. **autocorrelation** and **cross correlation** provide the measure of the quality of the estimated model.
- cross correlation returns the cross correlation of prediction error and stimulus signal. autocorrelation and cross correlation provide the measure of the quality of the estimated model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- confidence level of cross correlation returns the confidence level of cross correlation. The values of cross correlation between plus and minus confidence level of cross correlation are insignificant, and you can consider them to be equal to 0.

SI Model Residual Analysis (SISO Array)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.

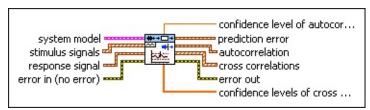


- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- confidence level of autocorrelation returns the confidence level of autocorrelation. The values of autocorrelation between plus and minus confidence level of autocorrelation are insignificant, and you can consider them to be equal to 0.
- **prediction error** returns the one-step-ahead prediction error of the system response.
- **autocorrelation** returns the autocorrelation of **prediction error**. **autocorrelation** and **cross correlation** provide the measure of the quality of the estimated model.
- cross correlation returns the cross correlation of prediction error and stimulus signal. autocorrelation and cross correlation provide the measure of the quality of the estimated model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- confidence level of cross correlation returns the confidence level of cross correlation. The values of cross correlation between plus and minus confidence level of cross correlation

are insignificant, and you can consider them to be equal to 0.

SI Model Residual Analysis (MISO Waveform)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

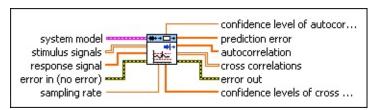
code is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- confidence level of autocorrelation returns the confidence level of autocorrelation. The values of autocorrelation between plus and minus confidence level of autocorrelation are insignificant, and you can consider them to be equal to 0.
- prediction error returns the waveform of the one-step-ahead prediction error of the system response.
- **autocorrelation** returns the autocorrelation of **prediction error**. **autocorrelation** and **cross correlations** provide the measure of the quality of the estimated model.
- cross correlations returns the cross correlations of prediction error and stimulus signals. Each element of the waveform array is the cross correlation between one input and the prediction error of the output. autocorrelation and cross correlations provide the measure of the quality of the estimated model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

[DBL]

confidence levels of cross correlations returns the confidence levels of **cross correlations**. The values of **cross correlations** between plus and minus **confidence levels of cross correlations** are insignificant, and you can consider them to be equal to 0.

SI Model Residual Analysis (MISO Array)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



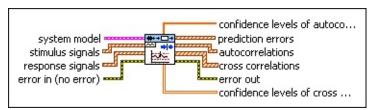
- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- of autocorrelation. The values of autocorrelation between plus and minus confidence level of autocorrelation are insignificant, and you can consider them to be equal to 0.
- **prediction error** returns the one-step-ahead prediction error of the system response.
- **autocorrelation** returns the autocorrelation of **prediction error**. **autocorrelation** and **cross correlations** provide the measure of the quality of the estimated model.
- cross correlations returns the cross correlations of prediction error and stimulus signals. Each row in the array is the cross correlation between one input and the prediction error of the output. autocorrelation and cross correlations provide the measure of the quality of the estimated model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

confidence levels of cross correlations returns the confidence levels of cross correlations. The values of cross correlations between plus and minus confidence levels of cross correlations are insignificant, and you can consider them to be equal to 0.

SI Model Residual Analysis (MIMO Waveform)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signals specifies the input waveform array of the response signals. Each element of the array is the waveform of one response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

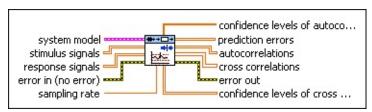
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- confidence levels of autocorrelations returns the confidence levels of autocorrelations. Each element of the array is the confidence level of one autocorrelation. The values of autocorrelations between plus and minus confidence levels of autocorrelations are insignificant, and you can consider them to be equal to 0.
- **prediction errors** returns the one-step-ahead prediction errors of the system response. Each element of the waveform array is the prediction error of one response.
- **autocorrelations** returns the autocorrelations of **prediction errors**. Each element of the array is the autocorrelation of the prediction error for one output. **autocorrelations** and **cross correlations** provide the measure of the quality of the estimated model.
- cross correlations returns the cross correlations of prediction errors and stimulus signals. autocorrelations and cross correlations provide the measure of the quality of the estimated model. The element of the *i*th row and *j*th column in the array is the cross correlation between the *j*th input and the prediction error of the *i*th output.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code

is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

confidence levels of cross correlations returns the confidence levels of cross correlations. Each element of the array is the confidence level of one cross correlation. The element in the *i*th row and *j*th column of confidence levels of cross correlations is the confidence level of the cross correlation between the *j*th input and the prediction error of the *i*th output. The values of cross correlations between plus and minus confidence levels of cross correlations are insignificant, and you can consider them to be equal to 0.

SI Model Residual Analysis (MIMO Array)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals specifies the input array of the response signals. Each row in the array is one response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- confidence levels of autocorrelations returns the confidence levels of autocorrelations. Each element of the array is the confidence level of one autocorrelation. The values of autocorrelations between plus and minus confidence levels of autocorrelations are insignificant, and you can consider them to be equal to 0.
- prediction errors returns the one-step-ahead prediction errors of the system response. Each row in the array is the prediction error for one output.
- **autocorrelations** returns the autocorrelations of **prediction errors**. Each row in the array is the autocorrelation of the prediction error for one output. **autocorrelations** and **cross correlations** provide the measure of the quality of the estimated model.
- cross correlations returns the cross correlations of prediction errors and stimulus signals. autocorrelations and cross correlations provide the measure of the quality of the estimated model. The 1D subarray of cross correlations with the *i*th first index and *j*th second index is the cross correlation between the *j*th input and the prediction error of the *i*th output.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- confidence levels of cross correlations returns the confidence levels of cross correlations. Each element of the array is the confidence level of one cross correlation. The element in the *j*th row and *j*th column of confidence levels of cross correlations is the confidence level of the cross correlation between the *j*th input and the prediction error of the *j*th output. The values of cross correlations between plus and minus confidence levels of cross correlations are insignificant, and you can consider them to be equal to 0.

Examples

Refer to the following VIs for examples of using the SI Model Residual Analysis VI:

- Residual Analysis VI: labview\examples\System Identification\Getting Started\General.llb
 - Open example Browse related examples
- Flexible Arm VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

SI Model Simulation VI

Owning Palette: Model Validation VIs

Installed With: System Identification Toolkit

Simulates the response of a system model to an input signal. Wire data to the **stimulus signal** and **noise** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.



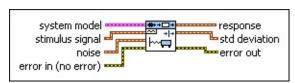
Note For ARX (MIMO), state-space, transfer function, and zero-pole-gain models, this VI does not return **std deviation** of the simulated response. For AR models, this VI ignores **stimulus signal**.

Example

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

Select an instance	▼
■ Place on the block diagram	■ Find on the Functions palette

SI Model Simulation (SISO Waveform)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.

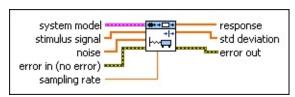
Use the Model Management VIs to retrieve the information system model contains.



- stimulus signal specifies the input waveform of the stimulus signal.
- **noise** is the waveform of the noise you want to apply to the system.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- response returns the simulated response waveform of the system.
- std deviation returns the standard deviation of the simulated system response. Each element is the standard deviation of the corresponding value in **response**.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Simulation (SISO Array)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.

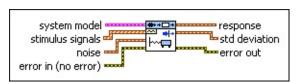


- stimulus signal specifies the input array of the stimulus signal.
- **noise** is the array of noise you want to apply to the system.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- response returns the simulated response output of the system.
- std deviation returns the standard deviations of the simulated system response. Each element of std deviation is the standard deviation of the corresponding value in response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Simulation (MISO Waveform)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.

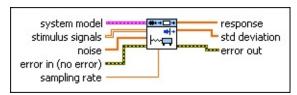
Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- **noise** is the waveform of the noise you want to apply to the system.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

- code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- response returns the simulated response waveform of the system.
- **std deviation** returns the standard deviation of the simulated system response. Each element is the standard deviation of the corresponding value in **response**.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Simulation (MISO Array)



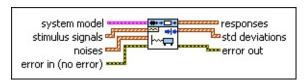
system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- **noise** is the array of noise you want to apply to the system.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- response returns the simulated response output of the system.
- std deviation returns the standard deviations of the simulated system response. Each element of std deviation is the standard deviation of the corresponding value in response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Simulation (MIMO Waveform)



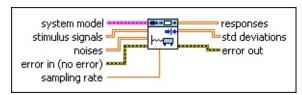
system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- **noises** is the waveform array of the noises you want to apply to the system. Each element of the waveform array is the waveform of one noise.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- responses returns the simulated response waveform array of the system. Each element of the waveform array is the waveform of one simulated response.
- std deviations returns the standard deviations of the simulated system responses. Each element of std deviations is the standard deviation of the corresponding value in responses.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Simulation (MIMO Array)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- **noises** is the array of noises you want to apply to the system. Each row in the array is one noise.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

- **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- responses returns the simulated response array of the system. Each row in the array is one response.
- std deviations returns the standard deviations of the simulated system responses. Each element of std deviations is the standard deviation of the corresponding value in responses.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Model Simulation VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Model Simulation VI.

■ Open example ■ Browse related examples

SI Model Simulation PtByPt VI

Owning Palette: Model Validation VIs

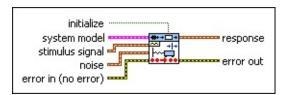
Installed With: System Identification Toolkit

Simulates the point-by-point response of a system model to an input signal. Wire data to the **stimulus signal** and **noise** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

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

Select an instance	_	
■ Place on the block diagram	■ Find on the Funct	i ons palette

SI Model Simulation PtByPt (SISO Waveform)



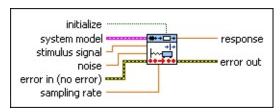
- initialize initializes the internal state of this VI when TRUE.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.



- stimulus signal specifies the input waveform of the stimulus signal.
- **noise** is the waveform of the noise you want to apply to the system.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

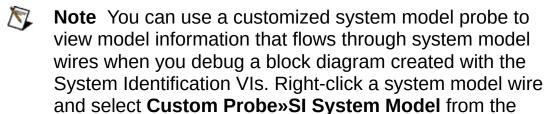
- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- response returns the simulated response waveform of the system.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Simulation PtByPt (SISO Array)



- initialize initializes the internal state of this VI when TRUE.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model contains.



stimulus signal is the input array of the stimulus signal.

noise is the array of noise you want to apply to the system.

shortcut menu to use the system model probe.

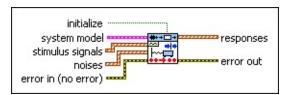
error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

- **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- response returns the simulated response output of the system.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Simulation PtByPt (MIMO Waveform)



- initialize initializes the internal state of this VI when TRUE.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.

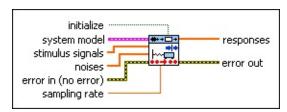


- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- **noises** is the waveform array of the noises you want to apply to the system. Each element of the waveform array is the waveform of one noise.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The

default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- responses returns the simulated response waveform array of the system. Each element of the waveform array is the waveform of one simulated response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Model Simulation PtByPt (MIMO Array)



- initialize initializes the internal state of this VI when TRUE.
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model contains.



- stimulus signals is the input array of the stimulus signals.
- **noises** is the array of noises you want to apply to the system. Each row in the array is one noise.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling rate of the input signals. sampling rate must equal the sampling rate used to estimate the system model.
- responses returns the response array of the system. Each row in the array is one response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Nonparametric Model Estimation VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Nonparametric Model Estimation VIs to estimate the impulse response or frequency response of an unknown, linear, time-invariant system from an input and corresponding output signal.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Estimate Frequency Response	
SI Estimate Impulse Response	Estimates the impulse response of an unknown system using the prewhitening-based correlation analysis method and the least squares method. You must manually select the polymorphic instance to use.

SI Estimate Frequency Response VI

Owning Palette: Nonparametric Model Estimation VIs

Installed With: System Identification Toolkit

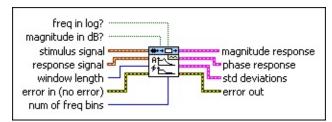
Estimates the frequency response of an unknown system using the spectral analysis method. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

<u>Details</u> <u>Examples</u>

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

Select an instance	
■ Place on the block diagram	■ Find on the Functions palette

SI Estimate Frequency Response (Waveform)



- **freq in log?** specifies whether to use logarithmic mapping for the frequency points. The default is TRUE.
- magnitude in dB? specifies whether to return the amplitude response in decibels. The default is TRUE.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- window length specifies the length of the window to use in frequency computation. The value of window length must be less than the length of stimulus signal and greater than 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

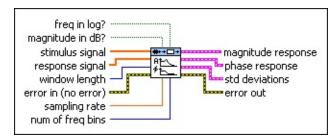
- num of freq bins specifies the number of frequency bins for which this VI computes the frequency response. The value of num of freq bins must be greater than or equal to 2.
- magnitude response returns the amplitude response of an unknown system at a given frequency.
 - freq point (mag) returns the frequency points at which this VI estimates the magnitude response.
 - magnitude returns the estimated amplitude response at each freq point (mag).
- phase response returns the phase response of an unknown system at a given frequency.
 - freq point (phase) returns the frequency points at which this VI estimates the phase response.
 - phase returns the estimated phase response at each freq point (phase).
- **std deviations** returns the standard deviation for each estimated amplitude and phase response.
 - magnitude std dev returns the standard deviation for each estimated amplitude response.
 - **phase std dev** returns the standard deviation for each estimated phase response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a

warning code.

source des

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Frequency Response (Array)



- **freq in log?** specifies whether to use logarithmic mapping for the frequency points. The default is TRUE.
- magnitude in dB? specifies whether to return the amplitude response in decibels. The default is TRUE.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- window length specifies the length of the window to use in frequency computation. The value of window length must be less than the length of stimulus signal and greater than 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- num of freq bins specifies the number of frequency bins for which this VI computes the frequency response. The value of **num of freq bins** must be greater than or equal to 2.
- magnitude response returns the amplitude response of an unknown system at a given frequency.
 - freq point (mag) returns the frequency points at which this VI estimates the magnitude response.
 - magnitude returns the estimated amplitude response at each freq point (mag).
- **phase response** returns the phase response of an unknown system at a given frequency.
 - freq point (phase) returns the frequency points at which this VI estimates the phase response.
 - phase returns the estimated phase response at each freq point (phase).
- **std deviations** returns the standard deviation for each estimated amplitude and phase response.
 - magnitude std dev returns the standard deviation for each estimated amplitude response.
 - **phase std dev** returns the standard deviation for each estimated phase response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code

is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Frequency Response Details

The following equation defines a frequency response estimated using the spectral analysis method:

$$G(e^{jw}) = \frac{\Phi_{oy}(e^{jw})}{\Phi_{oo}(e^{jw})}$$

where $G(e^{jw})$ is the frequency response of the system.

 $\Phi_{uy}(e^{jw})$ is the cross-spectral density between the stimulus signal and the response signal. This VI computes $\Phi_{uy}(e^{jw})$ by applying a Fourier transform on the cross correlation between the stimulus signal and the response signal.

 $_{uu}(e^{jw})$ is the auto-spectral density of the stimulus signal. This VI computes $_{uu}(e^{jw})$ by applying a Fourier transform on the autocorrelation of the stimulus signal.

In order to reduce leakage and improve resolution, this VI applies a Hanning window on the cross correlation and autocorrelation before applying the Fourier transform. The larger the window length, the larger the variance, but the smaller the bias of the estimated frequency response.

Examples

Refer to the following VIs for examples of using the SI Estimate Frequency Response VI:

- Estimate Frequency Response VI: labview\examples\System Identification\Getting Started\Nonparametric Estimation.llb
 - Open example Browse related examples
- Steel Subframe Flexible Structure VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

SI Estimate Impulse Response VI

Owning Palette: Nonparametric Model Estimation VIs

Installed With: System Identification Toolkit

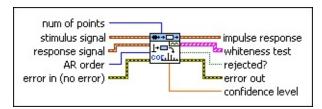
Estimates the impulse response of an unknown system using the prewhitening-based correlation analysis method and the least squares method. You must <u>manually select the polymorphic instance</u> to use.

Details Examples

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



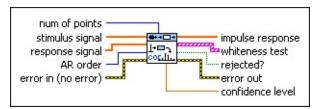
SI Estimate Impulse Response (Waveform)



- num of points specifies the number of points for which to compute the impulse response.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- AR order specifies the order of the AR model to use to estimate the filter for prewhitening. AR order must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- **impulse response** returns the waveform of the estimated impulse response of the system.
- whiteness test displays the autocorrelation of the prewhitened stimulus signal and the 99% confidence region. If stimulus signal is well prewhitened, most of the autocorrelation, except the first point, of the whitened stimulus signal will be within the confidence region. If some points exceed the confidence region, especially the second and third points, increase AR order to improve the prewhitening.
- rejected? indicates whether the impulse response estimation of this VI is reliable. If rejected? is FALSE, the impulse response estimation is reliable, and the risk of accepting an incorrect impulse response estimation is 5%. If rejected? is TRUE, the impulse response estimation is not reliable. Increase AR order or redesign the experiment to improve the impulse response estimation.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- confidence level returns the confidence level of the impulse response. The values of the impulse response between plus and minus confidence level are insignificant, and you can consider them to be equal to 0.

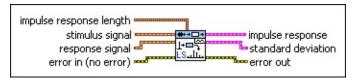
SI Estimate Impulse Response (Array)



- num of points specifies the number of points for which to compute the impulse response.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- AR order specifies the order of the AR model to use to estimate the filter for prewhitening. AR order must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **impulse response** returns the estimated impulse response of the unknown system.

- whiteness test displays the autocorrelation of the prewhitened stimulus signal and the 99% confidence region. If stimulus signal is well prewhitened, most of the autocorrelation, except the first point, of the whitened stimulus signal will be within the confidence region. If some points exceed the confidence region, especially the second and third points, increase AR order to improve the prewhitening.
- rejected? indicates whether the impulse response estimation of this VI is reliable. If rejected? is FALSE, the impulse response estimation is reliable, and the risk of accepting an incorrect impulse response estimation is 5%. If rejected? is TRUE, the impulse response estimation is not reliable. Increase AR order or redesign the experiment to improve the impulse response estimation.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- confidence level returns the confidence level of the impulse response. The values of the impulse response between plus and minus confidence level are insignificant, and you can consider them to be equal to 0.

SI Estimate Impulse Response (Least Squares Waveform)

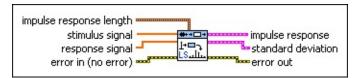


- impulse response length specifies the number of points for which to compute the impulse response.
 - num of points (t<0) determines the number of data points before t=0 for which to compute the **impulse response**.
 - num of points (t>=0) determines the number of data points starting from *t*=0 for which to compute the **impulse** response.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

- **impulse response** returns the estimated impulse response of the unknown system.
 - impulse response time step returns the time step of the estimated impulse response. The time step is a time vector, in samples, against which this VI estimates the impulse response.
 - **impulse response amplitude** returns the amplitude of the estimated impulse response.
- **standard deviation** returns the standard deviation of the estimated impulse response.
 - **std time step** returns the time step of the standard deviation of the estimated impulse response.
 - **std amplitude** returns the amplitude of the standard deviation of the estimated impulse response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Impulse Response (Least Squares Array)



- impulse response length specifies the number of points for which to compute the impulse response.
 - num of points (t<0) determines the number of data points before t=0 for which to compute the **impulse response**.
 - num of points (t>=0) determines the number of data points starting from *t*=0 for which to compute the **impulse** response.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

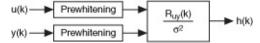
impulse response returns the estimated impulse response of the unknown system.

- impulse response time step returns the time step of the estimated impulse response. The time step is a time vector, in samples, against which this VI estimates the impulse response.
- **impulse response amplitude** returns the amplitude of the estimated impulse response.
- **standard deviation** returns the standard deviation of the estimated impulse response.
 - **std time step** returns the time step of the standard deviation of the estimated impulse response.
 - **std amplitude** returns the amplitude of the standard deviation of the estimated impulse response.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Impulse Response Details

The Correlation instances of the SI Estimate Impulse Response VI use a finite impulse response (FIR) filter to whiten the **stimulus signal** and compute the coefficients of the FIR filters from autoregressive (AR) processors. The **AR order** input determines the prewhitening behavior.

The following figure illustrates the structure of the Correlation instances of the SI Estimate Impulse Response VI. This VI conducts the prewhitening process for the stimulus signal u(k) and response signal y(k) using a pair of identical AR processors.



In the above diagram, $R_{uy}(k)$ is the cross correlation between the whitened stimulus signal u(k) and the whitened response signal y(k). σ is the standard deviation of the whitened stimulus signal u(k).

h(k) is the impulse response of the system.

Examples

Refer to the following VIs for examples of using the SI Estimate Impulse Response VI:

- Estimate Impulse Response VI: labview\examples\System Identification\Getting Started\Nonparametric Estimation.llb
 - Open example Browse related examples
- Glass Tube VI: labview\examples\System Identification\Industry Applications\General.llb
 - Open example Browse related examples
- Hairdryer VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

Parametric Model Estimation VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Parametric Model Estimation VIs to estimate a parametric mathematical model for an unknown, linear, time-invariant system.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Estimate Orders of System Model	Searches the model of an unknown system for the optimal orders and delay.
SI Estimate State- Space Model	Estimates the parameters of a <u>state-space (SS) model</u> for an unknown system. You must <u>manually select the polymorphic instance</u> to use.
SI Estimate Transfer Function Model	Estimates the parameters of a continuous or discrete transfer function model for an unknown system. This VI estimates only the transfer function between the stimulus and the response. The transfer function between the noise and the response is assumed to be 1. You must manually select the polymorphic instance to use.
SI Estimate User- Defined Model	Estimates a <u>user-defined model</u> . Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Model Estimation	Estimates the mathematical model for an unknown system.

<u>Transfer</u>

Estimates a discrete or continuous transfer function model for a SISO unknown system. For discrete models, this VI Function supports the direct, indirect, and joint input-output identification methods.

Subpalette	Description
Model	Use the Polynomial Model Estimation VIs to estimate an AR, ARX, ARMAX, Box-Jenkins, or output-error model for an unknown, linear, time-invariant system.

SI Estimate Orders of System Model VI

Owning Palette: Parametric Model Estimation VIs

Installed With: System Identification Toolkit

Searches the model of an unknown system for the optimal orders and

delay.

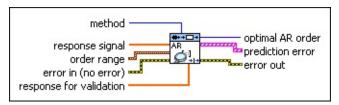
Details Example

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



■ Place on the block diagram ■ Find on the **Functions** palette

SI Estimate Orders of System Model (AR SISO Array)



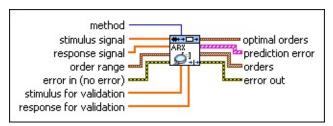
method specifies the method used to estimate the orders and delay.

0	FPE—Final Prediction Error Criterion
1	AIC—Akaike's Information Criterion
2	MDL (default)—Minimum Description Length Criterion
3	Other—User-defined model dimension

- response signal is the input array of the response signal.
- order range specifies the order range to search for the optimal order.
 - AR order low specifies the lower limit to use in the search for the optimal AR order of the model. The value must be greater than or equal to 0.
 - AR order high specifies the upper limit to use in the search for the optimal AR order of the model. The value must be greater than AR order low.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or

- that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- response for validation is the system response signal that this VI uses to validate the model it builds with response signal.
- optimal AR order returns the optimal order for the model. Use the Model Management VIs to retrieve the optimal orders and delay from the optimal AR order output.
- prediction error returns the <u>prediction error</u> in percent of the variance of the measured response signal versus the model dimension. **prediction error** also returns the optimal dimension selected by Final Prediction Error (FPE), Akaike's Information Criterion (AIC), or the Minimum Description Length (MDL) criterion.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model (ARX SISO Array)



method specifies the method used to estimate the orders and delay.

0	FPE—Final Prediction Error Criterion
1	AIC—Akaike's Information Criterion
2	MDL (default)—Minimum Description Length Criterion
3	Other—User-defined model dimension

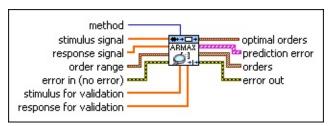
- stimulus signal is the input array of the stimulus signal.
- response signal is the input array of the response signal.
- order range specifies the order range to search for the optimal order.
 - A order low specifies the lower limit to use in the search for the optimal A order of the model. The value must be greater than or equal to 0.
 - A order high specifies the upper limit to use in the search for the optimal A order of the model. The value must be greater than A order low.
 - B order low specifies the lower limit to use in the search for the optimal *B* order of the model. The value must be greater than or equal to 0.
 - B order high specifies the upper limit to use in the search for the optimal *B* order of the model. The value must be greater than **B** order low.
 - **delay low** specifies the lower limit to use in the search for the optimal delay order of the model. The value must be greater than or equal to 0.
 - delay high specifies the upper limit to use in the search for

the optimal delay of the model. The value must be greater than **delay low**.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus for validation is the system stimulus signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- response for validation is the system response signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- optimal orders returns the optimal orders and delays for the model. Use the Model Management VIs to retrieve the optimal orders and delay from the optimal orders output.
 - optimal A order is the optimal A order for the model.
 - optimal B order is the optimal B order for the model.
 - optimal delay is the optimal delay of the model.

- prediction error returns the <u>prediction error</u> in percent of the variance of the measured response signal versus the model dimension. **prediction error** also returns the optimal dimension selected by Final Prediction Error (FPE), Akaike's Information Criterion (AIC), or the Minimum Description Length (MDL) criterion.
- orders returns the optimal orders at each model dimension. The model dimension ranges from the value of A order low + B order low to the value of A order high + B order high.
 - **A order** is the optimal A order for the model.
 - **B** order is the optimal B order for the model.
 - **delay** is the optimal delay of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model (ARMAX SISO Array)



method specifies the method used to estimate the orders and delay.

0	FPE — <u>Final Prediction Error Criterion</u>
1	AIC—Akaike's Information Criterion
2	MDL (default)—Minimum Description Length Criterion
3	Other—User-defined model dimension

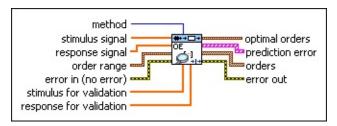
- stimulus signal is the input array of the stimulus signal.
- response signal is the input array of the response signal.
- order range specifies the order range to search for the optimal order.
 - A order low specifies the lower limit to use in the search for the optimal A order of the model. The value must be greater than or equal to 0.
 - A order high specifies the upper limit to use in the search for the optimal A order of the model. The value must be greater than A order low.
 - B order low specifies the lower limit to use in the search for the optimal *B* order of the model. The value must be greater than or equal to 0.
 - B order high specifies the upper limit to use in the search for the optimal *B* order of the model. The value must be greater than **B** order low.
 - **C order low** specifies the lower limit to use in the search for the optimal *C* order of the model. The value must be greater than or equal to 0.
 - C order high specifies the upper limit to use in the search

- for the optimal *C* order of the model. The value must be greater than **C** order low.
- delay low specifies the lower limit to use in the search for the optimal delay order of the model. The value must be greater than or equal to 0.
- delay high specifies the upper limit to use in the search for the optimal delay of the model. The value must be greater than delay low.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus for validation is the system stimulus signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- response for validation is the system response signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- optimal orders returns the optimal orders and delays for the

model. Use the <u>Model Management</u> VIs to retrieve the optimal orders and delay from the **optimal orders** output.

- optimal A order is the optimal A order for the model.
- optimal B order is the optimal B order for the model.
- optimal C order is the optimal C order for the model.
- optimal delay is the optimal delay of the model.
- prediction error returns the <u>prediction error</u> in percent of the variance of the measured response signal versus the model dimension. **prediction error** also returns the optimal dimension selected by Final Prediction Error (FPE), Akaike's Information Criterion (AIC), or the Minimum Description Length (MDL) criterion.
- orders returns the optimal orders at each model dimension. The model dimension ranges from the value of A order low + B order low + C order low to the value of A order high + B order high.
 - lack **A order** is the optimal *A* order for the model.
 - **C** order is the optimal *C* order for the model.
 - **B** order is the optimal B order for the model.
 - **delay** is the optimal delay of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model (OE SISO Array)



method specifies the method used to estimate the orders and delay.

0	FPE—Final Prediction Error Criterion
1	AIC—Akaike's Information Criterion
2	MDL (default)—Minimum Description Length Criterion
3	Other—User-defined model dimension

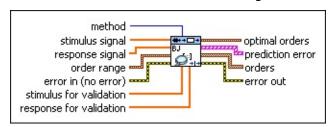
- stimulus signal is the input array of the stimulus signal.
- response signal is the input array of the response signal.
- order range specifies the order range to search for the optimal order.
 - B order low specifies the lower limit to use in the search for the optimal *B* order of the model. The value must be greater than or equal to 0.
 - B order high specifies the upper limit to use in the search for the optimal *B* order of the model. The value must be greater than **B** order low.
 - F order low specifies the lower limit to use in the search for the optimal *F* order of the model. The value must be greater than or equal to 0.
 - F order high specifies the upper limit to use in the search for the optimal *F* order of the model. The value must be greater than **F** order low.
 - **delay low** specifies the lower limit to use in the search for the optimal delay order of the model. The value must be greater than or equal to 0.
 - delay high specifies the upper limit to use in the search for

the optimal delay of the model. The value must be greater than **delay low**.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus for validation is the system stimulus signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- response for validation is the system response signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- optimal orders returns the optimal orders and delays for the model. Use the Model Management VIs to retrieve the optimal orders and delay from the optimal orders output.
 - optimal B order is the optimal B order for the model.
 - optimal F order is the optimal F order for the model.
 - optimal delay is the optimal delay of the model.

- prediction error returns the <u>prediction error</u> in percent of the variance of the measured response signal versus the model dimension. **prediction error** also returns the optimal dimension selected by Final Prediction Error (FPE), Akaike's Information Criterion (AIC), or the Minimum Description Length (MDL) criterion.
- orders returns the optimal orders at each model dimension. The model dimension ranges from the value of **B order low** + **F order low** to the value of **B order high** + **F order high**.
 - **B** order is the optimal B order for the model.
 - **F order** is the optimal F order for the model.
 - **delay** is the optimal delay of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model (BJ SISO Array)



method specifies the method used to estimate the orders and delay.

0	FPE — <u>Final Prediction Error Criterion</u>
1	AIC—Akaike's Information Criterion
2	MDL (default)—Minimum Description Length Criterion
3	Other—User-defined model dimension

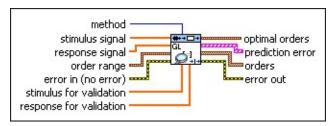
- stimulus signal is the input array of the stimulus signal.
- response signal is the input array of the response signal.
- order range specifies the order range to search for the optimal order.
 - B order low specifies the lower limit to use in the search for the optimal *B* order of the model. The value must be greater than or equal to 0.
 - B order high specifies the upper limit to use in the search for the optimal *B* order of the model. The value must be greater than **B** order low.
 - F order low specifies the lower limit to use in the search for the optimal *F* order of the model. The value must be greater than or equal to 0.
 - F order high specifies the upper limit to use in the search for the optimal *F* order of the model. The value must be greater than **F** order low.
 - **C order low** specifies the lower limit to use in the search for the optimal *C* order of the model. The value must be greater than or equal to 0.
 - C order high specifies the upper limit to use in the search

- for the optimal *C* order of the model. The value must be greater than **C** order low.
- **D** order low specifies the lower limit to use in the search for the optimal *D* order of the model. The value must be greater than or equal to 0.
- **D** order high specifies the upper limit to use in the search for the optimal *D* order of the model. The value must be greater than **D** order low.
- delay low specifies the lower limit to use in the search for the optimal delay order of the model. The value must be greater than or equal to 0.
- delay high specifies the upper limit to use in the search for the optimal delay of the model. The value must be greater than delay low.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus for validation is the system stimulus signal that this VI

- uses to validate the model it builds with **stimulus signal** and **response signal**.
- response for validation is the system response signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- optimal orders returns the optimal orders and delays for the model. Use the Model Management VIs to retrieve the optimal orders and delay from the optimal orders output.
 - optimal B order is the optimal B order for the model.
 - optimal F order is the optimal F order for the model.
 - optimal C order is the optimal C order for the model.
 - optimal D order is the optimal D order for the model.
 - optimal delay is the optimal delay of the model.
- prediction error returns the <u>prediction error</u> in percent of the variance of the measured response signal versus the model dimension. **prediction error** also returns the optimal dimension selected by Final Prediction Error (FPE), Akaike's Information Criterion (AIC), or the Minimum Description Length (MDL) criterion.
- orders returns the optimal orders at each model dimension. The model dimension ranges from the value of B order low + F order low + C order low + D order low to the value of B order high + F order high + C order high + D order high.
 - **B** order is the optimal B order for the model.
 - **F order** is the optimal F order for the model.
 - **C** order is the optimal *C* order for the model.
 - **D** order is the optimal D order for the model.
 - delay is the optimal delay of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model (GL SISO Array)



method specifies the method used to estimate the orders and delay.

0	FPE—Final Prediction Error Criterion
1	AIC—Akaike's Information Criterion
2	MDL (default)—Minimum Description Length Criterion
3	Other—User-defined model dimension

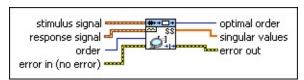
- stimulus signal is the input array of the stimulus signal.
- response signal is the input array of the response signal.
- order range specifies the order range to search for the optimal order.
 - A order low specifies the lower limit to use in the search for the optimal A order of the model. The value must be greater than or equal to 0.
 - A order high specifies the upper limit to use in the search for the optimal A order of the model. The value must be greater than A order low.
 - B order low specifies the lower limit to use in the search for the optimal *B* order of the model. The value must be greater than or equal to 0.
 - B order high specifies the upper limit to use in the search for the optimal *B* order of the model. The value must be greater than **B** order low.
 - F order low specifies the lower limit to use in the search for the optimal *F* order of the model. The value must be greater than or equal to 0.
 - F order high specifies the upper limit to use in the search

- for the optimal *F* order of the model. The value must be greater than **F** order low.
- **C order low** specifies the lower limit to use in the search for the optimal *C* order of the model. The value must be greater than or equal to 0.
- C order high specifies the upper limit to use in the search for the optimal *C* order of the model. The value must be greater than **C** order low.
- **D** order low specifies the lower limit to use in the search for the optimal *D* order of the model. The value must be greater than or equal to 0.
- **D** order high specifies the upper limit to use in the search for the optimal *D* order of the model. The value must be greater than **D** order low.
- delay low specifies the lower limit to use in the search for the optimal delay order of the model. The value must be greater than or equal to 0.
- delay high specifies the upper limit to use in the search for the optimal delay of the model. The value must be greater than delay low.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus for validation is the system stimulus signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- response for validation is the system response signal that this VI uses to validate the model it builds with stimulus signal and response signal.
- optimal orders returns the optimal orders and delays for the model. Use the Model Management VIs to retrieve the optimal orders and delay from the optimal orders output.
 - optimal A order is the optimal A order for the model.
 - optimal F order is the optimal F order for the model.
 - optimal B order is the optimal B order for the model.
 - optimal D order is the optimal D order for the model.
 - optimal C order is the optimal C order for the model.
 - optimal delay is the optimal delay of the model.
- prediction error returns the <u>prediction error</u> in percent of the variance of the measured response signal versus the model dimension. **prediction error** also returns the optimal dimension selected by Final Prediction Error (FPE), Akaike's Information Criterion (AIC), or the Minimum Description Length (MDL) criterion.
- orders returns the optimal orders at each model dimension. The model dimension ranges from the value of A order low + B order low + F order low + C order low + D order low to the value of A order high + B order high + F order high + C order high + D order high.
 - lacktriangledown **A order** is the optimal *A* order for the model.
 - **F order** is the optimal F order for the model.
 - **B** order is the optimal *B* order for the model.

- **D** order is the optimal D order for the model.
- **C order** is the optimal *C* order for the model.
- **delay** is the optimal delay of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

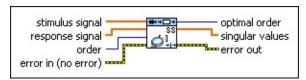
SI Estimate Orders of System Model (State-Space SISO Waveform)



- stimulus signal is the input waveform of the stimulus signal.
- response signal is the input waveform of the response signal.
- order specifies the number of states in the state-space model to build.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- optimal order returns the number of significant singular values in the state-space model, whose number of states equals order. Use the Model Management VIs to retrieve the optimal orders and delay from the optimal order output.

- **singular values** returns the singular values of matrix **A** in the state-space model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

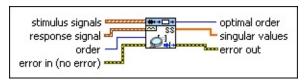
SI Estimate Orders of System Model (State-Space SISO Array)



- stimulus signal is the input array of the stimulus signal.
- response signal is the input array of the response signal.
- order specifies the number of states in the state-space model to build.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- optimal order returns the number of significant singular values in the state-space model, whose number of states equals order. Use the Model Management VIs to retrieve the optimal orders and delay from the optimal order output.

- **singular values** returns the singular values of matrix **A** in the state-space model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model (State-Space MISO Waveform)

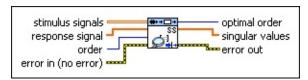


- stimulus signals is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal is the input waveform of the response signal.
- **order** specifies the number of states in the state-space model to build.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- optimal order returns the number of significant singular values in the state-space model, whose number of states equals order. Use the Model Management VIs to retrieve the optimal orders and

delay from the **optimal order** output.

- **singular values** returns the singular values of matrix **A** in the state-space model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

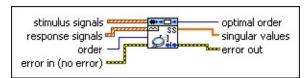
SI Estimate Orders of System Model (State-Space MISO Array)



- stimulus signals is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal is the input array of the response signal.
- order specifies the number of states in the state-space model to build.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- optimal order returns the number of significant singular values in the state-space model, whose number of states equals order. Use the Model Management VIs to retrieve the optimal orders and delay from the optimal order output.

- **singular values** returns the singular values of matrix **A** in the state-space model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model (State-Space MIMO Waveform)

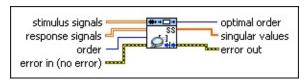


- stimulus signals is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal.
- order specifies the number of states in the state-space model to build.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- optimal order returns the number of significant singular values in

the state-space model, whose number of states equals **order**. Use the <u>Model Management</u> VIs to retrieve the optimal orders and delay from the **optimal order** output.

- **singular values** returns the singular values of matrix **A** in the state-space model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model (State-Space MIMO Array)



- stimulus signals is the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals is the input array of the response signals. Each row in the array is one response signal.
- order specifies the number of states in the state-space model to build.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- optimal order returns the number of significant singular values in the state-space model, whose number of states equals order. Use the Model Management VIs to retrieve the optimal orders and

delay from the **optimal order** output.

- **singular values** returns the singular values of matrix **A** in the state-space model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Orders of System Model Details

Use the optimal orders returned by the SI Estimate Orders of System Model VI as a starting point for building the system model. You also can use the **prediction error** output of the SI Estimate Orders of System Model VI to obtain the optimal model dimensions. You can display **prediction error** using an XY graph. The turning point in the curve specifies the optimal model dimension.

Example

Refer to the Glass Tube VI in the labview\examples\System Identification\Industry Applications\General.llb for an example of using the SI Estimate Orders of System Model VI.

■ Open example ■ Browse related examples

SI Estimate State-Space Model VI

Owning Palette: Parametric Model Estimation VIs

Installed With: System Identification Toolkit

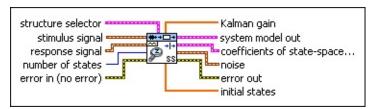
Estimates the parameters of a <u>state-space (SS) model</u> for an unknown system. You must <u>manually select the polymorphic instance</u> to use.

Details Examples

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



SI Estimate State-Space Model (Subspace SISO Waveform)



- structure selector determines additional matrices of the statespace model you want to estimate.
 - **D matrix?** specifies whether to estimate the **D** matrix of the model. If TRUE, this VI estimates the **D** matrix. If FALSE, the **D** matrix is 0.
 - **K matrix?** determines whether to estimate the Kalman gain matrix **K**. If TRUE, this VI estimates the **K** matrix. If FALSE, the **K** matrix is 0.
 - initial states? specifies whether to estimate the initial state of the model. If TRUE, this VI estimates the initial state. If FALSE, the initial state is 0.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or

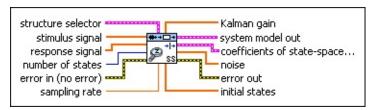
function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **Kalman gain** returns the Kalman gain of the state-space model. The dimension of **Kalman gain** equals **number of states**.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of state-space model returns the coefficients of the state-space model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficient of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The dimension of initial states equals number of states.

SI Estimate State-Space Model (Subspace SISO Array)



- **structure selector** determines additional matrices of the statespace model you want to estimate.
 - **D matrix?** specifies whether to estimate the **D** matrix of the model. If TRUE, this VI estimates the **D** matrix. If FALSE, the **D** matrix is 0.
 - **K matrix?** determines whether to estimate the Kalman gain matrix **K**. If TRUE, this VI estimates the **K** matrix. If FALSE, the **K** matrix is 0.
 - initial states? specifies whether to estimate the initial state of the model. If TRUE, this VI estimates the initial state. If FALSE, the initial state is 0.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The

default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- **Kalman gain** returns the Kalman gain of the state-space model. The dimension of **Kalman gain** equals **number of states**.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

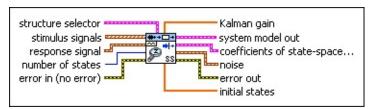
 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the
- **coefficients of state-space model** returns the coefficients of the state-space model.

shortcut menu to use the system model probe.

- **A** returns the A coefficients of the system model.
- **B** returns the *B* coefficients of the system model.
- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficient of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The dimension of initial states equals number of states.

SI Estimate State-Space Model (Subspace MISO Waveform)



- **structure selector** determines additional matrices of the statespace model you want to estimate.
 - **D matrix?** specifies whether to estimate the **D** matrix of the model. If TRUE, this VI estimates the **D** matrix. If FALSE, the **D** matrix is 0.
 - **K matrix?** determines whether to estimate the Kalman gain matrix **K**. If TRUE, this VI estimates the **K** matrix. If FALSE, the **K** matrix is 0.
 - initial states? specifies whether to estimate the initial state of the model. If TRUE, this VI estimates the initial state. If FALSE, the initial state is 0.
- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal specifies the input waveform of the response signal.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

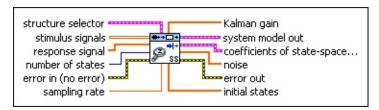
- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- Kalman gain returns the Kalman gain of the state-space model. The dimension of Kalman gain equals number of states.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of state-space model returns the coefficients of the state-space (SS) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu

for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The dimension of initial states equals number of states.

SI Estimate State-Space Model (Subspace MISO Array)



- **structure selector** determines additional matrices of the statespace model you want to estimate.
 - **D matrix?** specifies whether to estimate the **D** matrix of the model. If TRUE, this VI estimates the **D** matrix. If FALSE, the **D** matrix is 0.
 - **K matrix?** determines whether to estimate the Kalman gain matrix **K**. If TRUE, this VI estimates the **K** matrix. If FALSE, the **K** matrix is 0.
 - initial states? specifies whether to estimate the initial state of the model. If TRUE, this VI estimates the initial state. If FALSE, the initial state is 0.
- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal specifies the input array of the response signal.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or

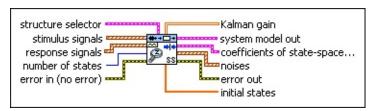
- that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- **Kalman gain** returns the Kalman gain of the state-space model. The dimension of **Kalman gain** equals **number of states**.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of state-space model returns the coefficients of the state-space (SS) model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu

for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The dimension of initial states equals number of states.

SI Estimate State-Space Model (Subspace MIMO Waveform)



- **structure selector** determines additional matrices of the state-space model you want to estimate.
 - **D matrix?** specifies whether to estimate the **D** matrix of the model. If TRUE, this VI estimates the **D** matrix. If FALSE, the **D** matrix is 0.
 - **K matrix?** determines whether to estimate the Kalman gain matrix **K**. If TRUE, this VI estimates the **K** matrix. If FALSE, the **K** matrix is 0.
 - initial states? specifies whether to estimate the initial state of the model. If TRUE, this VI estimates the initial state. If FALSE, the initial state is 0.
- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signals specifies the input waveform array of the response signals. Each element of the array is the waveform of one response signal.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error

in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

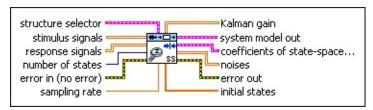
- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **Kalman gain** returns the Kalman gain of the state-space model. The dimension of **Kalman gain** equals **number of states**.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of state-space model returns the coefficients of the state-space (SS) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noises** returns the disturbances e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the

same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The dimension of initial states equals number of states.

SI Estimate State-Space Model (Subspace MIMO Array)



- structure selector determines additional matrices of the statespace model you want to estimate.
 - **D matrix?** specifies whether to estimate the **D** matrix of the model. If TRUE, this VI estimates the **D** matrix. If FALSE, the **D** matrix is 0.
 - **K matrix?** determines whether to estimate the Kalman gain matrix **K**. If TRUE, this VI estimates the **K** matrix. If FALSE, the **K** matrix is 0.
 - initial states? specifies whether to estimate the initial state of the model. If TRUE, this VI estimates the initial state. If FALSE, the initial state is 0.
- **stimulus signals** specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals specifies the input array of the response signals. Each row in the array is one response signal.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or

function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- **Kalman gain** returns the Kalman gain of the state-space model. The dimension of **Kalman gain** equals **number of states**.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.



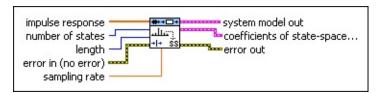
Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of state-space model returns the coefficients of the state-space (SS) model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noises** returns the disturbances e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status

that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model. The dimension of initial states equals number of states.

SI Estimate State-Space Model (Realization SISO)



- impulse response is the input array of the impulse response.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- length specifies the number of data points of the impulse response to use when estimating the state-space model. The value must be less than or equal to the array size of the impulse response. The default is -1, which means this VI uses all data points of the impulse response.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate is the signal sampling rate in hertz. The value of

sampling rate must be greater than 0.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

coefficients of state-space model returns the coefficients of the state-space model.

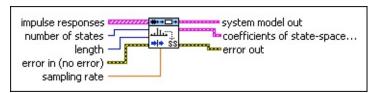
- **A** returns the *A* coefficients of the system model.
- **B** returns the *B* coefficients of the system model.
- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficient of the system model.

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate State-Space Model (Realization MIMO)



- impulse responses is the input array of the impulse response.
- number of states specifies the number of states of the system model. The value of number of states must be greater than 0. The default is 4.
- length specifies the number of data points of the impulse response to use when estimating the state-space model. The value must be less than or equal to the array size of the impulse response. The default is -1, which means this VI uses all data points of the impulse response.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate is the signal sampling rate in hertz. The value of

sampling rate must be greater than 0.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

coefficients of state-space model returns the coefficients of the state-space model.

- **A** returns the *A* coefficients of the system model.
- **B** returns the *B* coefficients of the system model.
- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficient of the system model.

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate State-Space Model Details

You can use the <u>SI Estimate Orders of System Model</u> VI to estimate the optimal order of the state-space model. In some cases, the optimal orders returned by the SI Estimate Orders of System Model VI might not be appropriate for the number of states. You can use the **singular values** output of the State-Space instances of the SI Estimate Orders of System Model VI to obtain the optimal number of states. You can display **singular values** using an <u>XY graph</u>. The turning point in the curve specifies the optimal number of states.

The LabVIEW System Identification Toolkit estimates discrete state-space models using two methods: the realization and the deterministic-stochastic subspace methods. The realization method uses the system impulse response as the input. You can use the <u>SI Estimate Impulse</u> <u>Response</u> VI to compute the impulse response from stimulus and response signals.

The realization method estimates only the deterministic part, A, B, C, D, of the system and does not include the stochastic part, K, in the model structure. The deterministic-stochastic subspace method includes both the deterministic and stochastic parts in the model structure. Therefore, you must choose the subspace method if you want to include the stochastic part in the model. Otherwise, you can use the realization method.

Examples

Refer to the following VIs for examples of using the SI Estimate State-Space Model VI:

- Discrete State-Space Model (Direct Method) VI: labview\examples\System Identification\Getting Started\Closed-Loop Estimation.llb
 - Open example Browse related examples
- Estimate State-Space Model from Impulse Response VI: labview\examples\System Identification\Getting Started\Parametric Estimation.llb
 - Open example Browse related examples

SI Estimate Transfer Function Model VI

Owning Palette: Parametric Model Estimation VIs

Installed With: System Identification Toolkit

Estimates the parameters of a continuous or discrete <u>transfer function</u> model for an unknown system. This VI estimates only the transfer function between the stimulus and the response. The transfer function between the noise and the response is assumed to be 1. You must <u>manually select the polymorphic instance</u> to use.

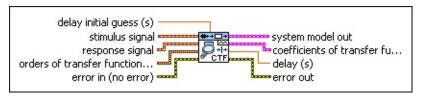
Details Examples

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

Select an instance

■ Place on the block diagram
■ Find on the Functions palette

SI Estimate Continuous Transfer Function Model (SISO Waveform)



- delay initial guess (s) specifies the initial guess of the system delay, in seconds. The default is NaN, which means no delay exists in this transfer function.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2. The value of den order must be greater than the value of num order.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

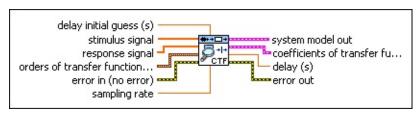
code is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1S} + b_{mS}$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- **delay (s)** returns the estimated delay of the system in seconds.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code

is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Continuous Transfer Function Model (SISO Array)



- delay initial guess (s) specifies the initial guess of the system delay, in seconds. The default is NaN, which means no delay exists in this transfer function.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the <u>transfer function model</u>.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2. The value of den order must be greater than the value of num order.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

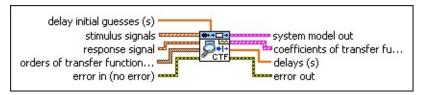
code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- **coefficients of transfer function model** returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 s + b_m s^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- delay (s) returns the estimated delay of the system in seconds.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Continuous Transfer Function Model (MISO Waveform)



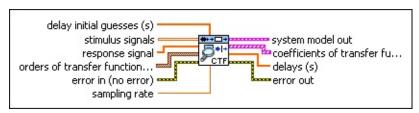
- delay initial guesses (s) specifies the initial guess of the system delay. The default is NaN, which means no delay exists in this transfer function.
- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the <u>transfer function (TF) model</u>.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2. The value of den order must be greater than the value of num order.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- **coefficients of transfer function model** returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1S} + b_{mS}^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 S + a_n S^n$.
- delays (s) returns the estimated delay of the system in seconds.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Continuous Transfer Function Model (MISO Array)

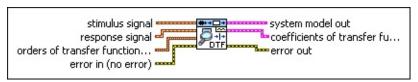


- delay initial guesses (s) specifies the initial guess of the system delay. The default is NaN, which means no delay exists in this transfer function.
- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal specifies the input array of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function (TF) model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2. The value of den order must be greater than the value of num order.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1S} + b_{mS}^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- delays (s) returns the estimated delay of the system in seconds.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete Transfer Function Model (Direct SISO Waveform)



- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

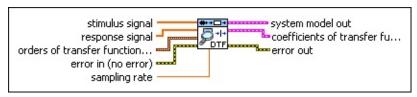
system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1Z} + b_{mZ}^m$.
 - denominator returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 z + a_n z^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete Transfer Function Model (Direct SISO Array)



- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

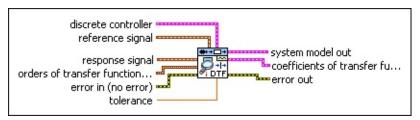
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 z + b_m z^m$.
 - denominator returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 z + a_n z^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete Transfer Function Model (Indirect SISO Waveform)



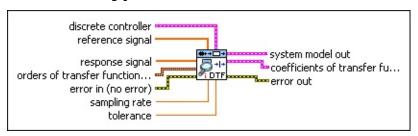
- discrete controller specifies information about the discrete, linear controller, such as the controller numerator, controller denominator, and controller structure.
- reference signal is the input waveform of the reference signal.
- response signal specifies the input waveform of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **tolerance** determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the **tolerance**, this VI removes the zero-pole pair.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1Z} + b_{mZ}^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 z + a_n z^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete Transfer Function Model (Indirect SISO Array)



- discrete controller specifies information about the discrete, linear controller, such as the controller numerator, controller denominator, and controller structure.
- reference signal is the input array of the reference signal.
- response signal specifies the input array of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - **num order** specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

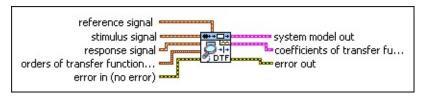
code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- tolerance determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the tolerance, this VI removes the zero-pole pair.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 z + b_m z^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 z + a_n z^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete Transfer Function Model (Joint SISO Waveform)



- reference signal is the input waveform of the reference signal.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

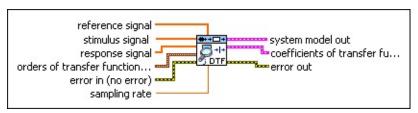
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the
- **coefficients of transfer function model** returns the coefficients of the <u>transfer function model</u>.

shortcut menu to use the system model probe.

- **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 z + b_m z^m$.
- **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 z + a_n z^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Discrete Transfer Function Model (Joint SISO Array)



- reference signal is the input array of the reference signal.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- sampling rate is the signal sampling rate in hertz. The value of sampling rate must be greater than 0.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 z + b_m z^m$.
 - denominator returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 z + a_n z^n$.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

M

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate Transfer Function Model Details

The SI Estimate Transfer Function Model VI supports SISO and MISO systems for continuous models. You can provide an initial guess to the system delay using the **delay initial guess (s)** or **delay initial guesses (s)** input.

The SI Estimate Transfer Function Model VI supports only SISO systems for discrete models. This VI provides three methods to estimate discrete models: the <u>direct</u>, <u>indirect</u>, and <u>joint input-output</u> methods. The direct method works for both open-loop and closed-loop data. The indirect and joint input-output methods are used only for closed-loop data.

Examples

Refer to the following VIs for examples of using the SI Estimate Transfer Function Model VI:

- Discrete Transfer Function Model (Direct Method) VI: labview\examples\System Identification\Getting Started\Closed-Loop Estimation.llb
 - Open example Browse related examples
- Discrete Transfer Function Model (Indirect Method) VI: labview\examples\System Identification\Getting Started\Closed-Loop Estimation.llb
 - Open example Browse related examples
- Discrete Transfer Function Model (Joint Input-Output Method) VI: labview\examples\System Identification\Getting Started\Closed-Loop Estimation.llb
 - Open example Browse related examples

SI Estimate User-Defined Model VI

Owning Palette: Parametric Model Estimation VIs

Installed With: System Identification Toolkit

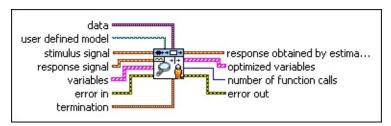
Estimates a <u>user-defined model</u>. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Details Examples

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



SI Estimate User-Defined Model (SISO Waveform)



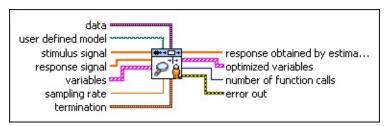
- data specifies the static data that the user-defined function needs at run time.
- user defined model is a file path to the VI that defines the model to be estimated. Use the model template in the labview\vi.lib\addons\System Identification\User-Defined Model Templates.llb to create a VI from a template.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - **initial guess** is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error

occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **termination** describes the stopping conditions for the model estimation.
 - max iterations is the largest number of iterations of the optimization routine. If the number of iterations exceeds max iterations, the estimation terminates.
 - tolerance is the relative change between consecutive cost function values. If the difference between the current cost function value and the next cost function value is less than tolerance, LabVIEW accepts the current value and terminates the estimation.
- response obtained by estimated model returns the simulated response signal from the estimated model.
- **optimized variables** returns the name and optimized value of each variable.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid

- variable names beginning with E in such cases.
- value returns the estimated value of each variable.
- number of function calls returns the number of times that LabVIEW calls the user-defined model VI.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate User-Defined Model (SISO Array)



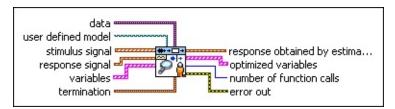
- data specifies the static data that the user-defined function needs at run time.
- user defined model is a file path to the VI that defines the model to be estimated. Use the model template in the labview\vi.lib\addons\System Identification\User-Defined Model Templates.llb to create a VI from a template.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - initial guess is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error

status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- **termination** describes the stopping conditions for the model estimation.
 - max iterations is the largest number of iterations of the optimization routine. If the number of iterations exceeds max iterations, the estimation terminates.
 - tolerance is the relative change between consecutive cost function values. If the difference between the current cost function value and the next cost function value is less than tolerance, LabVIEW accepts the current value and terminates the estimation.
- response obtained by estimated model returns the simulated response signal from the estimated model.
- **optimized variables** returns the name and optimized value of each variable.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid

- variable names beginning with E in such cases.
- value returns the estimated value of each variable.
- number of function calls returns the number of times that LabVIEW calls the user-defined model VI.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate User-Defined Model (MISO Waveform)



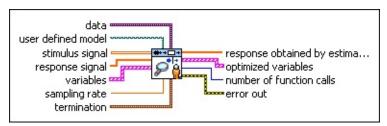
- data specifies the static data that the user-defined function needs at run time.
- user defined model is a file path to the VI that defines the model to be estimated. Use the model template in the labview\vi.lib\addons\System Identification\User-Defined Model Templates.llb to create a VI from a template.
- stimulus signal is the input waveform array of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - initial guess is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while

this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **termination** describes the stopping conditions for the model estimation.
 - max iterations is the largest number of iterations of the optimization routine. If the number of iterations exceeds max iterations, the estimation terminates.
 - tolerance is the relative change between consecutive cost function values. If the difference between the current cost function value and the next cost function value is less than tolerance, LabVIEW accepts the current value and terminates the estimation.
- response obtained by estimated model returns the simulated response signal from the estimated model.
- **optimized variables** returns the name and optimized value of each variable.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.

- value returns the estimated value of each variable.
- number of function calls returns the number of times that LabVIEW calls the user-defined model VI.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate User-Defined Model (MISO Array)



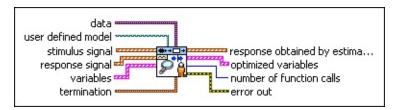
- data specifies the static data that the user-defined function needs at run time.
- user defined model is a file path to the VI that defines the model to be estimated. Use the model template in the labview\vi.lib\addons\System Identification\User-Defined Model Templates.llb to create a VI from a template.
- stimulus signal is the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - initial guess is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error

status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- **termination** describes the stopping conditions for the model estimation.
 - max iterations is the largest number of iterations of the optimization routine. If the number of iterations exceeds max iterations, the estimation terminates.
 - tolerance is the relative change between consecutive cost function values. If the difference between the current cost function value and the next cost function value is less than tolerance, LabVIEW accepts the current value and terminates the estimation.
- response obtained by estimated model returns the simulated response signal from the estimated model.
- **optimized variables** returns the name and optimized value of each variable.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid

- variable names beginning with E in such cases.
- value returns the estimated value of each variable.
- number of function calls returns the number of times that LabVIEW calls the user-defined model VI.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate User-Defined Model (MIMO Waveform)



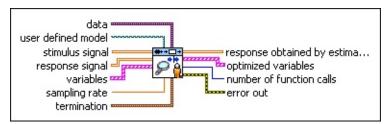
- data specifies the static data that the user-defined function needs at run time.
- user defined model is a file path to the VI that defines the model to be estimated. Use the model template in the labview\vi.lib\addons\System Identification\User-Defined Model Templates.llb to create a VI from a template.
- stimulus signal is the input waveform array of the stimulus signal.
- response signal is the input waveform array of the response signal.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - initial guess is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while

this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **termination** describes the stopping conditions for the model estimation.
 - max iterations is the largest number of iterations of the optimization routine. If the number of iterations exceeds max iterations, the estimation terminates.
 - tolerance is the relative change between consecutive cost function values. If the difference between the current cost function value and the next cost function value is less than tolerance, LabVIEW accepts the current value and terminates the estimation.
- response obtained by estimated model returns the simulated response signal from the estimated model.
- **optimized variables** returns the name and optimized value of each variable.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.

- value returns the estimated value of each variable.
- number of function calls returns the number of times that LabVIEW calls the user-defined model VI.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate User-Defined Model (MIMO Array)



- data specifies the static data that the user-defined function needs at run time.
- user defined model is a file path to the VI that defines the model to be estimated. Use the model template in the labview\vi.lib\addons\System Identification\User-Defined Model Templates.llb to create a VI from a template.
- stimulus signal is the input array of the stimulus signal.
- response signal is the input array of the response signal.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - initial guess is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error

status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- **termination** describes the stopping conditions for the model estimation.
 - max iterations is the largest number of iterations of the optimization routine. If the number of iterations exceeds max iterations, the estimation terminates.
 - tolerance is the relative change between consecutive cost function values. If the difference between the current cost function value and the next cost function value is less than tolerance, LabVIEW accepts the current value and terminates the estimation.
- response obtained by estimated model returns the simulated response signal from the estimated model.
- **optimized variables** returns the name and optimized value of each variable.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid

- variable names beginning with E in such cases.
- value returns the estimated value of each variable.
- number of function calls returns the number of times that LabVIEW calls the user-defined model VI.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate User-Defined Model Details

The SI Estimate User-Defined Model VI estimates a user-defined model using the Gauss-Newton algorithm to optimize the parameters. This VI requires a predefined model to optimize the parameters. You can use the template in the labview\vi.lib\addons\System Identification\User-Defined Model Templates.llb directory to create a predefined model. If you create a predefined model from scratch, make sure your model has exactly the same connector pane as that in the template.

The predefined model can be either a linear or nonlinear model. The LabVIEW System Identification Toolkit provides two common nonlinear models, the Weiner model and the Hammerstein model, as examples of defining nonlinear models.

Examples

Refer to the following VIs for examples of using the SI Estimate User-Defined Model VI:

- Estimate Partially Known State-Space Model VI: labview\examples\System Identification\Getting Started\User Defined Model.llb
 - Open example Browse related examples
- Parameterize Nonlinear Differential Equation VI: labview\examples\System Identification\Getting Started\User Defined Model.llb
 - Open example Browse related examples
- Estimate Hammerstein-Wiener Model VI: labview\examples\System Identification\Getting Started\User Defined Model.llb
 - Open example Browse related examples

SI Model Estimation Express VI

Owning Palette: Parametric Model Estimation VIs

Installed With: System Identification Toolkit

Estimates the mathematical model for an unknown system.

Details

Dialog Box Options

Block Diagram Inputs

Block Diagram Outputs

■ Place on the block diagram ■ Find on the **Functions** palette

Dialog Box Options

Parameter	Description		
Select	Specifies the type of model to estimate. Contains the		
Model	following options:		
Туре	 AR (autoregressive) 		
	 ARX (autoregressive with exogenous terms) (default) 		
	 ARMAX (autoregressive—moving average with exogenous terms) 		
	Output-Error		
	Box-Jenkins		
	• <u>General-Linear</u>		
	• State-Space		
Select System Dims	Specifies the dimensions of the system model. Contains the following options: • SISO (single-input-single-output) (default)		
	MISO (multiple-input-single-output)		
	MIMO (multiple-input-multiple-output)		
Calaat	` ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '		
Select Data Type	Specifies the data type for the input signal or signals. Contains the following options:		
Data Type	Array (default)		
	Waveform		
N			
Model Diagram	Displays the mathematical equation for the selected model type and a diagram of the model.		
Set Model	Sets the model orders for the selected model type.		
Orders	Note The options available depend on the model type and system dimensions.		
	Set Model Orders contains the following options:		
	 AR order—Specifies the order of the AR model to estimate noise for prewhitening. 		
	 Method to estimate AR model—Specifies the method to estimate the AR model. Contains the following options: 		

- Forward-Backward (Default)
- Least-Squares
- Yule-Walker
- Burg-Lattice
- Principal Component
- A order—Specifies the order of the A coefficients of the system model.
- **B order**—Specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
- **Delay**—Specifies the delay *k* of the system model.
- **B orders**—Specifies the orders of the *B* coefficients of the system model. The value of **B orders** must be greater than or equal to 1.
- **Delays**—Specifies the delays *k* of the system model.
- A orders—Specifies the orders of the *A* coefficients of the system model.
- **C** order—Specifies the order of the *C* coefficients of the system model.
- **F order**—Specifies the order of the *F* coefficients of the system model.
- **F orders**—Specifies the orders of the *F* coefficients of the system model.
- **D** order—Specifies the order of the *D* coefficients of the system model.
- **Number of states**—Specifies the number of states of the system model.

Block Diagram Inputs

Parameter	Description
stimulus signal	Specifies the input waveform or array of a stimulus signal.
response signal	Specifies the input waveform or array of a response signal.
sampling rate	Specifies the sampling rate for the stimulus signal and response signal .
error in (no error)	Describes error conditions that occur before this VI or function runs.

Block Diagram Outputs

Parameter	Description	
system model out	system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.	
	Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.	
model	on the model type and the dimensions of the model. model coefficients can contain the following elements: • A—Returns the A coefficients of the model for AR, ARX, ARMAX, output-error, Box-Jenkins, and general-linear models and returns the A matrix of state-space models. A has the following characteristics and dimensions: - SISO, MISO, and MIMO models—The first value of A always equals 1. The dimension of A equals A order + 1. - State-space models—A is an n × n matrix, where n is Number of states. • B—Returns the B coefficients of the model for AR, ARX, ARMAX, output-error, Box-Jenkins, and general-linear models, the column vector of the model for state-space SISO models, and the B matrix of the model for state-space MISO and MIMO models. B has the following characteristics and dimensions:	
	and dimensions: - SISO models, excluding state-space	

- models—The dimension of **B** equals **B** order + Delay. The first Delay number of elements in **B** always equals 0.
- MISO and MIMO models, excluding state-space models—The number of rows in B equals the number of system inputs.
 The number of columns in B equals the maximum value of B orders + Delays. The ith row of B has Delays; number of zeros at the beginning.
- State-space SISO models—The dimension of B equals Number of states.
- State-space MISO and MIMO models—B
 is an n × m matrix, where n is Number of
 states and m is the number of system
 inputs.
- C—Returns the C coefficients of the model for ARMAX, Box-Jenkins, and general-linear models, the row vector of the model for state-space SISO and MISO models, and the C matrix of the model for state-space MIMO models. C has the following characteristics and dimensions:
 - ARMAX, Box-Jenkins, and generallinear models—The first value of C always equals 1. The dimension of C equals C order + 1.
 - State-space SISO and MISO models— The dimension of C equals Number of states.
 - State-space MIMO models—C is an $r \times n$ matrix, where r is the number of system outputs and n is Number of states.
- D—Returns the D coefficients of the model for Box-Jenkins and general-linear models, the D parameter of the model for state-space SISO models, the row vector of the model for statespace MISO models, and the D matrix of the model

	error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces.
error out	Returns the disturbance $e(t)$ in the estimated system. Contains error information. If error in indicates that an
noise	
	 MISO models—The number of rows in F equals the number of system inputs. The number of columns in F equals the maximum value of F orders + 1.
	 SISO models—The first value of F always equals 1. The dimension of F equals F order + 1.
	 F—Returns the F coefficients of the model for output-error, Box-Jenkins, and general-linear models. F has the following characteristics and dimensions:
	 State-space MIMO models—D is an r × m matrix, where r is the number of system outputs and m is the number of system inputs.
	for state-space MIMO models. D has the following characteristics and dimensions: - Box-Jenkins and general linear models —The first value of D always equals 1. The dimension of D equals D order + 1. - State-space MISO models —The dimension of D equals the number of system inputs.

SI Model Estimation Details

Refer to the <u>LabVIEW System Identification Toolkit Algorithm References</u> manual for more information about the forward-backward, least-squares, Yule-Walker, Burg-Lattice, and principal component methods.

This Express VI operates similarly to the following VIs and functions:

- SI Estimate AR Model SI Estimate ARX Model
- SI Estimate ARMAX Model
- SI Estimate OE Model
- SI Estimate BJ Model
- SI Estimate General Linear Model
- SI Estimate State-Space Model

SI Transfer Function Estimation Express VI

Owning Palette: Parametric Model Estimation VIs

Installed With: System Identification Toolkit

Estimates a discrete or continuous <u>transfer function</u> model for a SISO unknown system. For discrete models, this VI supports the direct, indirect, and joint input-output identification methods.

Dialog Box Options

Block Diagram Inputs

Block Diagram Outputs

■ Place on the block diagram ■ Find on the **Functions** palette

Dialog Box Options

Dialog Box		
Parameter	Description	
Signals	Displays the signals used to estimate the system, including the stimulus signal, reference signal, response signal, and estimated response signal.	
Data type	Specifies the data type for the input signal(s). Contains the following options: • Waveform (default)	
	• Array	
Model type	Specifies the type of model to estimate. Contains the following options: • Continuous • Discrete (default)	
Numerator order	Specifies the order of the numerator of the system model.	
Denominator order	Specifies the order of the denominator of the system model.	
Estimation method	Specifies the estimation method to use for discrete systems. Contains the following options: • Direct (default)	
	• Indirect	
	Joint input-output	
Controller numerator	Specifies the numerator coefficients of the discrete, linear controller.	
Controller denominator	Specifies the denominator coefficients of the discrete, linear controller.	
Controller structure	Specifies the controller position in the feedback loop. If the controller is set before the plant, select Feedforward-path . If the controller is set after the output, select Feedback-path .	
Zero-Pole cancellation tolerance	Determines zero-pole cancellations. If the difference between the location of a pole and a zero is within the tolerance, this VI removes the zero-pole pair.	

System diagram	Displays the system diagram of the closed-loop system.	
Estimated model	Displays the mathematical equation and sampling rate of the estimated transfer function model.	

Block Diagram Inputs

Parameter	Description
stimulus signal	Specifies the input waveform or array of a stimulus signal.
reference signal	Specifies the input waveform or array of a reference signal.
response signal	Specifies the input waveform or array of a response signal.
sampling rate	Specifies the sampling frequency in hertz. For discrete models, sampling rate is the system sampling rate. For continuous models, sampling rate is used to convert the continuous model to a discrete model before simulating the output.
error in (no error)	Describes error conditions that occur before this VI or function runs.

Block Diagram Outputs

Parameter	Description	
system model out	system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.	
	Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.	
coefficients	Returns the coefficients of the transfer function (TF) model. Contains the following elements:	
	 numerator—returns the estimated numerator coefficients of the transfer function. 	
	 denominator—returns the estimated denominator coefficients of the transfer function. 	
continuous delay	Returns the estimated delay of the continuous system in seconds.	
error out	Contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces.	

This Express VI operates similarly to the following VIs and functions:

SI Estimate Transfer Function Model

Polynomial Model Estimation VIs

Owning Palette: Parametric Model Estimation VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Polynomial Model Estimation VIs to estimate an AR, ARX, ARMAX, Box-Jenkins, or output-error model for an unknown, linear, time-invariant system.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Estimate AR Model	Estimates the parameters of an AR model for an unknown system. Wire data to the response signal input to determine the polymorphic instance to use or manually select the instance.
SI Estimate ARMAX Model	Estimates the parameters of an <u>ARMAX model</u> for an unknown system. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Estimate ARX Model	Estimates the parameters of an ARX model for an unknown system. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or manually select the instance.
SI Estimate BJ Model	Estimates the parameters of a <u>Box-Jenkins (BJ) model</u> for an unknown system. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Estimate General Linear Model	Estimates the parameters of a general-linear (GL) model for an unknown system. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or manually select the instance.
SI	Estimates the parameters of an output-error (OE) model for an

Î	
Estimate	unknown system. Wire data to the stimulus signal and
<u>OE</u>	response signal inputs to determine the polymorphic instance
Model	to use or <u>manually select</u> the instance.

SI Estimate AR Model VI

Owning Palette: Polynomial Model Estimation VIs

Installed With: System Identification Toolkit

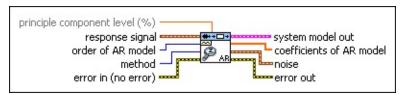
Estimates the parameters of an <u>AR model</u> for an unknown system. Wire data to the **response signal** input to determine the polymorphic instance to use or <u>manually select</u> the instance.

Details

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

Select an instance	•
■ Place on the block diagram	■ Find on the Functions palette

SI Estimate AR Model (Waveform)



- principle component level (%) defines the percentage of principle components this VI uses. This parameter applies only when method is Principal Component.
- response signal is the input waveform of the response signal.
 The length of response signal must be greater than two times order of AR model.
- order of AR model specifies the order of the AR model. The value of order of AR model must be greater than or equal to 0.
- method specifies the method to use to estimate the AR model.

0	Forward-Backward (default)
1	Least-Squares
2	Yule-Walker
3	Burg-Lattice
4	Principal Component

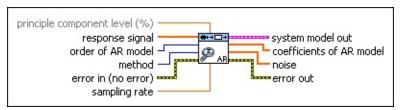
error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of AR model returns the coefficients of the AR model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate AR Model (Array)



- principle component level (%) defines the percentage of principle components this VI uses. This parameter applies only when method is Principal Component.
- response signal is the input array of the response signal. The length of response signal must be greater than two times order of AR model.
- order of AR model specifies the order of the AR model. The value of order of AR model must be greater than or equal to 0.
- method specifies the method to use to estimate the AR model.

0	Forward-Backward (default)
1	Least-Squares
2	Yule-Walker
3	Burg-Lattice
4	Principal Component

error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The

default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. sampling rate is ignored if the response signal is a waveforms data file.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- **coefficients of AR model** returns the coefficients of the <u>AR model</u>.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

SI Estimate AR Model Details

Refer to the <u>LabVIEW System Identification Toolkit Algorithm References</u> manual for more information about the forward-backward, least-squares, Yule-Walker, Burg-Lattice, and principal component methods.

SI Estimate ARMAX Model VI

Owning Palette: Polynomial Model Estimation VIs

Installed With: System Identification Toolkit

Estimates the parameters of an <u>ARMAX model</u> for an unknown system. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

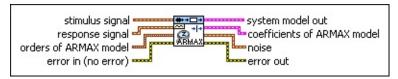
The success of the model estimation depends on the correct selection of the **orders of ARMAX model** input.

Example

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

Select an instance		
■ Place on the block diagram	■ Find on the Function	s palette

SI Estimate ARMAX Model (SISO Waveform)



- stimulus signal specifies the input waveform of the stimulus signal.
- response signal is the input waveform of the response signal.

 The length of response signal must be greater than [max(A order, B order + (delay 1), C order) + (A order + B order + C order)].
- orders of ARMAX model specifies the orders and delay of the ARMAX model.
 - A order specifies the order of the A coefficients of the system model. The value of A order must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or

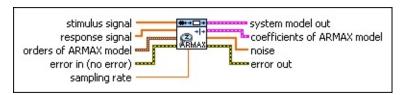
function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- coefficients of ARMAX model returns the coefficients of the ARMAX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code

is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

SI Estimate ARMAX Model (SISO Array)



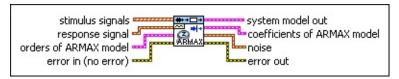
- stimulus signal specifies the input array of the stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(A order, B order + (delay 1), C order) + (A order + B order + C order)].
- orders of ARMAX model specifies the orders and delay of the ARMAX model.
 - A order specifies the order of the A coefficients of the system model. The value of A order must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or

- that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of ARMAX model returns the coefficients of the ARMAX model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate ARMAX Model (MISO Waveform)



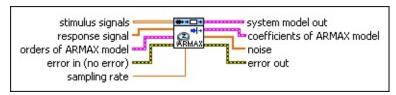
- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal is the input waveform of the response signal. The length of response signal must be greater than [max(A order, max(B orders + (delays 1)), C order) + (A order + sum(B orders) + C order)].
- orders of ARMAX model specifies the orders and delay of the ARMAX model.
 - A order specifies the order of the A coefficients of the system model. The value of A order must be greater than or equal to 0.
 - B orders specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of ARMAX model returns the coefficients of the ARMAX model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate ARMAX Model (MISO Array)

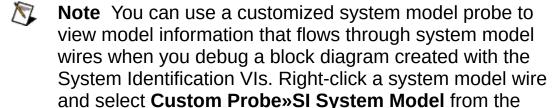


- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(A order, max(B orders + (delays 1)), C order) + (A order + sum(B orders) + C order)].
- orders of ARMAX model specifies the orders and delay of the ARMAX model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - B orders specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.



coefficients of ARMAX model returns the coefficients of the ARMAX model.

shortcut menu to use the system model probe.

A returns the *A* coefficients of the system model.

B returns the *B* coefficients of the system model.

C returns the *C* coefficients of the system model.

noise returns the disturbance e(t) in the estimated system model.

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- **status** is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Estimate Polynomial Models VI in the labview\examples\System Identification\Getting Started\Parametric Estimation.llb for an example of using the SI Estimate ARMAX Model VI.

■ Open example ■ Browse related examples

SI Estimate ARX Model VI

Owning Palette: Polynomial Model Estimation VIs

Installed With: System Identification Toolkit

Estimates the parameters of an <u>ARX model</u> for an unknown system. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

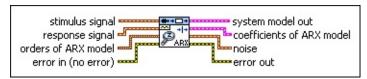
The success of the model estimation depends on the correct selection of the **orders of ARX model** input. Use the <u>SI Estimate Orders of System Model</u> VI to estimate **orders of ARX model** if you do not know the orders of the model.

Example

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



SI Estimate ARX Model (SISO Waveform)



- stimulus signal specifies the input waveform of the stimulus signal.
- response signal is the input waveform of the response signal.
 The length of response signal must be greater than [max(A order, B order + delay 1) + (A order + B order)].
- orders of ARX model specifies the orders and delay of the ARX model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

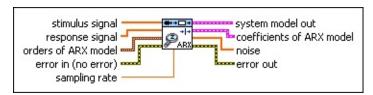
- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the
- coefficients of ARX model returns the coefficients of the ARX model.

shortcut menu to use the system model probe.

- **A** returns the *A* coefficients of the system model.
- **B** returns the *B* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate ARX Model (SISO Array)



- stimulus signal specifies the input array of the stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(A order, B order + delay 1) + (A order + B order)].
- orders of ARX model specifies the orders and delay of the ARX model.
 - A order specifies the order of the A coefficients of the system model. The value of A order must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **delay** specifies the delay *k* of the system model. The value of **delay** must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

Use the Model Management VIs to retrieve the information system model out contains.

Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

coefficients of ARX model returns the coefficients of the ARX model.

A returns the *A* coefficients of the system model.

B returns the *B* coefficients of the system model.

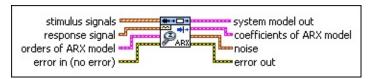
noise returns the disturbance e(t) in the estimated system model.

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

SI Estimate ARX Model (MISO Waveform)



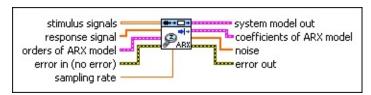
- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal is the input waveform of the response signal. The length of response signal must be greater than [max(A order, max(B orders + delays) 1) + (A order + sum(B orders))].
- orders of ARX model specifies the orders and delays of the ARX model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B orders** specifies the orders of the *B* coefficients of the system model. The value of **B orders** must be greater than or equal to 1.
 - delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The

default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

SI Estimate ARX Model (MISO Array)



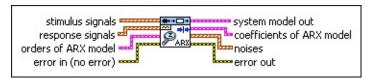
- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(A order, max(B orders + delays) 1) + (A order + sum(B orders))].
- orders of ARX model specifies the orders and delays of the ARX model.
 - A order specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - B orders specifies the orders of the *B* coefficients of the system model. The value of **B** orders must be greater than or equal to 1.
 - delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

code is the error or warning code. The default is 0. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

SI Estimate ARX Model (MIMO Waveform)



- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signals is the input waveform array of the response signals. Each element of the waveform array is the waveform of one response signal. The length of response signals must be greater than [max(max(A orders) * number of outputs, max(B orders + delays) * number of inputs 1) + max(A orders) * number of outputs + max(B orders + delays) * number of inputs].
- orders of ARX model specifies the orders and delay of the ARX model.
 - A orders specifies the order of the A coefficients of the model. The value of A orders must be greater than or equal to 0.
 - B orders specifies the orders of the *B* coefficients of the system model. The value of **B orders** must be greater than or equal to 1.
 - **delays** specifies the delays *k* of the model. The value of **delays** must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or

function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

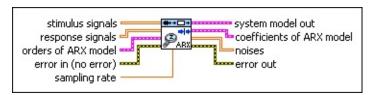
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- **noises** returns the disturbances e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a

warning code.

source des

SI Estimate ARX Model (MIMO Array)



- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signals is the input array of the stimulus signals. Each row in the array is one response signal. The length of response signals must be greater than [max(max(A orders) * number of outputs, max(B orders + delays) * number of inputs 1) + max(A orders) * number of outputs + max(B orders + delays) * number of inputs].
- orders of ARX model specifies the orders and delay of the ARX model.
 - A orders specifies the order of the A coefficients of the model. The value of A orders must be greater than or equal to 0.
 - B orders specifies the orders of the *B* coefficients of the system model. The value of **B orders** must be greater than or equal to 1.
 - delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or

- that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- **noises** returns the disturbances e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Estimate Polynomial Models VI in the labview\examples\System Identification\Getting Started\Parametric Estimation.llb for an example of using the SI Estimate ARX Model VI.

■ Open example ■ Browse related examples

SI Estimate BJ Model VI

Owning Palette: Polynomial Model Estimation VIs

Installed With: System Identification Toolkit

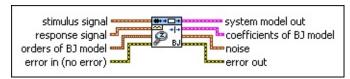
Estimates the parameters of a <u>Box-Jenkins (BJ) model</u> for an unknown system. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Example

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

Select an instance	•	
■ Place on the block diagram	■ Find on the	Functions palette

SI Estimate BJ Model (SISO Waveform)



- stimulus signal specifies the input waveform of the stimulus signal.
- response signal is the input waveform of the response signal.

 The length of response signal must be greater than [max(B order + (delay 1) + D order, C order + F order) + (B order + F order + C order + D order)].
- orders of BJ model specifies the orders and delay of the Box-Jenkins (BJ) model.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **F order** specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - **D order** specifies the order of the *D* coefficients of the system model. The value of **D order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error

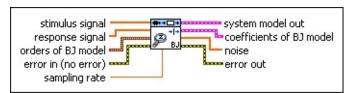
in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of BJ model returns the coefficients of the Box-Jenkins (BJ) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu

for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate BJ Model (SISO Array)



- stimulus signal specifies the input array of the stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(B order + (delay 1) + D order, C order + F order) + (B order + F order + C order + D order)]
- orders of BJ model specifies the orders and delay of the Box-Jenkins (BJ) model.
 - B order specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **F order** specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - **D** order specifies the order of the *D* coefficients of the system model. The value of **D** order must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error

in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.



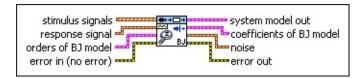
Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of BJ model returns the coefficients of the Box-Jenkins (BJ) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- **error out** contains error information. If **error in** indicates that an error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status

that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate BJ Model (MISO Waveform)



- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal is the input waveform of the response signal.
 The length of response signal must be greater than [max(max(B orders + (delays 1)) + D order, max(C order + F orders)) + (sum(B orders) + sum(F orders) + C order + D order)].
- orders of BJ model specifies the orders and delay of the Box-Jenkins (BJ) model.
 - B orders specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - F orders specifies the orders of the *F* coefficients of the model. The value of **F orders** must be greater than or equal to 0.
 - C order specifies the order of the C coefficients of the model. The value of C order must be greater than or equal to 0.
 - **D order** specifies the order of the *D* coefficients of the model. The value of **D order** must be greater than or equal to 0.
 - **delays** specifies the delays *k* of the model. The value of **delays** must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error

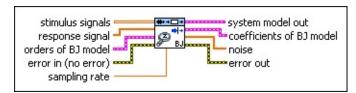
<u>Handler</u> VIs to display the description of the error code. Use **error** in and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of BJ model returns the coefficients of the Box-Jenkins (BJ) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the F coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front

panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate BJ Model (MISO Array)



- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(max(B orders + (delays 1)) + D order, max(C order + F orders)) + (sum(B orders) + sum(F orders) + C order + D order)].
- orders of BJ model specifies the orders and delay of the <u>Box</u>-Jenkins (BJ) model.
 - B orders specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - F orders specifies the orders of the F coefficients of the model. The value of F orders must be greater than or equal to 0.
 - C order specifies the order of the C coefficients of the model. The value of C order must be greater than or equal to 0.
 - **D** order specifies the order of the *D* coefficients of the model. The value of **D** order must be greater than or equal to 0.
 - delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error

Handler VIs to display the description of the error code. Use **error** in and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of BJ model returns the coefficients of the Box-Jenkins (BJ) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the

same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Estimate Polynomial Models VI in the labview\examples\System Identification\Getting Started\Parametric Estimation.llb for an example of using the SI Estimate BJ Model VI.

■ Open example ■ Browse related examples

SI Estimate General Linear Model VI

Owning Palette: Polynomial Model Estimation VIs

Installed With: System Identification Toolkit

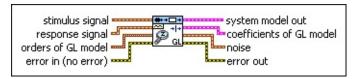
Estimates the parameters of a <u>general-linear (GL) model</u> for an unknown system. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Example

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



SI Estimate General Linear Model (SISO Waveform)



- stimulus signal specifies the input waveform of the stimulus signal.
- response signal is the input waveform of the response signal.

 The length of response signal must be greater than [max(A order + D order, B order + (delay 1) + D order, C order + F order) + (A order + B order + F order + C order + D order)].
- orders of GL model specifies the orders and delay of the generallinear (GL) model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - B order specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - F order specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - **D order** specifies the order of the *D* coefficients of the model. The value of **D order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while

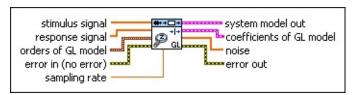
this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate General Linear Model (SISO Array)



- stimulus signal specifies the input array of the stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(A order + D order, B order + (delay 1) + D order, C order + F order) + (A order + B order + F order + C order + D order)].
- orders of GL model specifies the orders and delay of the generallinear (GL) model.
 - A order specifies the order of the A coefficients of the system model. The value of A order must be greater than or equal to 0.
 - B order specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - F order specifies the order of the *F* coefficients of the system model. The value of **F** order must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - **D order** specifies the order of the *D* coefficients of the model. The value of **D order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while

this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

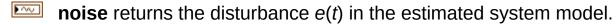
- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

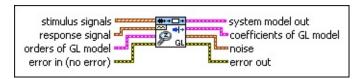
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.



error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate General Linear Model (MISO Waveform)



- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal is the input waveform of the response signal.
 The length of response signal must be greater than [max(A order + D order, max(B orders + (delays 1)) + D order, C order + max(F orders)) + (A order + sum(B orders) + sum(F orders) + C order + D order)].
- orders of GL model specifies the orders and delay of the generallinear (GL) model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B orders** specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - **F orders** specifies the orders of the *F* coefficients of the model. The value of **F orders** must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - **D** order specifies the order of the *D* coefficients of the system model. The value of **D** order must be greater than or equal to 0.
 - **delays** specifies the delays *k* of the model. The value of **delays** must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value

to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

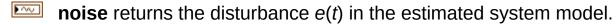
- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

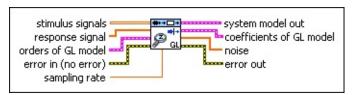
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the F coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.



error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate General Linear Model (MISO Array)



- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(A order + D order, max(B orders + (delays 1)) + D order, C order + max(F orders)) + (A order + sum(B orders) + sum(F orders) + C order + D order)].
- orders of GL model specifies the orders and delay of the generallinear (GL) model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - B orders specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - F orders specifies the orders of the *F* coefficients of the model. The value of **F orders** must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - **D order** specifies the order of the *D* coefficients of the system model. The value of **D order** must be greater than or equal to 0.
 - **delays** specifies the delays *k* of the model. The value of **delays** must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value

to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - D

Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.

- **D** returns the *D* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Estimate Polynomial Models VI in the labview\examples\System Identification\Getting Started\Parametric Estimation.llb for an example of using the SI Estimate General Linear Model VI.

■ Open example ■ Browse related examples

SI Estimate OE Model VI

Owning Palette: Polynomial Model Estimation VIs

Installed With: System Identification Toolkit

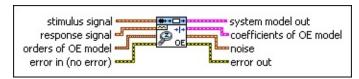
Estimates the parameters of an <u>output-error (OE) model</u> for an unknown system. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Examples

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

Select an instance	▼1
■ Place on the block diagram	■ Find on the Functions palette

SI Estimate OE Model (SISO Waveform)



- stimulus signal specifies the input waveform of the stimulus signal.
- response signal is the input waveform of the response signal.

 The length of response signal must be greater than [max(B order + (delay 1), F order) + (B order + F order)].
- orders of OE model specifies the orders and delay of the outputerror (OE) model.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **F order** specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

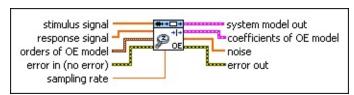
- is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the
- coefficients of OE model returns the coefficients of the outputerror (OE) model.

shortcut menu to use the system model probe.

- **B** returns the *B* coefficients of the system model.
- **F** returns the *F* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate OE Model (SISO Array)



- stimulus signal specifies the input array of the stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(B order + (delay 1), F order) + (B order + F order)].
- orders of OE model specifies the orders and delay of the outputerror (OE) model.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - F order specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status

is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

Use the Model Management VIs to retrieve the information system model out contains.

Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

coefficients of OE model returns the coefficients of the outputerror (OE) model.

B returns the *B* coefficients of the system model.

F returns the *F* coefficients of the system model.

noise returns the disturbance e(t) in the estimated system model.

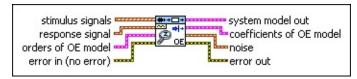
error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate OE Model (MISO Waveform)



- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal is the input waveform of the response signal.
 The length of response signal must be greater than [max(max(B orders + (delays 1)), max(F orders)) + (sum(B orders) + sum(F orders))].
- orders of OE model specifies the orders and delay of the <u>outputerror</u> (OE) model.
 - B orders specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - F orders specifies the orders of the *F* coefficients of the model. The value of **F orders** must be greater than or equal to 0.
 - delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The

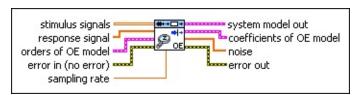
default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of OE model returns the coefficients of the outputerror (OE) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the F coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Estimate OE Model (MISO Array)



- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal is the input array of the response signal. The length of response signal must be greater than [max(max(B orders + (delays 1)), max(F orders)) + (sum(B orders) + sum(F orders))].
- orders of OE model specifies the orders and delay of the outputerror (OE) model.
 - B orders specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - F orders specifies the orders of the *F* coefficients of the model. The value of **F orders** must be greater than or equal to 0.
 - delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. The default is 1.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the shortcut menu to use the system model probe.
- coefficients of OE model returns the coefficients of the outputerror (OE) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
- **noise** returns the disturbance e(t) in the estimated system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Examples

Refer to the following VIs for examples of using the SI Estimate OE Model VI:

- Merge Models VI: labview\examples\System Identification\Getting Started\General.llb
 - Open example Browse related examples
- Estimate Polynomial Models VI: labview\examples\System Identification\Getting Started\Parametric Estimation.llb
 - Open example Browse related examples

Partially Known Model Estimation VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Partially Known Model Estimation VIs to create and estimate partially known models for the plant in a system.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Create Partially Known Continuous Transfer Function Model	Creates a continuous <u>transfer function</u> model for a partially known system. Use the <u>SI Estimate Partially Known</u> <u>Continuous Transfer Function Model</u> VI to estimate the model you create with this VI. You must <u>manually select the polymorphic instance</u> to use.
SI Create Partially Known State- Space Model	Creates a <u>state-space</u> model for a partially known system. Use the <u>SI Estimate Partially Known State-Space Model</u> VI to estimate the model you create with this VI. You must <u>manually select the polymorphic instance</u> to use.
SI Estimate Partially Known Continuous Transfer Function Model	Estimates a continuous transfer function model for a partially known system. Use the SI Create Partially Known Continuous Transfer Function Model VI to create the model you want to estimate. You must manually select the polymorphic instance to use.
SI Estimate Partially Known State-	Estimates a <u>state-space model</u> for a partially known system. Use the <u>SI Create Partially Known State-Space</u> <u>Model</u> VI to create the model you want to estimate. Wire data to the <u>stimulus signal</u> and <u>response signal</u> inputs to

Space determine the polymorphic instance to use or manually select the instance.

SI Create Partially Known Continuous Transfer Function Model VI

Owning Palette: Partially Known Model Estimation VIs

Installed With: System Identification Toolkit

Creates a continuous <u>transfer function</u> model for a partially known system. Use the <u>SI Estimate Partially Known Continuous Transfer</u> <u>Function Model</u> VI to estimate the model you create with this VI. You must <u>manually select the polymorphic instance</u> to use.

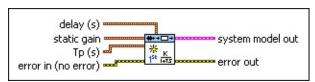
Details Examples

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

Select an instance

■ Place on the block diagram ■ Find on the Functions palette

SI Create Partially Known Continuous Transfer Function Model (1st Order)



- **delay (s)** specifies the delay, in seconds, of the continuous transfer function model.
 - delay initial guess specifies the initial guess of the system delay. The value of delay initial guess must be greater than or equal to 0.
 - delay upper limit specifies the upper limit to use to search for the optimal delay of the model. The value of delay upper limit must be greater than 0. The default is Inf.
 - delay lower limit specifies the lower limit to use to search for the optimal delay of the model. The value of delay lower limit must be greater than 0 and smaller than the delay upper limit. The default is 0.
- static gain specifies the static gain of the continuous transfer function model.
 - static gain initial guess specifies the initial guess of the static gain.
 - static gain upper limit specifies the upper limit to use to search the optimal static gain of the model. The default is Inf.
 - static gain lower limit specifies the lower limit to use to search for the optimal static gain of the model. The default is -Inf.
- **Tp (s)** specifies the time constant, in seconds, of the continuous transfer function model.
 - **Tp initial guess** specifies the initial guess of the system time constant. The value of **Tp initial guess** must be greater than or equal to 0.
 - **Tp upper limit** specifies the upper limit to use to search for

the optimal time constant of the model. The value of **Tp upper limit** must be greater than 0. The default is Inf.

Tp lower limit specifies the lower limit to use to search for the optimal time constant of the model. The value of **Tp lower limit** must be greater than or equal to 0. The default is 0.

error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

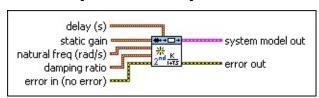
source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

system model out contains information of the mathematical model of a partially known system. The information includes model type, model orders, constraints on each model coefficient, input and output names of the system, and so on.

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Create Partially Known Continuous Transfer Function Model (2nd Order)



- **delay (s)** specifies the delay, in seconds, of the continuous transfer function model.
 - delay initial guess specifies the initial guess of the system delay. The value of delay initial guess must be greater than or equal to 0.
 - delay upper limit specifies the upper limit to use to search for the optimal delay of the model. The value of delay upper limit must be greater than 0. The default is Inf.
 - delay lower limit specifies the lower limit to use to search for the optimal delay of the model. The value of delay lower limit must be greater than 0 and smaller than the delay upper limit. The default is 0.
- static gain specifies the static gain of the continuous transfer function model.
 - static gain initial guess specifies the initial guess of the static gain.
 - static gain upper limit specifies the upper limit to use to search the optimal static gain of the model. The default is Inf.
 - static gain lower limit specifies the lower limit to use to search for the optimal static gain of the model. The default is -Inf.
- natural freq (rad/s) specifies the natural frequency, in radians per second, of the continuous transfer function model.
 - freq initial guess specifies the initial guess of the system natural frequency. freq initial guess must be greater than or equal to 0.

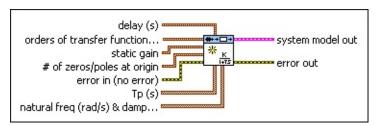
freq upper limit specifies the upper limit to use to search for the optimal natural frequency of the model. The value of **freq upper limit** must be greater than 0. The default is Inf.

- freq lower limit specifies the lower limit to use to search for the optimal natural frequency of the model. The value must be greater than or equal to 0. The default is 0.
- damping ratio specifies the damping ratio of the continuous transfer function model.
 - ratio initial guess specifies the initial guess of the damping ratio. ratio initial guess must be greater than or equal to 0.
 - ratio upper limit specifies the upper limit to use to search for the optimal damping ratio of the model. The value of ratio upper limit must be greater than 0. The default is Inf.
 - ratio lower limit specifies the lower limit to use to search for the optimal damping ratio of the model. The value of ratio lower limit must be greater than or equal to 0. The default is 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- system model out contains information of the mathematical model of a partially known system. The information includes model type, model orders, constraints on each model coefficient, input and output names of the system, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Create Partially Known Continuous Transfer Function Model (General)



- **delay (s)** specifies the delay, in seconds, of the continuous transfer function model.
 - delay initial guess specifies the initial guess of the system delay. The value of delay initial guess must be greater than or equal to 0.
 - delay upper limit specifies the upper limit to use to search for the optimal delay of the model. The value of delay upper limit must be greater than 0. The default is Inf.
 - delay lower limit specifies the lower limit to use to search for the optimal delay of the model. The value of delay lower limit must be greater than 0 and smaller than the delay upper limit. The default is 0.
- orders of transfer function model specifies the numerator and denominator orders of the transfer function model.
 - num order specifies the numerator order of the system model. The default value is 1.
 - den order specifies the denominator order of the system model. The default value is 2. The value of den order must be greater than the value of num order.
- static gain specifies the static gain of the continuous transfer function model.
 - static gain initial guess specifies the initial guess of the static gain.
 - static gain upper limit specifies the upper limit to use to search the optimal static gain of the model. The default is Inf.

static gain lower limit specifies the lower limit to use to search for the optimal static gain of the model. The default is -Inf.

- # of zeros/poles at origin specifies the number of zeros or poles at the origin. You can specify the number of either zeros or poles, but you cannot have both zeros and poles at the origin.
 - **zeros/poles** specifies the zeros or poles of the system.
 - number specifies the number of zeros or poles at the origin.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **Tp (s)** specifies the time constant(s), in seconds, of the continuous transfer function model.
 - **Tp initial guess** specifies the initial guess of the system time constant. The value of **Tp initial guess** must be greater than or equal to 0.
 - **Tp upper limit** specifies the upper limit to use to search for

- the optimal time constant of the model. The value of **Tp upper limit** must be greater than 0. The default is Inf.
- **Tp lower limit** specifies the lower limit to use to search for the optimal time constant of the model. The value of **Tp lower limit** must be greater than or equal to 0. The default is 0.
- natural freq (rad/s) & damping ratio specifies the natural frequency(s) and the damping ratio(s) of the continuous transfer function model.
 - **freq initial guess** specifies the initial guess of the system natural frequency. **freq initial guess** must be greater than or equal to 0.
 - freq upper limit specifies the upper limit to use to search for the optimal natural frequency of the model. The value of freq upper limit must be greater than 0. The default is Inf.
 - freq lower limit specifies the lower limit to use to search for the optimal natural frequency of the model. The value must be greater than or equal to 0. The default is 0.
 - ratio initial guess specifies the initial guess of the damping ratio. ratio initial guess must be greater than or equal to 0.
 - ratio upper limit specifies the upper limit to use to search for the optimal damping ratio of the model. The value of ratio upper limit must be greater than 0. The default is Inf.
 - ratio lower limit specifies the lower limit to use to search for the optimal damping ratio of the model. The value of ratio lower limit must be greater than or equal to 0. The default is 0.
- system model out contains information of the mathematical model of a partially known system. The information includes model type, model orders, constraints on each model coefficient, input and output names of the system, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status

that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Create Partially Known Continuous Transfer Function Model Details

The following equations represent first-order, second-order, and general models, respectively.

First-order models: $\frac{\kappa}{(1+T_ps)}e^{-sT_d}$

Second-order models: $\frac{\kappa}{(1+2rs/w+(s/w)^2)}e^{-sT_d}$

 $\text{General models: } \frac{\frac{\mathcal{K}(1+a_1s)(1+a_2s)\dots}{(1+T_p^js)(1+2r^js/w^j+(s/w^j)^2)}e^{-sT_d}$

where K is the transfer function gain

 T_d is the delay

 T_p is the first-order time constant

r is the damping ratio

w is the natural frequency

If a system has zeros at the origin, you can use general models to represent the system using the following equation:

$$\frac{\mathcal{K}s^{k}(1+a_{1}s)(1+a_{2}s)...}{(1+T_{D}^{i}s)(1+2r^{j}s/w^{j}+(s/w^{j})^{2})}e^{-sT_{d}}$$

You must select the **zeros** input of the **# of zeros/poles at origin** parameter and specify the number of zeros in the **number** input.

If a system has poles at the origin, you can use general models to represent the system using the following equation:

$$\frac{K(1+a_{1}s)(1+a_{2}s)...}{s^{k}(1+T_{D}^{i}s)(1+2r^{j}s/w^{j}+(s/w^{j})^{2})}e^{-sT_{d}}$$

You must select the **poles** input of the # **of zeros/poles at origin** parameter and specify the number of poles in the **number** input.

Examples

Refer to the following VIs for examples of using the SI Create Partially Known Continuous Transfer Function Model VI:

- Continuous Transfer Function Model of a DC Motor with Known Gain VI: labview\examples\System Identification\Getting Started\Grey-Box Model.llb
 - Open example Browse related examples
- Ball and Beam VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

SI Create Partially Known State-Space Model VI

Owning Palette: Partially Known Model Estimation VIs

Installed With: System Identification Toolkit

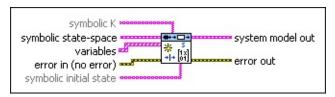
Creates a <u>state-space</u> model for a partially known system. Use the <u>SI</u> <u>Estimate Partially Known State-Space Model</u> VI to estimate the model you create with this VI. You must <u>manually select the polymorphic</u> instance to use.

Example

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



SI Create Partially Known State-Space Model (Continuous SISO)



- symbolic K specifies the symbolic representation of the Kalman gain. If symbolic K is not provided, the estimated state-space model contains only the deterministic part of the system.
- **symbolic state-space** specifies the matrices of a state-space model in symbolic representation.
 - symbolic A is the <u>symbolic representation</u> of the system matrix that describes the dynamics of the states of the system.
 - symbolic B is the symbolic representation of the input matrix that relates the inputs to the states of the system.
 - **symbolic C** is the symbolic representation of the output matrix that relates the outputs to the states of the system.
 - symbolic **D** is the symbolic representation of the transmission matrix that relates the inputs to the outputs of the system.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - initial guess is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the

optimal value of each variable. The default is -Inf.

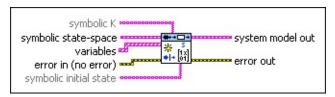
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **symbolic initial state** is the symbolic representation of the initial state.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a

warning code.

source des

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Create Partially Known State-Space Model (Continuous MISO)



- symbolic K specifies the symbolic representation of the Kalman gain. If symbolic K is not provided, the estimated state-space model contains only the deterministic part of the system.
- **symbolic state-space** specifies the matrices of a state-space model in symbolic representation.
 - symbolic A is the <u>symbolic representation</u> of the system matrix that describes the dynamics of the states of the system.
 - symbolic B is the symbolic representation of the input matrix that relates the inputs to the states of the system.
 - **symbolic C** is the symbolic representation of the output matrix that relates the outputs to the states of the system.
 - symbolic **D** is the symbolic representation of the transmission matrix that relates the inputs to the outputs of the system.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - **initial guess** is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the

optimal value of each variable. The default is -Inf.

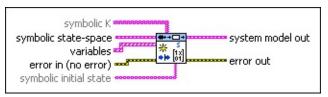
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **symbolic initial state** is the symbolic representation of the initial state.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a

warning code.

source des

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Create Partially Known State-Space Model (Continuous MIMO)



- symbolic K is the symbolic representation of the Kalman gain. If symbolic K is not provided, the estimated state-space model contains only the deterministic part of the system.
- **symbolic state-space** specifies the matrices of a state-space model in symbolic representation.
 - symbolic A is the <u>symbolic representation</u> of the system matrix that describes the dynamics of the states of the system.
 - symbolic B is the symbolic representation of the input matrix that relates the inputs to the states of the system.
 - **symbolic C** is the symbolic representation of the output matrix that relates the outputs to the states of the system.
 - symbolic **D** is the symbolic representation of the transmission matrix that relates the inputs to the outputs of the system.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - **initial guess** is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.
 - lower limit specifies the lower limit to use to search for the

optimal value of each variable. The default is -Inf.

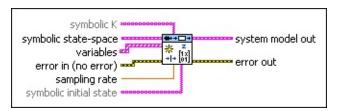
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **symbolic initial state** is the symbolic representation of the initial state.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a

warning code.

source des

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Create Partially Known State-Space Model (Discrete SISO)



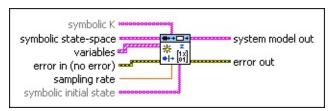
- symbolic K specifies the symbolic representation of the Kalman gain. If symbolic K is not provided, the estimated state-space model contains only the deterministic part of the system.
- **symbolic state-space** specifies the matrices of a state-space model in symbolic representation.
 - symbolic A is the <u>symbolic representation</u> of the system matrix that describes the dynamics of the states of the system.
 - symbolic B is the symbolic representation of the input matrix that relates the inputs to the states of the system.
 - symbolic C is the symbolic representation of the output matrix that relates the outputs to the states of the system.
 - symbolic **D** is the symbolic representation of the transmission matrix that relates the inputs to the outputs of the system.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - **initial guess** is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.

- lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- symbolic initial state is the symbolic representation of the initial state.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Create Partially Known State-Space Model (Discrete MISO)



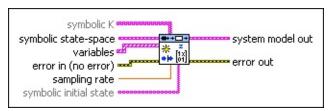
- symbolic K specifies the symbolic representation of the Kalman gain. If symbolic K is not provided, the estimated state-space model contains only the deterministic part of the system.
- symbolic state-space specifies the matrices of a state-space model in symbolic representation.
 - symbolic A is the <u>symbolic representation</u> of the system matrix that describes the dynamics of the states of the system.
 - symbolic B is the symbolic representation of the input matrix that relates the inputs to the states of the system.
 - symbolic C is the symbolic representation of the output matrix that relates the outputs to the states of the system.
 - symbolic **D** is the symbolic representation of the transmission matrix that relates the inputs to the outputs of the system.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - **initial guess** is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.

- lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- symbolic initial state is the symbolic representation of the initial state.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Create Partially Known State-Space Model (Discrete MIMO)



- symbolic K is the symbolic representation of the Kalman gain. If symbolic K is not provided, the estimated state-space model contains only the deterministic part of the system.
- symbolic state-space specifies the matrices of a state-space model in symbolic representation.
 - symbolic A is the <u>symbolic representation</u> of the system matrix that describes the dynamics of the states of the system.
 - symbolic B is the symbolic representation of the input matrix that relates the inputs to the states of the system.
 - symbolic C is the symbolic representation of the output matrix that relates the outputs to the states of the system.
 - symbolic **D** is the symbolic representation of the transmission matrix that relates the inputs to the outputs of the system.
- variables specifies the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - **initial guess** is the initial guess of the numeric value this VI associates with the variable.
 - **upper limit** specifies the upper limit to use to search for the optimal value of each variable. The default is Inf.

- lower limit specifies the lower limit to use to search for the optimal value of each variable. The default is -Inf.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- symbolic initial state is the symbolic representation of the initial state.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Continuous State-Space Model of an RLC Circuit VI in the labview\examples\System Identification\Getting Started\Grey-Box Model.llb for an example of using the SI Create Partially Known State-Space Model VI.

■ Open example ■ Browse related examples

SI Estimate Partially Known Continuous Transfer Function Model VI

Owning Palette: Partially Known Model Estimation VIs

Installed With: System Identification Toolkit

Estimates a continuous <u>transfer function</u> model for a partially known system. Use the <u>SI Create Partially Known Continuous Transfer Function Model</u> VI to create the model you want to estimate. You must <u>manually select the polymorphic instance</u> to use.

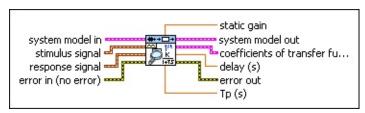
Details Examples

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

Select an instance

■ Place on the block diagram ■ Find on the **Functions** palette

SI Estimate Partially Known Continuous Transfer Function Model (1st Order SISO Waveform)



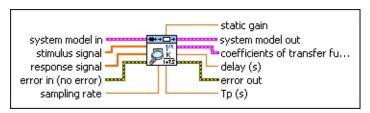
- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- static gain returns the static gain of the model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 s + b_m s^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 S + a_n S^n$.
- delay (s) returns the estimated delay, in seconds, of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

DBL

Tp (s) returns the estimated time constant, in seconds, of the model.

SI Estimate Partially Known Continuous Transfer Function Model (1st Order SISO Array)



- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. sampling rate is used when this VI converts the continuous

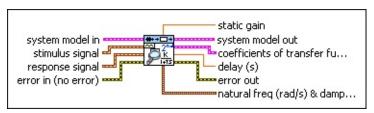
system to a discrete system before simulating the output.

- static gain returns the static gain of the model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- **coefficients of transfer function model** returns the coefficients of the <u>transfer function model</u>.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1S} + b_{mS}^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- delay (s) returns the estimated delay, in seconds, of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning.

Tp (s) returns the estimated time constant, in seconds, of the model.

SI Estimate Partially Known Continuous Transfer Function Model (2nd Order SISO Waveform)

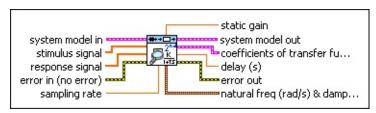


- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- static gain returns the static gain of the model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 s + b_m s^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- delay (s) returns the estimated delay, in seconds, of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

- natural freq (rad/s) & damping ratio returns the estimated natural frequency and damping ratio of the model.
 - **natural freq (rad/s)** returns the estimated natural frequency, in radians per second, of the model.
 - **damping ratio** returns the estimated damping ratio of the model.

SI Estimate Partially Known Continuous Transfer Function Model (2nd Order SISO Array)



- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz.
 sampling rate is used when this VI converts the continuous

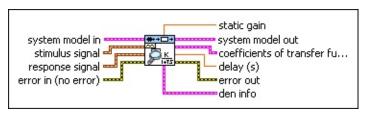
system to a discrete system before simulating the output.

- static gain returns the static gain of the model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- **coefficients of transfer function model** returns the coefficients of the <u>transfer function model</u>.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1S} + b_{mS}^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- delay (s) returns the estimated delay, in seconds, of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning.

- natural freq (rad/s) & damping ratio returns the estimated natural frequency and damping ratio of the model.
 - **natural freq (rad/s)** returns the estimated natural frequency, in radians per second, of the model.
 - **damping ratio** returns the estimated damping ratio of the model.

SI Estimate Partially Known Continuous Transfer Function Model (General SISO Waveform)

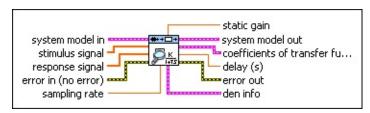


- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- static gain returns the static gain of the model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- coefficients of transfer function model returns the coefficients of the transfer function model.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_1 s + b_m s^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- delay (s) returns the estimated delay, in seconds, of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

- den info returns the estimated denominator of the model.
 - **Tp (s)** returns the estimated time constant of the model in seconds.
 - natural freq (rad/s) & damping ratio returns the estimated natural frequency and damping ratio of the model.
 - natural freq (rad/s) returns the estimated natural frequency, in radians per second, of the model.
 - **damping ratio** returns the estimated damping ratio of the model.

SI Estimate Partially Known Continuous Transfer Function Model (General SISO Array)



- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz.
 sampling rate is used when this VI converts the continuous

system to a discrete system before simulating the output.

- static gain returns the static gain of the model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
 Use the Model Management VIs to retrieve the information system model out contains.
 - **Note** You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- **coefficients of transfer function model** returns the coefficients of the <u>transfer function model</u>.
 - **numerator** returns the numerator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $b_0 + b_{1S} + b_{mS}^m$.
 - **denominator** returns the denominator coefficients of the transfer function model, in ascending order. The coefficients take the following form: $a_0 + a_1 s + a_n s^n$.
- delay (s) returns the estimated delay, in seconds, of the model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning.



- **Tp (s)** returns the estimated time constant of the model in seconds.
- natural freq (rad/s) & damping ratio returns the estimated natural frequency and damping ratio of the model.
 - natural freq (rad/s) returns the estimated natural frequency, in radians per second, of the model.
 - **damping ratio** returns the estimated damping ratio of the model.

SI Estimate Partially Known Continuous Transfer Function Model Details

When estimating continuous transfer function models from array data, you must set the sampling rate for this VI to convert continuous systems to discrete systems. This VI then simulates the output and compares the simulated output with the response signal to optimize estimation.

Examples

Refer to the following VIs for examples of using the SI Estimate Partially Known Continuous Transfer Function Model VI:

- Continuous Transfer Function Model of a DC Motor with Known Gain VI: labview\examples\System Identification\Getting Started\Grey-Box Model.llb
 - Open example Browse related examples
- Ball and Beam VI: labview\examples\System Identification\Industry Applications\Mechanical Systems.llb
 - Open example Browse related examples

SI Estimate Partially Known State-Space Model VI

Owning Palette: Partially Known Model Estimation VIs

Installed With: System Identification Toolkit

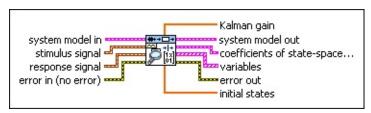
Estimates a <u>state-space model</u> for a partially known system. Use the <u>SI</u> <u>Create Partially Known State-Space Model</u> VI to create the model you want to estimate. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Details Example

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



SI Estimate Partially Known State-Space Model (SISO Waveform)

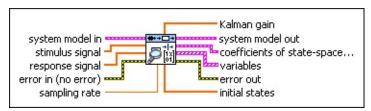


- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- Kalman gain returns the Kalman gain of the state-space model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire
 - and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.
- coefficients of state-space model returns the coefficients of the state-space (SS) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- variables returns the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - value returns the estimated value of each variable.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model.

SI Estimate Partially Known State-Space Model (SISO Array)



- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. For continuous models, sampling rate is used to convert the

continuous system to a discrete system before this VI simulates the output. For discrete models, **sampling rate** is the sampling rate of the system.

Kalman gain returns the Kalman gain of the state-space model.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.

D

Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

coefficients of state-space model returns the coefficients of the state-space (SS) model.

A returns the *A* coefficients of the system model.

B returns the *B* coefficients of the system model.

C returns the *C* coefficients of the system model.

D returns the *D* coefficients of the system model.

variables returns the names and values of the variables in the state-space model.

name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.

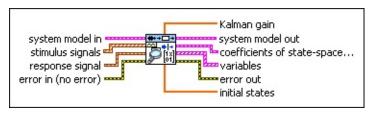
value returns the estimated value of each variable.

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu

for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model.

SI Estimate Partially Known State-Space Model (MISO Waveform)



- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signals is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signal specifies the input waveform of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced

the error or warning. The default is an empty string.

Kalman gain returns the Kalman gain of the state-space model.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

coefficients of state-space model returns the coefficients of the state-space (SS) model.

A returns the A coefficients of the system model.

B returns the *B* coefficients of the system model.

C returns the *C* coefficients of the system model.

D returns the *D* coefficients of the system model.

variables returns the names and values of the variables in the state-space model.

name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.

value returns the estimated value of each variable.

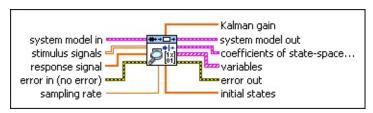
error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model.

SI Estimate Partially Known State-Space Model (MISO Array)



- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signals is the input array of the stimulus signals. Each element in the array is one stimulus signal.
- response signal specifies the input array of the response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate specifies the sampling frequency in hertz. For

continuous models, **sampling rate** is used to convert the continuous system to a discrete system before this VI simulates the output. For discrete models, **sampling rate** is the sampling rate of the system.

Kalman gain returns the Kalman gain of the state-space model.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.

Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the

shortcut menu to use the system model probe.

coefficients of state-space model returns the coefficients of the state-space (SS) model.

A returns the A coefficients of the system model.

B returns the *B* coefficients of the system model.

C returns the *C* coefficients of the system model.

D returns the *D* coefficients of the system model.

variables returns the names and values of the variables in the state-space model.

name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.

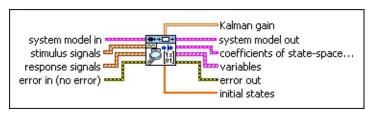
value returns the estimated value of each variable.

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front

panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model.

SI Estimate Partially Known State-Space Model (MIMO Waveform)



- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signals is the input waveform array of the stimulus signals. Each element of the waveform array is the waveform of one stimulus signal.
- response signals specifies the input waveform array of the response signals. Each element of the array is the waveform of one response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

Kalman gain returns the Kalman gain of the state-space model.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

coefficients of state-space model returns the coefficients of the state-space (SS) model.

A returns the *A* coefficients of the system model.

B returns the *B* coefficients of the system model.

C returns the *C* coefficients of the system model.

D returns the *D* coefficients of the system model.

variables returns the names and values of the variables in the state-space model.

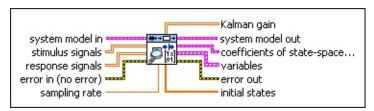
name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.

value returns the estimated value of each variable.

error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model.

SI Estimate Partially Known State-Space Model (MIMO Array)



- system model in contains information for the mathematical model of a partially known system. The information includes the model type, model orders, constraints on each of the model coefficients, input and output names of the system, and so on.
- stimulus signals is the input array of the stimulus signals. Each element in the array is one stimulus signal.
- response signals is the input array of the response signals. Each element in the array is one response signal.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- sampling rate specifies the sampling frequency in hertz. For continuous models, sampling rate is used to convert the continuous system to a discrete system before this VI simulates the output. For discrete models, sampling rate is the sampling rate of the system.
- Kalman gain returns the Kalman gain of the state-space model.
- system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

 Use the Model Management VIs to retrieve the information system model out contains.
 - Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select Custom Probe»SI System Model from the
- coefficients of state-space model returns the coefficients of the state-space (SS) model.

shortcut menu to use the system model probe.

- **A** returns the A coefficients of the system model.
- **B** returns the *B* coefficients of the system model.
- **C** returns the *C* coefficients of the system model.
- **D** returns the *D* coefficients of the system model.
- variables returns the names and values of the variables in the state-space model.
 - name is a name this VI uses to define the variable of the system model. Variable names can be a combination of letters and numbers. A variable name that begins with a capital letter E can produce unpredictable errors if parts of the original string represent numbers like 1E–2. Avoid variable names beginning with E in such cases.
 - value returns the estimated value of each variable.
- **error out** contains error information. If **error in** indicates that an error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status

that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.
- initial states returns the initial states of the state-space model.

SI Estimate Partially Known State-Space Model Details

The SI Estimate Partially Known State-Space Model VI estimates a continuous or discrete state-space model for a partially known system, depending on the **system model** input. This VI accepts only models the SI Create Partially Known State-Space Model VI creates. When estimating discrete models from array data, you must set **sampling rate** to the same sampling rate you set when you created the model using the SI Create Partially Known State-Space Model VI. When estimating continuous models from array data, you must set the **sampling rate** for the VI to convert continuous systems to discrete systems. This VI simulates the output and then compares the simulated output with the response signal to optimize estimation.

Example

Refer to the Continuous State-Space Model of an RLC Circuit VI in the labview\examples\System Identification\Getting Started\Grey-Box Model.llb for an example of using the SI Estimate Partially Known State-Space Model VI.

■ Open example ■ Browse related examples

Recursive Model Estimation VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Recursive Model Estimation VIs to recursively estimate the parametric mathematical model for an unknown system.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description
SI Recursively Estimate ARMAX Model	Estimates the parameters of an ARMAX model using a recursive method. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or manually select the instance.
SI Recursively Estimate ARX Model	Estimates the parameters of an ARX model using a recursive method. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or manually select the instance.
SI Recursively Estimate BJ Model	Estimates the parameters of a <u>Box-Jenkins (BJ) model</u> using a recursive method. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.
SI Recursively Estimate GL Model	Estimates the parameters of a general-linear (GL) model using a recursive method. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or manually select the instance.
SI Recursively Estimate OE Model	Estimates the parameters of an <u>output-error</u> (OE) <u>model</u> using a recursive method. Wire data to the stimulus signal and response signal inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

SI Recursively Estimate ARMAX Model VI

Owning Palette: Recursive Model Estimation VIs

Installed With: System Identification Toolkit

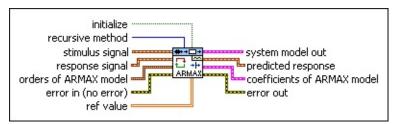
Estimates the parameters of an <u>ARMAX model</u> using a recursive method. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Example

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



SI Recursively Estimate ARMAX Model (SISO Waveform)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of ARMAX model specifies the orders and delay of the ARMAX model.
 - A order specifies the order of the A coefficients of the system model. The value of A order must be greater than or equal to 0.
 - B order specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value

of **delay** must be greater than or equal to 0.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the

algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.

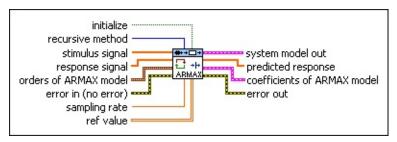


Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of ARMAX model returns the coefficients of the ARMAX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate ARMAX Model (SISO Array)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- orders of ARMAX model specifies the orders and delay of the ARMAX model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size.

The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of ARMAX model returns the coefficients of the ARMAX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

Pabe

source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Online Model Estimation VI in the labview\examples\System Identification\Getting Started\Recursive Estimation.llb for an example of using the SI Recursively Estimate ARMAX Model VI.

■ Open example ■ Browse related examples

SI Recursively Estimate ARX Model VI

Owning Palette: Recursive Model Estimation VIs

Installed With: System Identification Toolkit

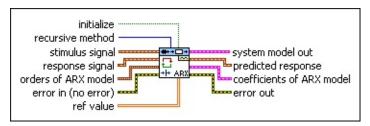
Estimates the parameters of an <u>ARX model</u> using a recursive method. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Example

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



SI Recursively Estimate ARX Model (SISO Waveform)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of ARX model specifies the orders and delay of the ARX model.
 - A order specifies the order of the A coefficients of the system model. The value of A order must be greater than or equal to 0.
 - B order specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- **error in** describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before

this VI or function runs, the VI or function passes the **error in** value to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

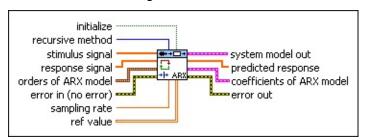
system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate ARX Model (SISO Array)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- orders of ARX model specifies the orders and delay of the ARX model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value

to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input

signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

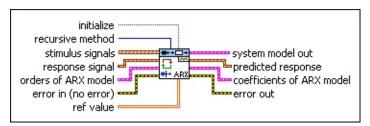
Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate ARX Model (MISO Waveform)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of ARX model specifies the orders and delays of the ARX model.
 - A order specifies the order of the A coefficients of the system model. The value of A order must be greater than or equal to 0.
 - B orders specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - delays specifies the delays *k* of the model. The value of delays should be greater than 0.
- error in describes error conditions that occur before this VI or

function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the **error in** value to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input

signal.

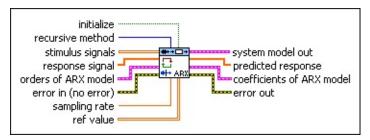
system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate ARX Model (MISO Array)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal specifies the input array of the response signal.
- orders of ARX model specifies the orders and delays of the ARX model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B orders** specifies the orders of the *B* coefficients of the model. The value of **B orders** must be greater than or equal to 1.
 - **delays** specifies the delays *k* of the model. The value of **delays** should be greater than 0.
- **error in** describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before

this VI or function runs, the VI or function passes the **error in** value to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An

appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.



Note You can use a customized system model probe to view model information that flows through system model wires when you debug a block diagram created with the System Identification VIs. Right-click a system model wire and select **Custom Probe»SI System Model** from the shortcut menu to use the system model probe.

- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of ARX model returns the coefficients of the ARX model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Online Model Estimation VI in the labview\examples\System Identification\Getting Started\Recursive Estimation.llb for an example of using the SI Recursively Estimate ARX Model VI.

■ Open example ■ Browse related examples

SI Recursively Estimate BJ Model VI

Owning Palette: Recursive Model Estimation VIs

Installed With: System Identification Toolkit

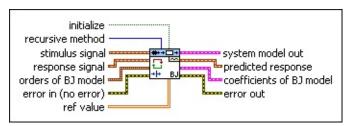
Estimates the parameters of a <u>Box-Jenkins (BJ) model</u> using a recursive method. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Example

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

Select an instance			
■ Place on the block diagram	■ Find on the	Functions	palette

SI Recursively Estimate BJ Model (SISO Waveform)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of BJ model specifies the orders and delay of the Box-Jenkins (BJ) model.
 - B order specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - F order specifies the order of the F coefficients of the system model. The value of F order must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - **D** order specifies the order of the *D* coefficients of the

model. The value of **D** order must be greater than or equal to 0.

delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.

error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.

code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.

source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

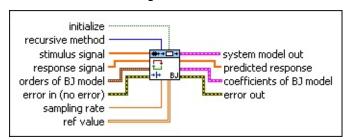
Use the Model Management VIs to retrieve the information system model out contains.



- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of BJ model returns the coefficients of the Box-Jenkins (BJ) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate BJ Model (SISO Array)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- orders of BJ model specifies the orders and delay of the Box-Jenkins (BJ) model.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **F order** specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
 - **D** order specifies the order of the *D* coefficients of the model. The value of **D** order must be greater than or equal

to 0.

- delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate is the signal sampling rate in hertz. The value of sampling rate must be greater than 0.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

Use the Model Management VIs to retrieve the information system model out contains.



- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of BJ model returns the coefficients of the <u>Box</u>-Jenkins (BJ) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE

(checkmark) to indicate a warning or that no error occurred.

- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Online Model Estimation VI in the labview\examples\System Identification\Getting Started\Recursive Estimation.llb for an example of using the SI Recursively Estimate BJ Model VI.

■ Open example ■ Browse related examples

SI Recursively Estimate GL Model VI

Owning Palette: Recursive Model Estimation VIs

Installed With: System Identification Toolkit

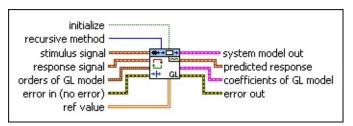
Estimates the parameters of a <u>general-linear (GL) model</u> using a recursive method. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually</u> **select** the instance.

Example

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



SI Recursively Estimate GL Model (SISO Waveform)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of GL model specifies the orders and delay of the generallinear (GL) model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - B order specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **F order** specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - **C** order specifies the order of the C coefficients of the

- system model. The value of **C order** must be greater than or equal to 0.
- **D** order specifies the order of the *D* coefficients of the system model. The value of **D** order must be greater than or equal to 0.
- delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying

systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

Use the Model Management VIs to retrieve the information system model out contains.

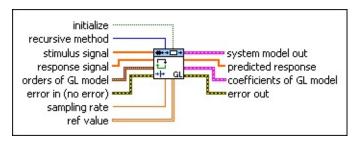


- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - A returns the A coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front

panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate GL Model (SISO Array)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- orders of GL model specifies the orders and delay of the generallinear (GL) model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **F order** specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than

or equal to 0.

- **D** order specifies the order of the *D* coefficients of the system model. The value of **D** order must be greater than or equal to 0.
- delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- sampling rate is the signal sampling rate in hertz. The value of sampling rate must be greater than 0.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small

forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.

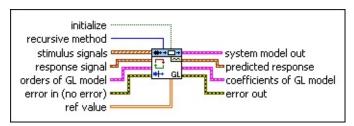


- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- **error out** contains error information. If **error in** indicates that an error occurred before this VI or function ran, **error out** contains the

same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate GL Model (MISO Waveform)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signals specifies the input waveform array of the stimulus signals. Each element of the array is the waveform of one stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of GL model specifies the orders and delays of the general-linear (GL) model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - F orders specifies the orders of the F coefficients of the model. The value of F orders must be greater than or equal to 0.

- **C order** specifies the order of the *C* coefficients of the system model. The value of **C order** must be greater than or equal to 0.
- **D** order specifies the order of the *D* coefficients of the system model. The value of **D** order must be greater than or equal to 0.
- delays specifies the delays k of the model. The value of delays must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small

forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model out contains.

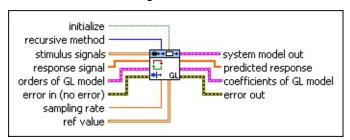


- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - F returns the F coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the

same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate GL Model (MISO Array)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signals specifies the input array of the stimulus signals. Each row in the array is one stimulus signal.
- response signal specifies the input array of the response signal.
- orders of GL model specifies the orders and delays of the general-linear (GL) model.
 - A **order** specifies the order of the *A* coefficients of the system model. The value of **A order** must be greater than or equal to 0.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **F orders** specifies the orders of the *F* coefficients of the model. The value of **F orders** must be greater than or equal to 0.
 - **C order** specifies the order of the C coefficients of the

- system model. The value of **C order** must be greater than or equal to 0.
- **D order** specifies the order of the *D* coefficients of the system model. The value of **D order** must be greater than or equal to 0.
- **delays** specifies the delays *k* of the model. The value of **delays** must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from

previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.

Use the Model Management VIs to retrieve the information system model out contains.



- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of GL model returns the coefficients of the generallinear (GL) model.
 - **A** returns the *A* coefficients of the system model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the F coefficients of the system model.
 - **C** returns the *C* coefficients of the system model.
 - **D** returns the *D* coefficients of the system model.
- error out contains error information. If error in indicates that an

error occurred before this VI or function ran, **error out** contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the **error out** front panel indicator and select **Explain Error** from the shortcut menu for more information about the error.

- status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
- code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Online Model Estimation VI in the labview\examples\System Identification\Getting Started\Recursive Estimation.llb for an example of using the SI Recursively Estimate GL Model VI.

■ Open example ■ Browse related examples

SI Recursively Estimate OE Model VI

Owning Palette: Recursive Model Estimation VIs

Installed With: System Identification Toolkit

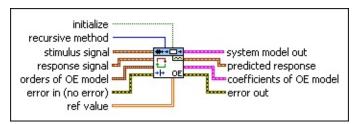
Estimates the parameters of an <u>output-error (OE) model</u> using a recursive method. Wire data to the **stimulus signal** and **response signal** inputs to determine the polymorphic instance to use or <u>manually</u> **select** the instance.

Example

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



SI Recursively Estimate OE Model (SISO Waveform)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS —Least mean squares method

- stimulus signal specifies the input waveform of the stimulus signal.
- response signal specifies the input waveform of the response signal.
- orders of OE model specifies the orders and delay of the outputerror (OE) model.
 - B order specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - F order specifies the order of the F coefficients of the system model. The value of F order must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- **error in** describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before

this VI or function runs, the VI or function passes the **error in** value to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

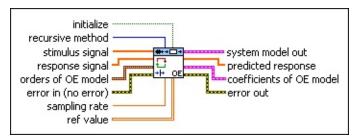
When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.



- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of OE model returns the coefficients of the outputerror (OE) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Recursively Estimate OE Model (SISO Array)



- initialize initializes the internal state of the VI when TRUE. This VI performs calculations that are dependent on all previous data since you last ran the VI or since you set initialize to TRUE. When initialize is TRUE, this VI restarts the calculation dependency.
- recursive method specifies the recursive estimation method to use.

0	RLS (default)—Recursive least squares method
1	KF —Kalman filter method
2	NLMS —Normalized least mean squares method
3	LMS—Least mean squares method

- stimulus signal specifies the input array of the stimulus signal.
- response signal specifies the input array of the response signal.
- orders of OE model specifies the orders and delay of the outputerror (OE) model.
 - **B order** specifies the order of the *B* coefficients of the system model. The value of **B order** must be greater than or equal to 1.
 - **F order** specifies the order of the *F* coefficients of the system model. The value of **F order** must be greater than or equal to 0.
 - delay specifies the delay k of the system model. The value of delay must be greater than or equal to 0.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value

to **error out**. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in **error out**. Use the <u>Simple Error Handler</u> or <u>General Error Handler</u> VIs to display the description of the error code. Use **error in** and **error out** to check errors and to specify execution order by wiring **error out** from one node to **error in** of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- **sampling rate** is the signal sampling rate in hertz. The value of **sampling rate** must be greater than 0.
- ref value specifies the reference value for the recursive estimation algorithms. When recursive method is KF, ref value is the drift matrix.

When **recursive method** is **RLS**, this VI uses the value in the first row and the first column of **ref value** as the forgetting factor. The smaller the forgetting factor, the less information this VI uses from previous estimation calculations. When this VI uses small forgetting factors, the system model is able to track time-varying systems. The range of the forgetting factor is between 0 and 1, typically greater than 0.98 and less than 1.

When **recursive method** is **NLMS** or **LMS**, this VI uses the value in the first row and the first column of **ref value** as the step size. The value of the step size is proportional to the convergence rate. The larger the step size, the faster the convergence. However, the algorithm can become unstable if the step size gets too large. An appropriate step size depends on the model type, order, and input

signal.

system model out returns information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model out contains.



- predicted response returns the predicted response output from the current estimated system model. The difference between the values of predicted response and response signal is the measure of the recursive estimation.
- coefficients of OE model returns the coefficients of the outputerror (OE) model.
 - **B** returns the *B* coefficients of the system model.
 - **F** returns the *F* coefficients of the system model.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Online Model Estimation VI in the labview\examples\System Identification\Getting Started\Recursive Estimation.llb for an example of using the SI Recursively Estimate OE Model VI.

■ Open example ■ Browse related examples

Utilities VIs

Owning Palette: System Identification VIs

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the Utilities VIs to perform miscellaneous tasks on data or the system model, including producing data samples, displaying model equations, merging models, and so on.

The VIs on this palette can return <u>general LabVIEW error codes</u> or specific <u>system identification error codes</u>.

Palette Object	Description		
SI Data Samples	Produces sample stimulus and response signals. You must manually select the polymorphic instance to use.		
SI Draw Model	Displays model equations and the sampling rate in a picture indicator. You can use this VI to display the equations of a transfer function, state-space, zero-polegain, AR, ARX, ARMAX, output-error, Box-Jenkins, or general-linear model in a picture indicator according to the model representation you wire to the system model input.		
SI Generate Pseudo- Random Binary Sequence	Generates a Pseudo-Random Binary Sequence (PRBS).		
SI Get Continuous Transfer Function Denominator Information	Returns the denominator from a continuous transfer function model, including Tp, natural frequency, and damping ratio.		
SI Merge Models	Merges multiple models of the same representation and order to one model. This VI supports only polynomial models. Wire system models to the system model 1 and system model 2 inputs to determine the polymorphic		

	instance to use or manually select the instance.
SI Read from File	Reads arrays or waveforms from a specified data file. Use this VI to read spreadsheet text files and waveforms data files.

SI Data Samples VI

Owning Palette: Utilities VIs

Installed With: System Identification Toolkit

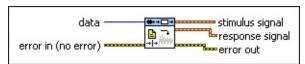
Produces sample stimulus and response signals. You must <u>manually</u>

select the polymorphic instance to use.

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

Select an instance	\	
■ Place on the block diagram	■ Find on the Functions pa	lette

SI Data Samples (SISO Waveform)



data specifies the sample data source.

0	Motor (default)
1	Flexible Arm
2	Ball and Beam
3	Motor (step response)
4	RC Circuit (white noise)
5	RC Circuit (chirp)
6	DC Motor (chirp)
7	DC Motor (PRBS)
8	RLC Circuit (chirp)

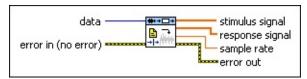
error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- stimulus signal returns a sample stimulus waveform.
- response signal returns a sample response waveform.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Data Samples (SISO Array)



data specifies the sample data source.

0	Motor (default)
1	Flexible Arm
2	Ball and Beam
3	Motor (step response)
4	RC Circuit (white noise)
5	RC Circuit (chirp)
6	DC Motor (chirp)
7	DC Motor (PRBS)
8	RLC Circuit (chirp)

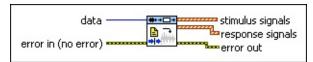
error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.

- status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
- code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
- source specifies the origin of the error or warning and is, in

most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- **stimulus signal** returns a sample stimulus array.
- response signal returns a sample response array.
- sample rate returns the sample rate for the selected data source.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

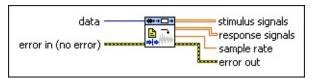
SI Data Samples (MIMO Waveform)



- data specifies the sample data source.
 - 0 Glass Tube Manufacturing (default)1 Car Servo System
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus signals returns sample stimulus waveforms. Each element of the waveform array is the waveform of one stimulus signal.
- response signals returns sample response waveforms. Each element of the waveform array is the waveform of one response signal.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Data Samples (MIMO Array)



- data specifies the sample data source.
 - 0 Glass Tube Manufacturing (default)
 1 Car Servo System
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- stimulus signals returns sample stimulus arrays. Each row in the array is one stimulus signal.
- response signals returns sample response arrays. Each row in the array is one response signal.
- sample rate returns the sample rate for the selected data source.

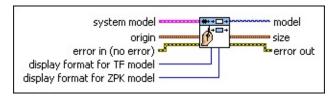
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Draw Model VI

Owning Palette: Utilities VIs

Installed With: System Identification Toolkit

Displays model equations and the sampling rate in a picture indicator. You can use this VI to display the equations of a <u>transfer function</u>, <u>state-space</u>, <u>zero-pole-gain</u>, <u>AR</u>, <u>ARX</u>, <u>ARMAX</u>, <u>output-error</u>, <u>Box-Jenkins</u>, or <u>general-linear</u> model in a picture indicator according to the model representation you wire to the **system model** input.



- Place on the block diagram Find on the **Functions** palette
- system model contains information about the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information system model contains.



- origin specifies the position in the picture indicator where you want this VI to display the upper-left corner of the equation image. LabVIEW considers the upper-left position of the picture indicator to be the origin, (0,0), when determining the locations of the left and top coordinates.
 - left specifies the number of pixels to the right of the origin that LabVIEW places the upper-left corner of the equation image. The default is 10.
 - top specifies the number of pixels below the origin that LabVIEW places the upper-left corner of the equation image. The default is 8.

- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- display format for TF model specifies the format in which this VI displays transfer function equations. This VI ignores the display format for TF model if the system model is a not transfer function model.
 - DescendingAscending (default)Negative Power
- display format for ZPK model specifies the format in which this VI displays zero-pole-gain equations. This VI ignores the display format for ZPK model if the system model is not a zero-pole-gain model.

0	Standard (default)
1	Engineering

- 2 Time Constant3 Negative Power
- model displays the model equations that the system model defines in a picture indicator.
- size returns the size of the area in the picture control this VI uses to draw the model equations.
 - width returns the width of the area in the picture control this VI uses to draw the model equations.
 - height returns the height of the area in the picture control this VI uses to draw the model equations.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

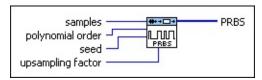
SI Generate Pseudo-Random Binary Sequence VI

Owning Palette: Utilities VIs

Installed With: System Identification Toolkit

Generates a Pseudo-Random Binary Sequence (PRBS).

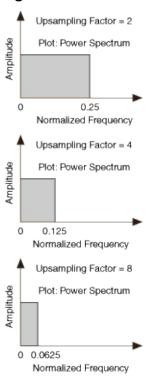
Details



- Place on the block diagram Find on the Functions palette
- samples specifies the number of samples the PRBS contains. samples must be greater than or equal to 0. The default is 128.
- **polynomial order** specifies the order of the modulo-2 primitive polynomial used to generate the PRBS. The default is 31.
- **seed**, when greater than 0, causes reseeding of the noise sample generator. The default is -1.
- upsampling factor specifies how many times the original binary Maximum Length Sequence (MLS) gets upsampled to generate the PRBS.
- **PRBS** returns a Pseudo-Random Binary Sequence.

SI Generate Pseudo-Random Binary Sequence Details

The Pseudo-Random Binary Sequence (PRBS) also is known as the binary MLS. Using the **upsampling factor**, the original binary maximum length sequence is upsampled. The power spectrum of the PRBS narrows as the **upsampling factor** increases, as shown in the following figures.



SI Get Continuous Transfer Function Denominator Information VI

Owning Palette: Utilities VIs

Installed With: System Identification Toolkit

Returns the denominator from a continuous transfer function model,

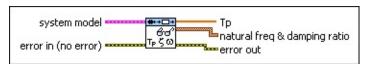
including Tp, natural frequency, and damping ratio.

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

Select an instance

■ Place on the block diagram ■ Find on the **Functions** palette

SI Get Continuous Transfer Function Denominator Information (SISO)



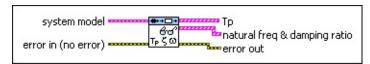
system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model contains.



- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- **Tp** returns the time constant of the continuous transfer function model.
- natural freq & damping ratio returns the natural frequency and damping ratio of the continuous transfer function models.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Continuous Transfer Function Denominator Information (MISO)



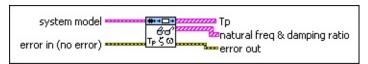
system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model contains.



- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- **Tp** returns the time constants of the continuous transfer function models.
- natural freq & damping ratio returns the natural frequencies and damping ratios of the continuous transfer function models.
 - natural freq (rad/s) returns the natural frequencies of the continuous transfer function models.
 - **damping ratio** returns the damping ratios of the continuous transfer function models.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Get Continuous Transfer Function Denominator Information (MIMO)



system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
Use the Model Management VIs to retrieve the information system model contains.



- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.

- **Tp** returns the time constants of the continuous transfer function models.
- natural freq & damping ratio returns the natural frequencies and damping ratios of the continuous transfer function models.
 - **natural freq (rad/s)** returns the natural frequencies of the continuous transfer function models.
 - **damping ratio** returns the damping ratios of the continuous transfer function models.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - **source** describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Merge Models VI

Owning Palette: Utilities VIs

Installed With: System Identification Toolkit

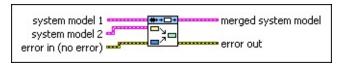
Merges multiple models of the same representation and order to one model. This VI supports only polynomial models. Wire system models to the **system model 1** and **system model 2** inputs to determine the polymorphic instance to use or <u>manually select</u> the instance.

Example

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

Select an instance	_
■ Place on the block diagram	■ Find on the Functions palette

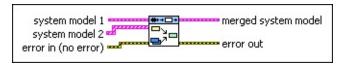
SI Merge Models (Single with Single)



- system model 1 contains information about the first model, including the model structure, nominal or estimated parameters, identification result, and so on.
- system model 2 contains information about the second model, including the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- merged system model returns information about the merged model, including the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information the merged system model contains.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

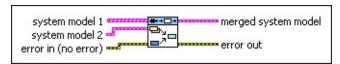
SI Merge Models (Single with Multiple)



- system model 1 contains information about the first model, including the model structure, nominal or estimated parameters, identification result, and so on.
- system model 2 specifies an array of system models. Each system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- merged system model returns information about the merged model, including the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information the merged system model contains.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

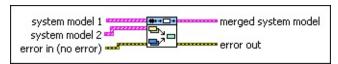
SI Merge Models (Multiple with Single)



- system model 1 is an array of system models. Each system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- system model 2 contains information about the second model, including the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- merged system model returns information about the merged model, including the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information the merged system model contains.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

SI Merge Models (Multiple with Multiple)



- system model 1 is an array of system models. Each system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- system model 2 specifies an array of system models. Each system model contains information about the model structure, nominal or estimated parameters, identification result, and so on.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- merged system model returns information about the merged model, including the model structure, nominal or estimated parameters, identification result, and so on. Use the Model Management VIs to retrieve the information the merged system model contains.

- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If **status** is TRUE, **code** is a nonzero <u>error code</u>. If **status** is FALSE, **code** is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Merge Models VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Merge Models VI.

 \blacksquare Open example \blacksquare Browse related examples

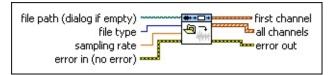
SI Read from File VI

Owning Palette: Utilities VIs

Installed With: System Identification Toolkit

Reads arrays or waveforms from a specified data file. Use this VI to read spreadsheet text files and waveforms data files.

Example



- Place on the block diagram Find on the Functions palette
- **file path (dialog if empty)** specifies the path to the file from which this VI reads data.
- file type specifies the type of the source data file. You can specify a Spreadsheet Text File or a Waveforms Data File.
- sampling rate specifies the sampling frequency in hertz. The value of sampling rate must be greater than 0. sampling rate is ignored if the file type is a waveforms data file.
- error in describes error conditions that occur before this VI or function runs. The default is no error. If an error occurred before this VI or function runs, the VI or function passes the error in value to error out. This VI or function runs normally only if no error occurred before this VI or function runs. If an error occurs while this VI or function runs, it runs normally and sets its own error status in error out. Use the Simple Error Handler or General Error Handler VIs to display the description of the error code. Use error in and error out to check errors and to specify execution order by wiring error out from one node to error in of the next node.
 - status is TRUE (X) if an error occurred before this VI or function ran or FALSE (checkmark) to indicate a warning or that no error occurred before this VI or function ran. The default is FALSE.
 - code is the error or warning code. The default is 0. If status is TRUE, code is a nonzero error code. If status is FALSE,

code is 0 or a warning code.

- source specifies the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning. The default is an empty string.
- first channel returns the data from the first waveform in the record if the file type is Waveforms Data File. If the file type is Spreadsheet Text File, this VI converts the data array to a waveform based on the sampling rate you provide.
- all channels returns the data from all waveforms in the record if the file type is Waveforms Data File. If only one waveform exists in the record, this output is identical to the first channel output. If the file type is Spreadsheet Text File, this VI converts the data array to an array of waveforms based on the sampling rate you provide.
- error out contains error information. If error in indicates that an error occurred before this VI or function ran, error out contains the same error information. Otherwise, it describes the error status that this VI or function produces. Right-click the error out front panel indicator and select Explain Error from the shortcut menu for more information about the error.
 - status is TRUE (X) if an error occurred or FALSE (checkmark) to indicate a warning or that no error occurred.
 - code is the error or warning code. If status is TRUE, code is a nonzero error code. If status is FALSE, code is 0 or a warning code.
 - source describes the origin of the error or warning and is, in most cases, the name of the VI or function that produced the error or warning.

Example

Refer to the Read Data from File VI in the labview\examples\System Identification\Getting Started\General.llb for an example of using the SI Read from File VI.

 \blacksquare Open example \blacksquare Browse related examples

System Identification Indicators

Installed With: System Identification Toolkit. This topic might not match its corresponding palette in LabVIEW depending on your operating system, licensed product(s), and target.

Use the System Identification indicators to display Bode, Nyquist, and pole-zero plots on the front panel window of a VI you create.

You also can create these indicators from the block diagram by using the SI Bode Plot VI, the SI Nyquist Plot VI, and the SI Pole-Zero Plot VI.

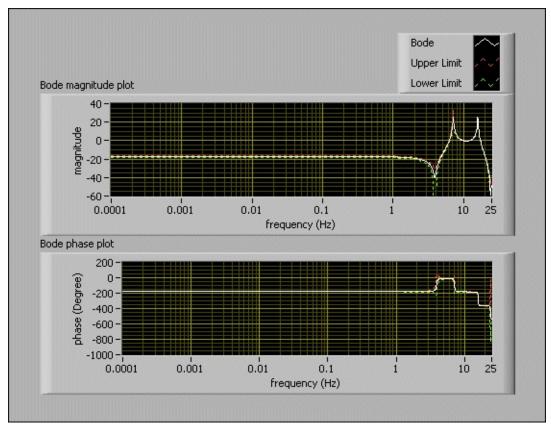
Palette Object	Description
SI Bode Plot Indicator	Displays the Bode plot generated from the <u>SI Bode</u> <u>Plot</u> VI.
SI Nyquist Plot Indicator	Displays the Nyquist plot generated from the <u>SI</u> Nyquist Plot VI.
SI Pole-Zero Plot Indicator	Displays the pole-zero plot generated from the <u>SI</u> <u>Pole-Zero Plot</u> VI.

SI Bode Plot Indicator

Owning Palette: System Identification Indicators

Installed With: System Identification Toolkit

Displays the Bode plot generated from the SI Bode Plot VI.



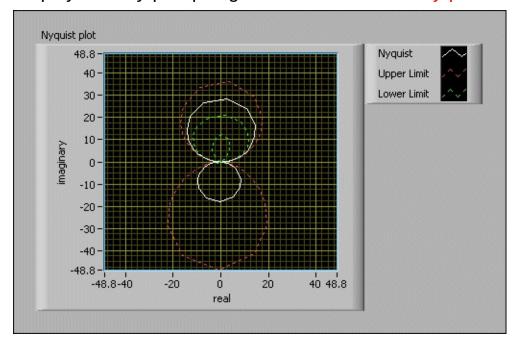
■ Place on the block diagram ■ Find on the **Functions** palette The above figure shows a Bode plot with sample data.

SI Nyquist Plot Indicator

Owning Palette: System Identification Indicators

Installed With: System Identification Toolkit

Displays the Nyquist plot generated from the SI Nyquist Plot VI.



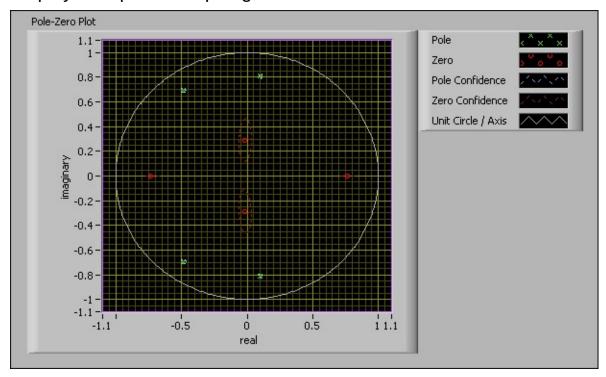
■ Place on the block diagram
 ■ Find on the Functions palette
 The above figure shows a Nyquist plot with sample data.

SI Pole-Zero Plot Indicator

Owning Palette: System Identification Indicators

Installed With: System Identification Toolkit

Displays the pole-zero plot generated from the SI Pole-Zero Plot VI.



■ Place on the block diagram ■ Find on the **Functions** palette The above figure shows a pole-zero plot with sample data.