Setting Up Scope Displays in Simulink

Lecture 74, v03

NOTE: The Simulink Scope Block Settings Properties have changed significantly in Release 2025a

This version (v03) of Lecture 74 addresses these new Scope controls

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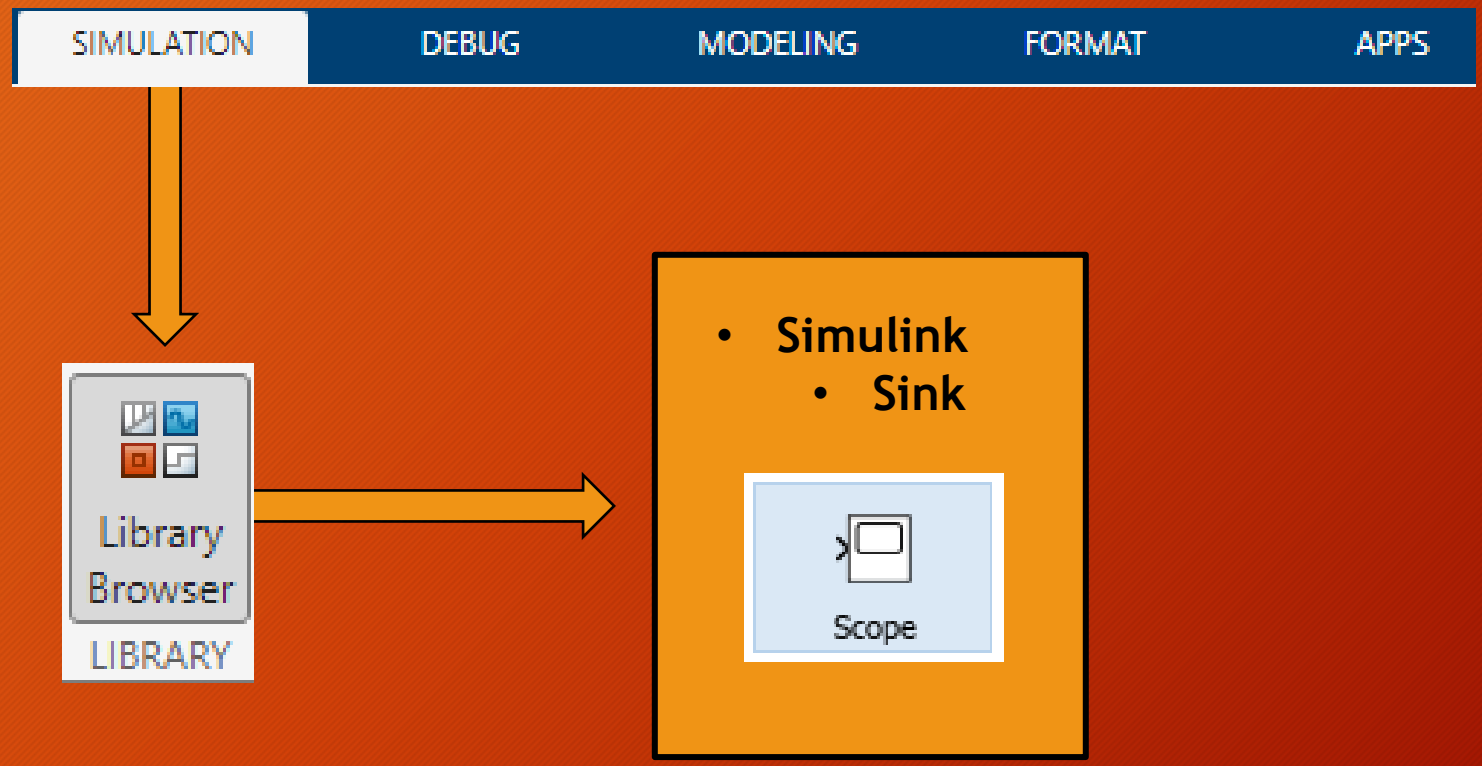
Set Up the Simulink Scope to View Multiple Signals

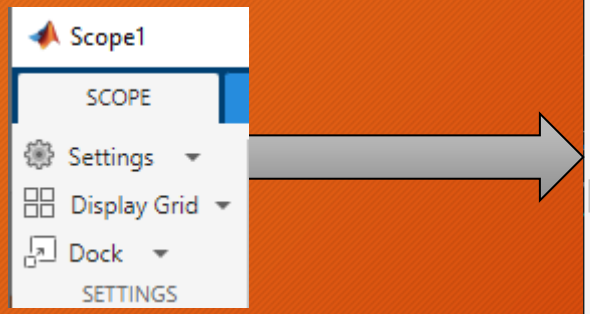
Simulink Blocks Used in this Setup

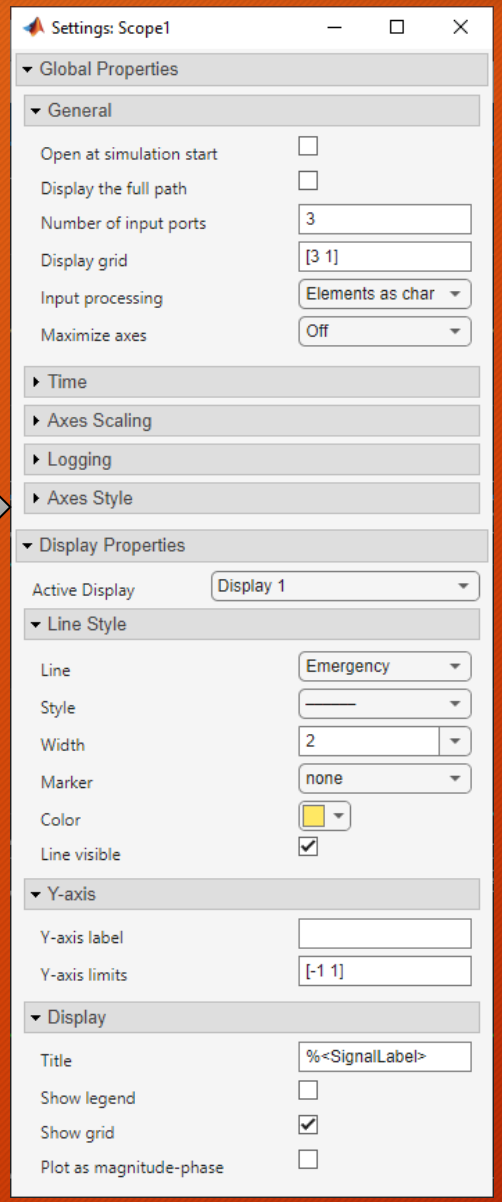
- The blocks shown here are found in the Simulink Library Browser under the sections as indicated below



Scope Display Plot Settings

Most of the Scope display setting controls are now located in one menu





- Some settings take effect immediately
- Other do not take effect until a simulation run is started

The number of input signals that the scope will accept
The organization of display plot area (vertical by horizontal)

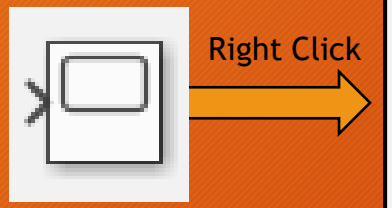
The display for which the control settings below will apply

The style of the plot line
The width of the plot line
Whether or not “markers” (small circles) are applied to data points on the plot
The color of the plot line

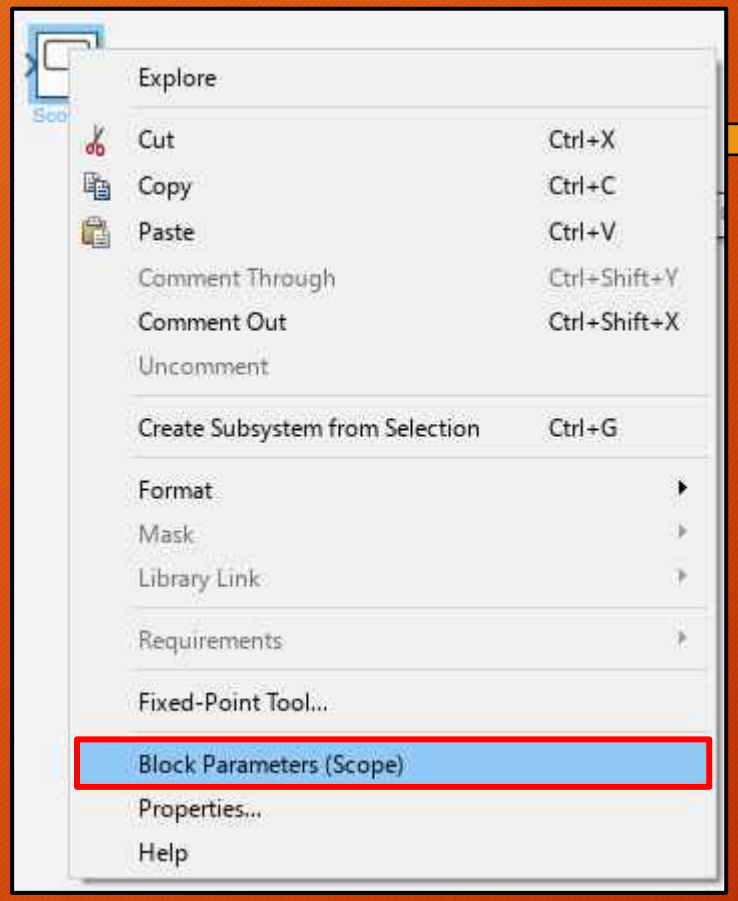
Whether the legend is shown on the plot (preference is No, unless needed)
Whether the grid is shown on the plot (preference is Yes, unless not needed)

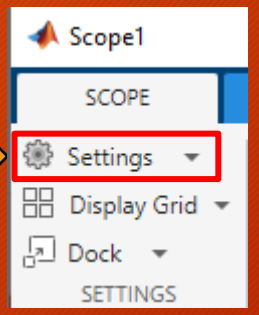
Set Up the Scope to View Multiple Signals

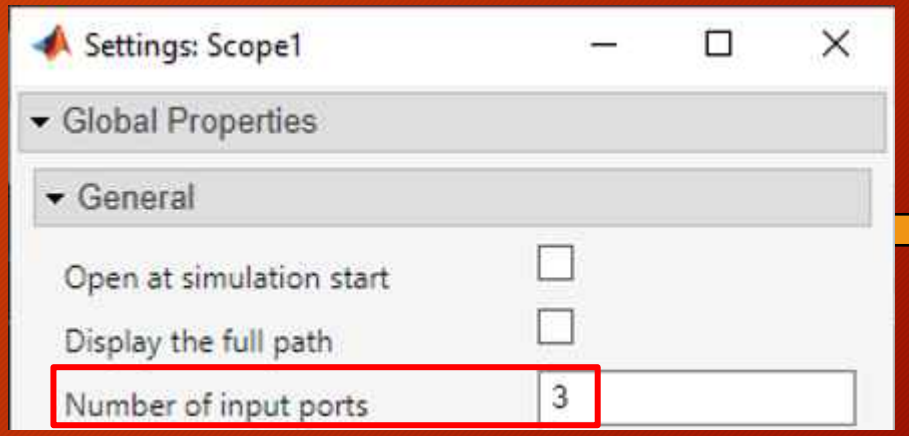
- Initially, the Scope has only one signal input
- By accessing the Block Parameters, the actual Scope opens up
- Right Click on the Scope or Go to View -> Configuration Properties... to change the number of input ports

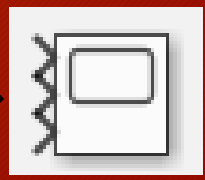


Right Click







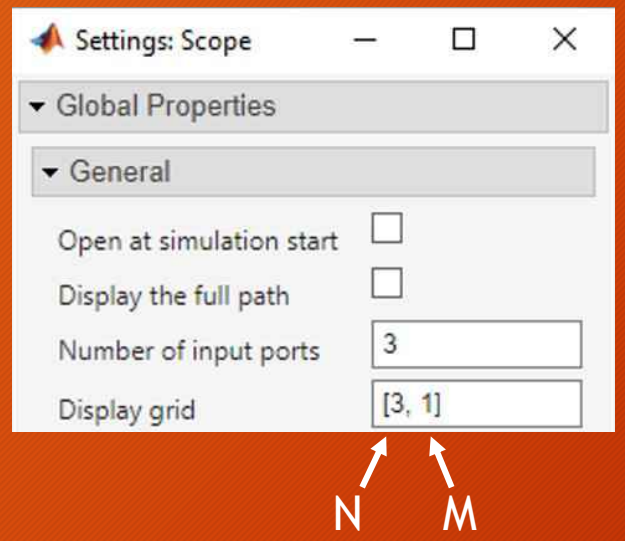


Set Up the Scope to View Multiple Signals (continued)

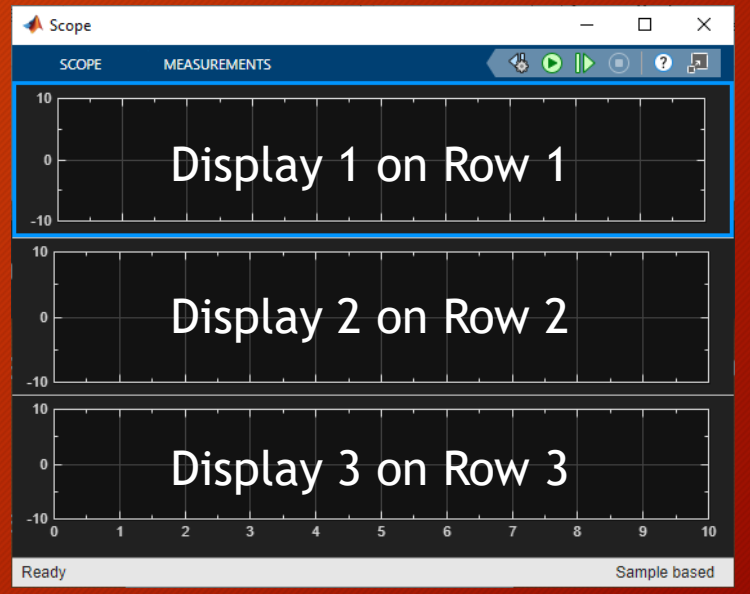
- As set up by default, the Simulink Scope overlaps signals
  - This arrangement makes it difficult to see signals overwritten by other signals
  - Which makes it difficult to clearly see relative start /stop times of multiple signals
- The solution is to break out multiple signals into their own individual traces

Setting Up Scope Grid

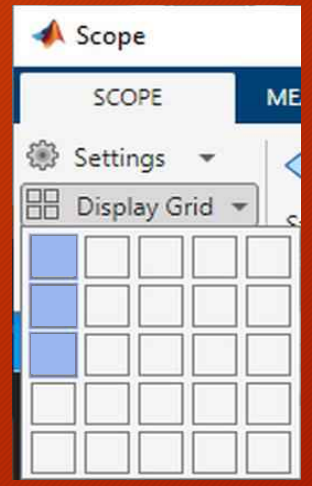
- The Scope screen can be set up to show multiple “displays” in a N (horizontal rows) x M (vertical columns) grid form
- This can be set up in one of two simple ways:
  - Use the Settings page



Resulting Scope

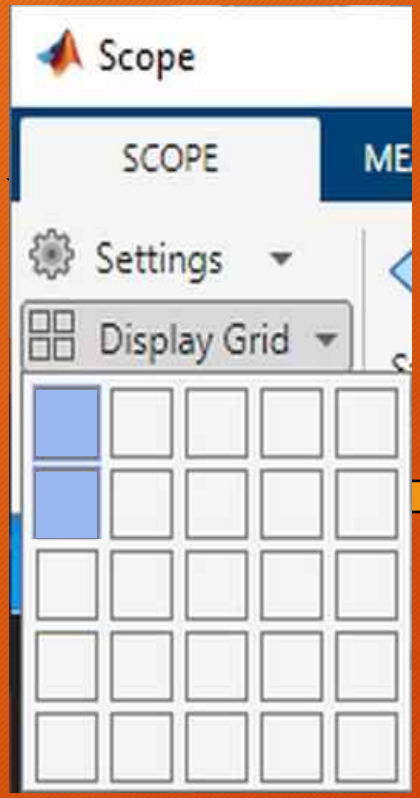


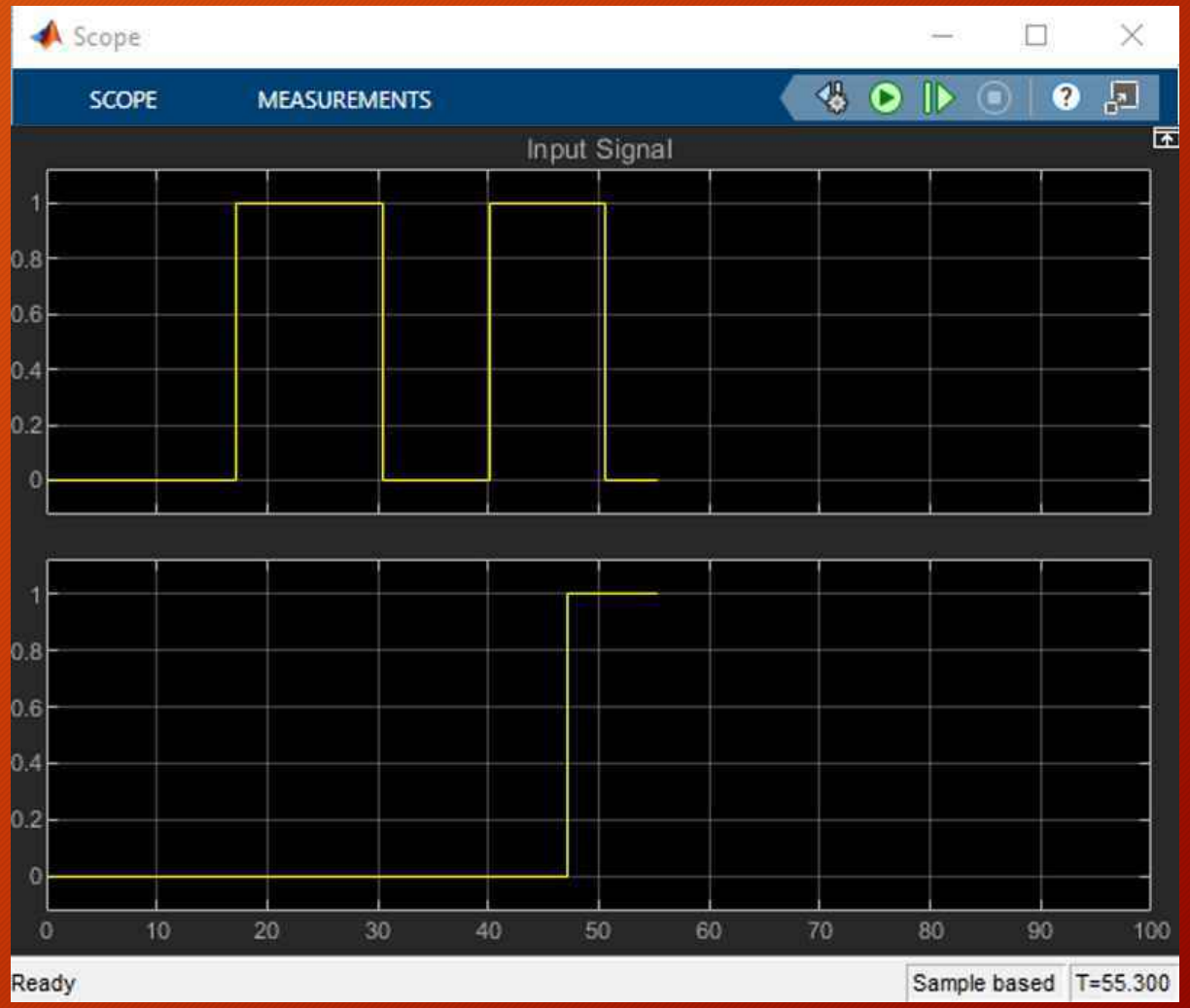
  - Use a Display Grid control in Settings
    - Mouse over the grid cells you wish to activate



Expand Number of Scope Traces

- To break out multiple signals into their individual traces

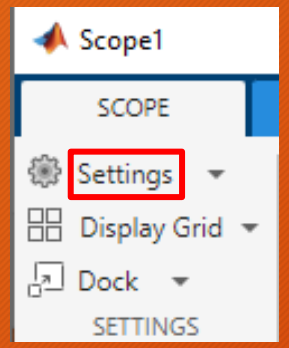




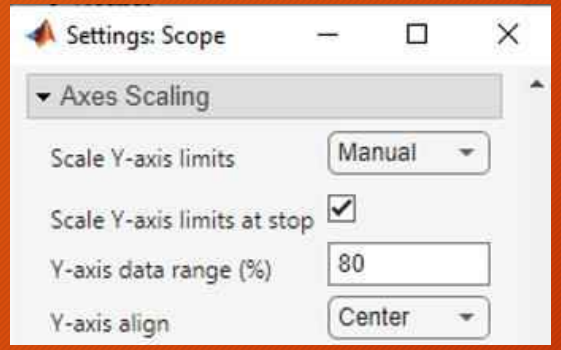
- Use the layout graphic to select the number and layout of the individual scope traces

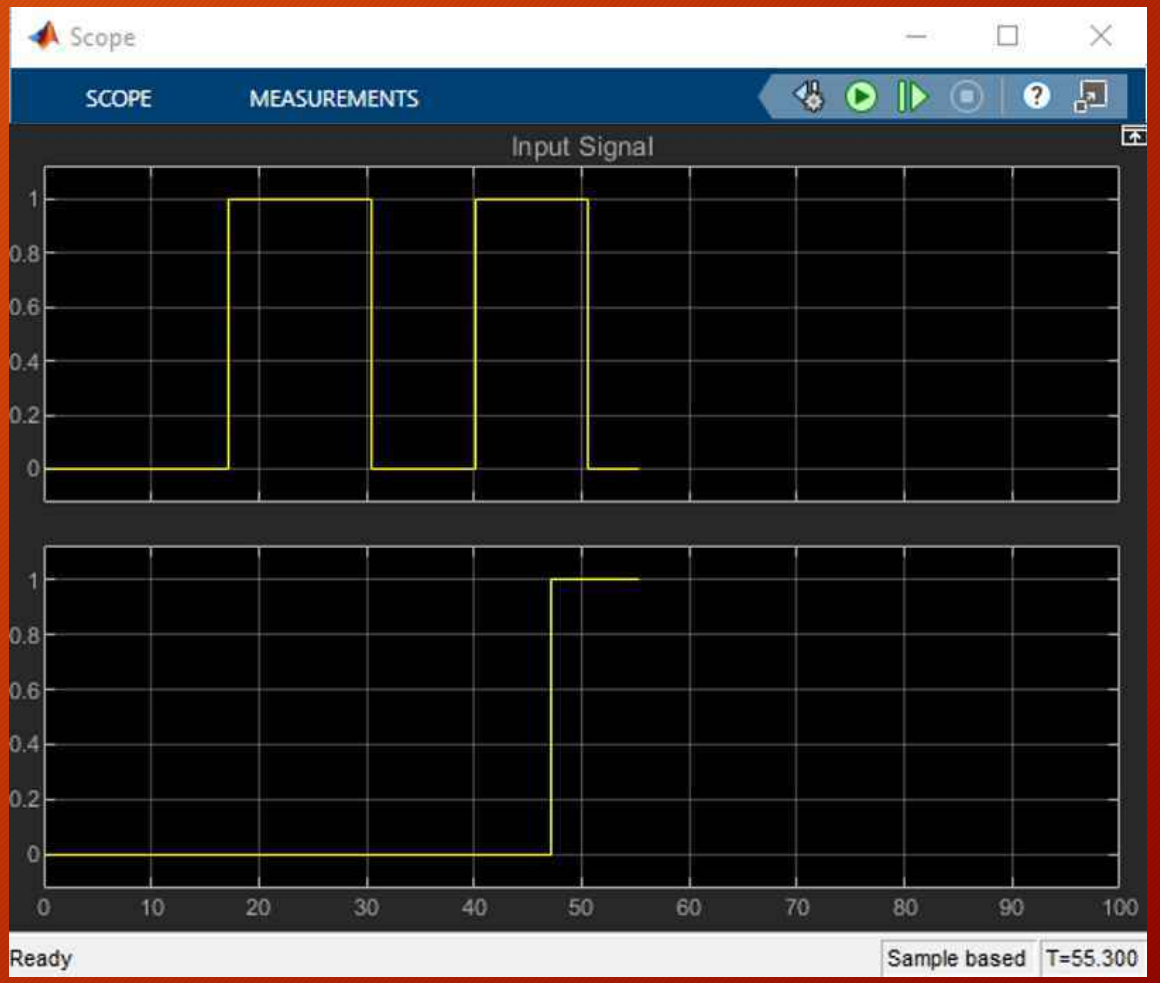
Set Up Scope Y-Axes

- Do this to better read Boolean traces, so that the extreme limits of the y-values do not overlap the upper and lower y-value limits of the scope
- To do this, go to Scope “Settings”



- Normally, the Scope is already set up to present this kind of display
  - This is controlled by the following settings:

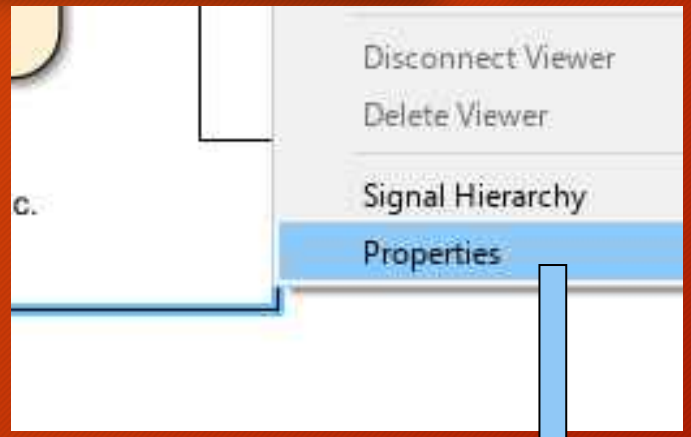


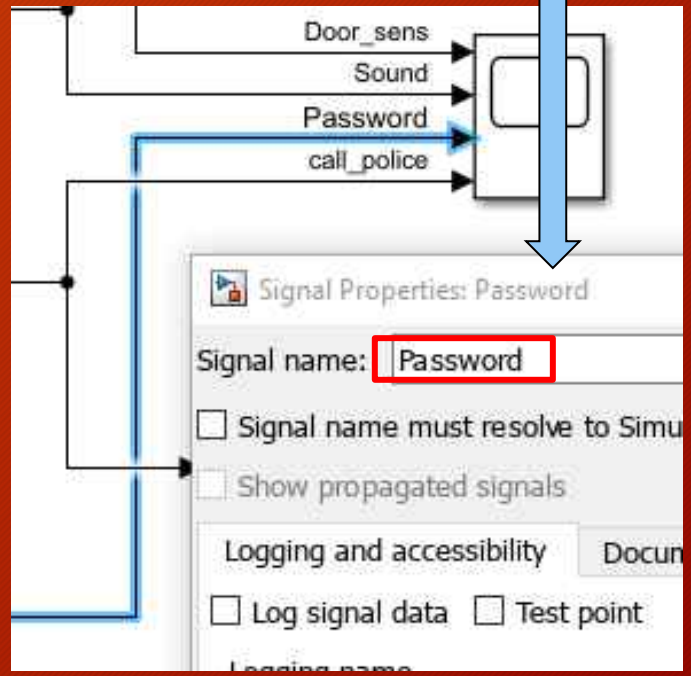


Set up Display of Signal Name at Top of Trace

- By default, the Scope is already set up to show the trace name at the top of the scope trace for each signal

The Display "Title" must say **%<SignalLabel>**



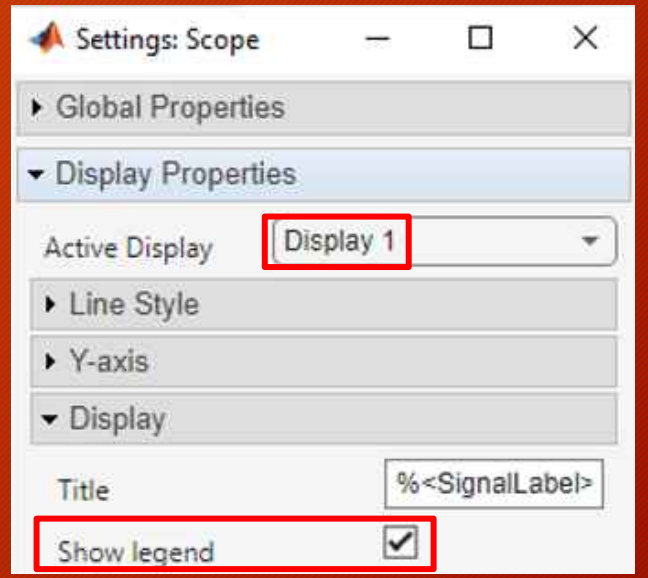


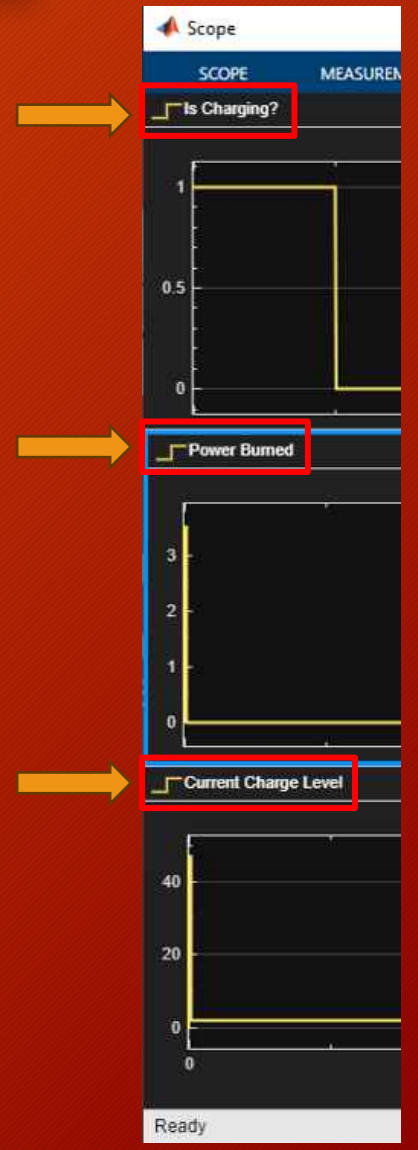
- What is required is for the signal to have a name
- Right click on the signal connector in the Simulink Editor
- The signal connector will turn blue
- Select "Properties"
- Inside the Properties dialog, enter the signal name
- The signal name will show up on the Scope above the signal trace

Add Legends to Better Read the Scope Output

- Legends are useful on the Scope if you have the scope set up to show multiple traces (signals) on one Display
- In this case, the “legend” (in upper left hand corner of each display) indicates the color of each of the traces in that display
- Legends can be enabled for all displays globally

- Or you can turn legends on/off for each display individually

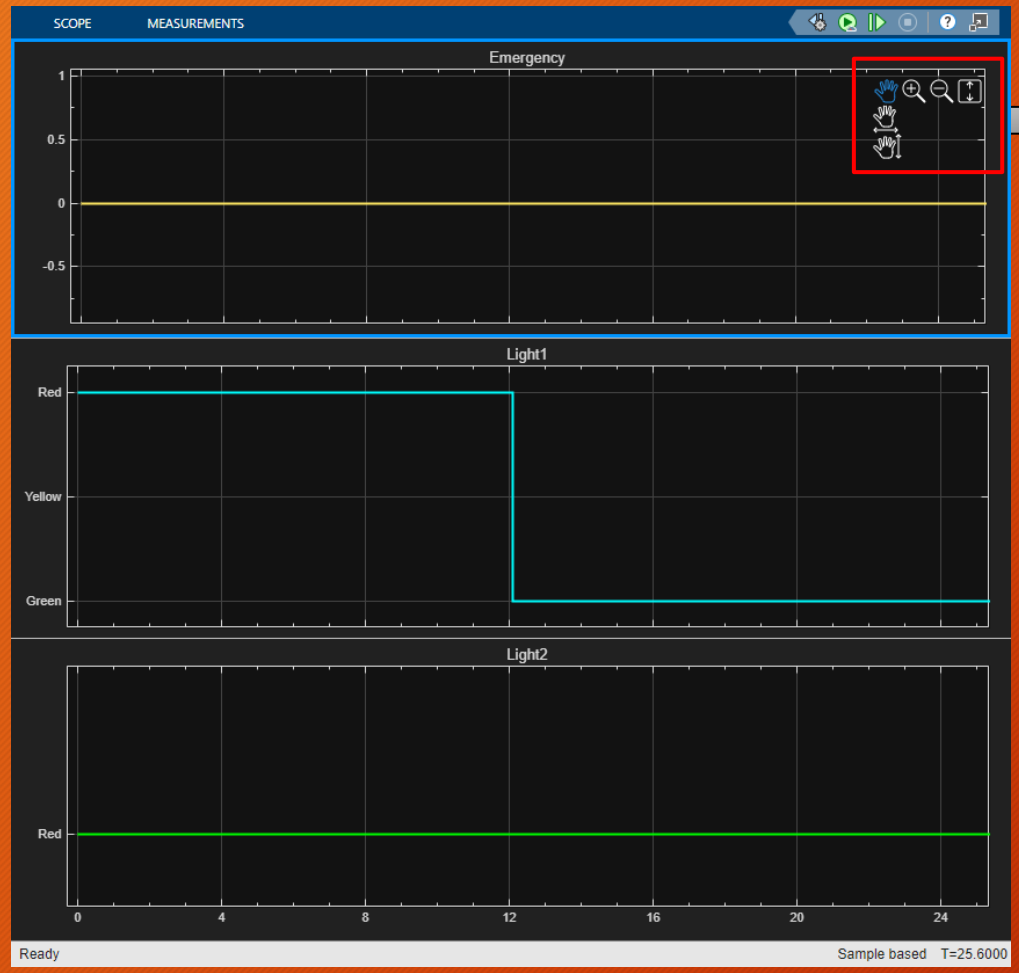




Scope Pop-Up Focus Controls

The Scope features pop-up controls that allow the user to control the focus of the scope display

- The controls appear in the upper right conner of each display space when the user hovers over that area



Blue highlight indicates that the control is active

Unfortunately, I have found that after executing a simulation run, the Scope always needs to be resized to show the entire timeline and range of values

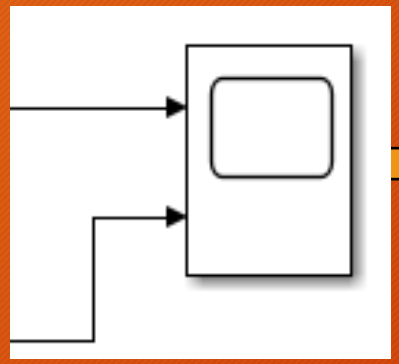
Use “Fill Focus in Two Dimensions” for this purpose

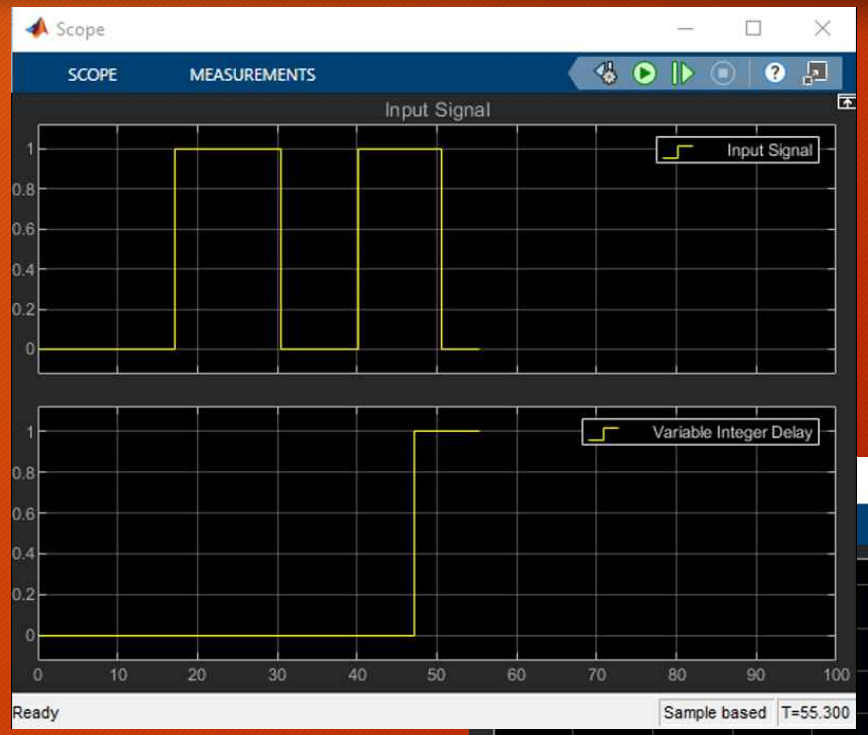
Simulink Pop-Up Scope Controls

- Translate Focus in Two Dimensions
- Translate Focus Horizontally
- Translate Focus Vertically
- Expand Focus in Two Dimensions
- Expand Focus in Horizontally
- Expand Focus Vertically
- Contract Focus in Two Dimensions
- Contract Focus Horizontally
- Contract Focus Vertically
- Fill Focus in Two Dimensions
- Fill Focus Horizontally
- Fill Focus in Two Dimensions

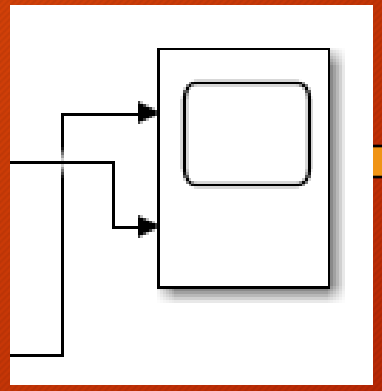
The Order of Scope Inputs is Reflected in Traces

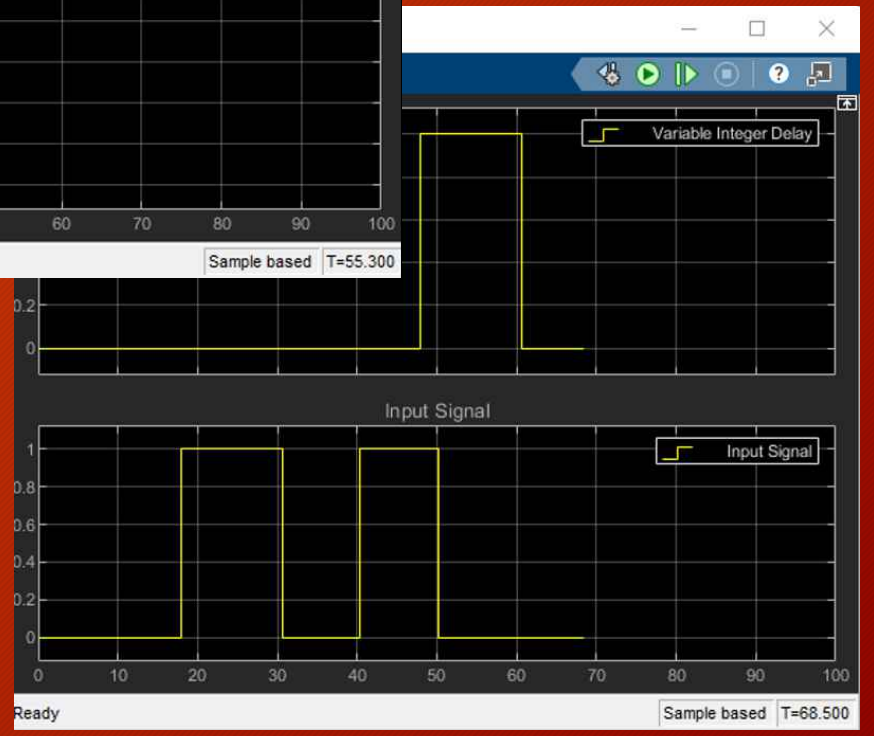
- Recommended order:
  - Inputs on top
  - Outputs below





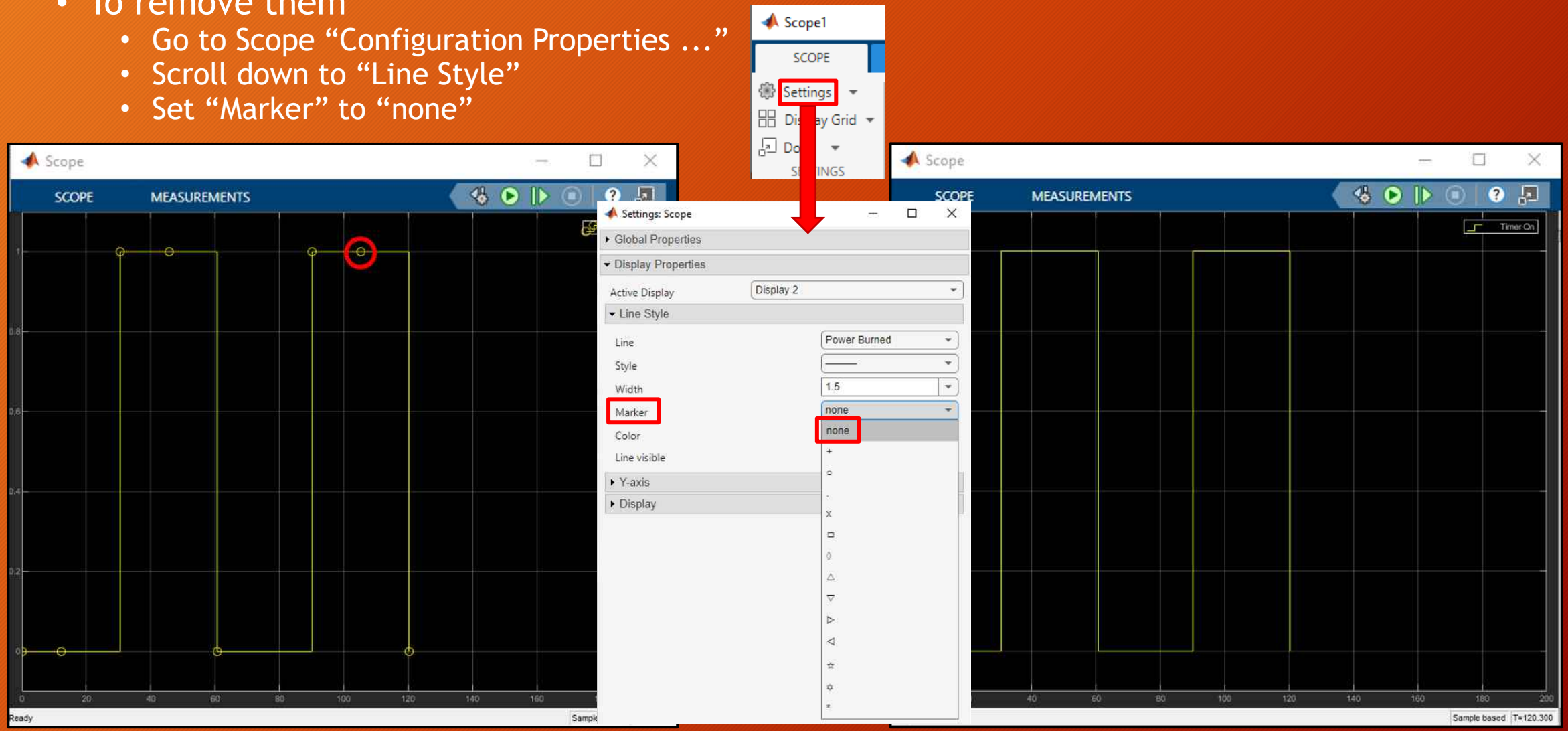
- Reversing order of inputs changes order of scope traces





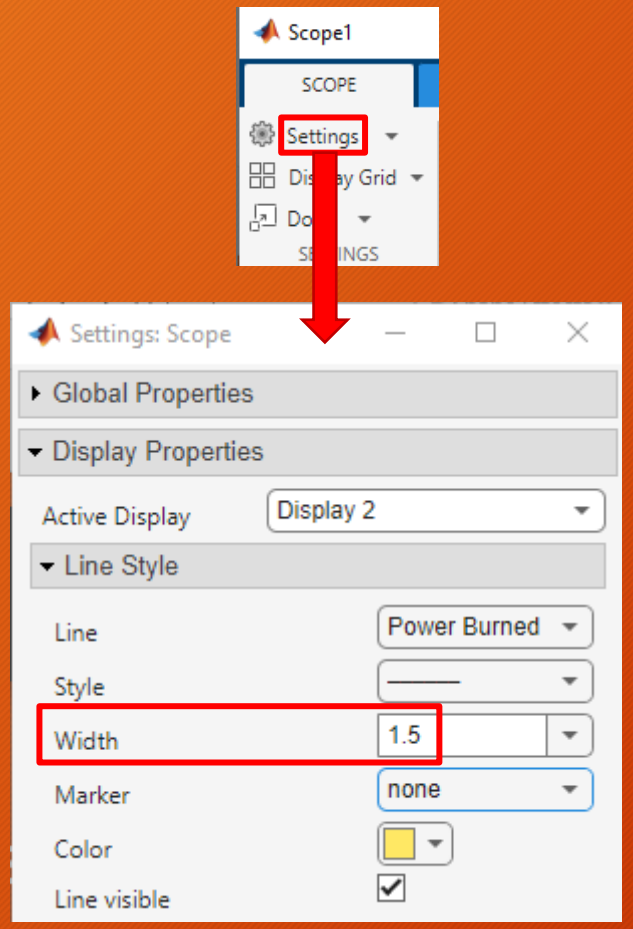
Remove Markers on Scope Display

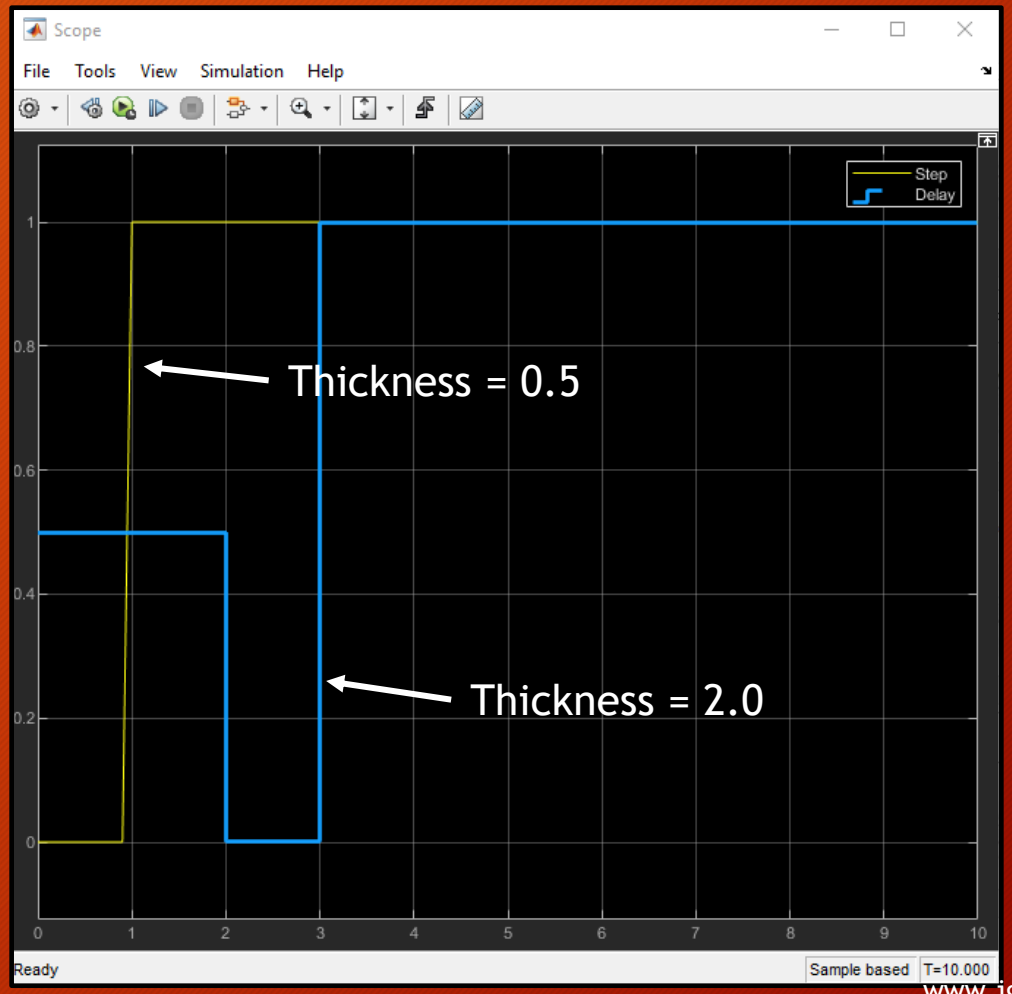
- Markers can be used to indicate individual data points in a plot
- To remove them
  - Go to Scope “Configuration Properties ...”
  - Scroll down to “Line Style”
  - Set “Marker” to “none”



Adjust Trace Width as Needed

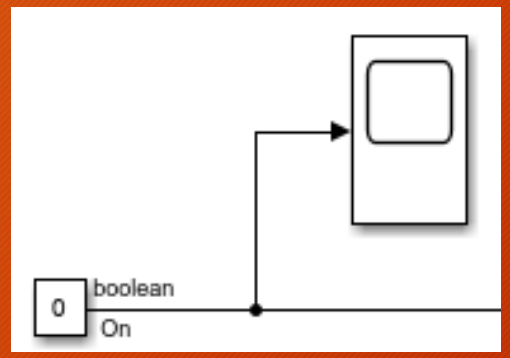
- If a copy of the Scope will be reduced in size for use in documentation, it is often beneficial to widen the trace lines for easier viewing

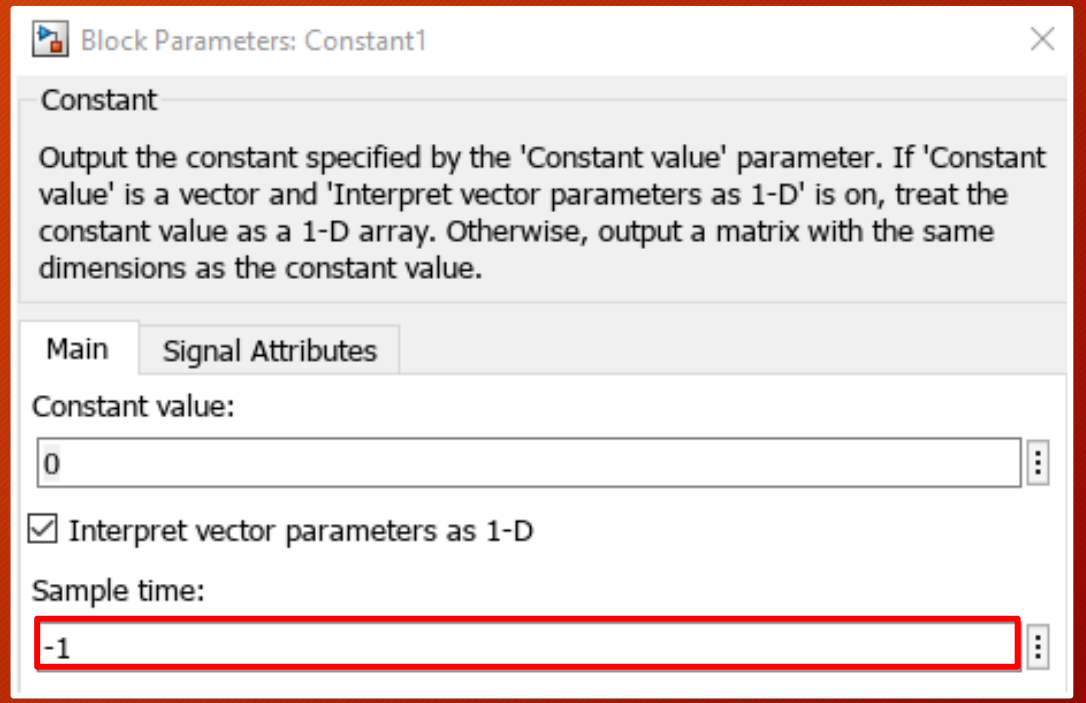




Scope Taking Input from Constant Block

- If your scope is taking input from a Constant Block, as shown here, be sure to make the indicated adjustment to the Constant Block to prevent the Scope from displaying strange behavior

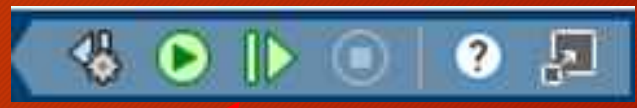


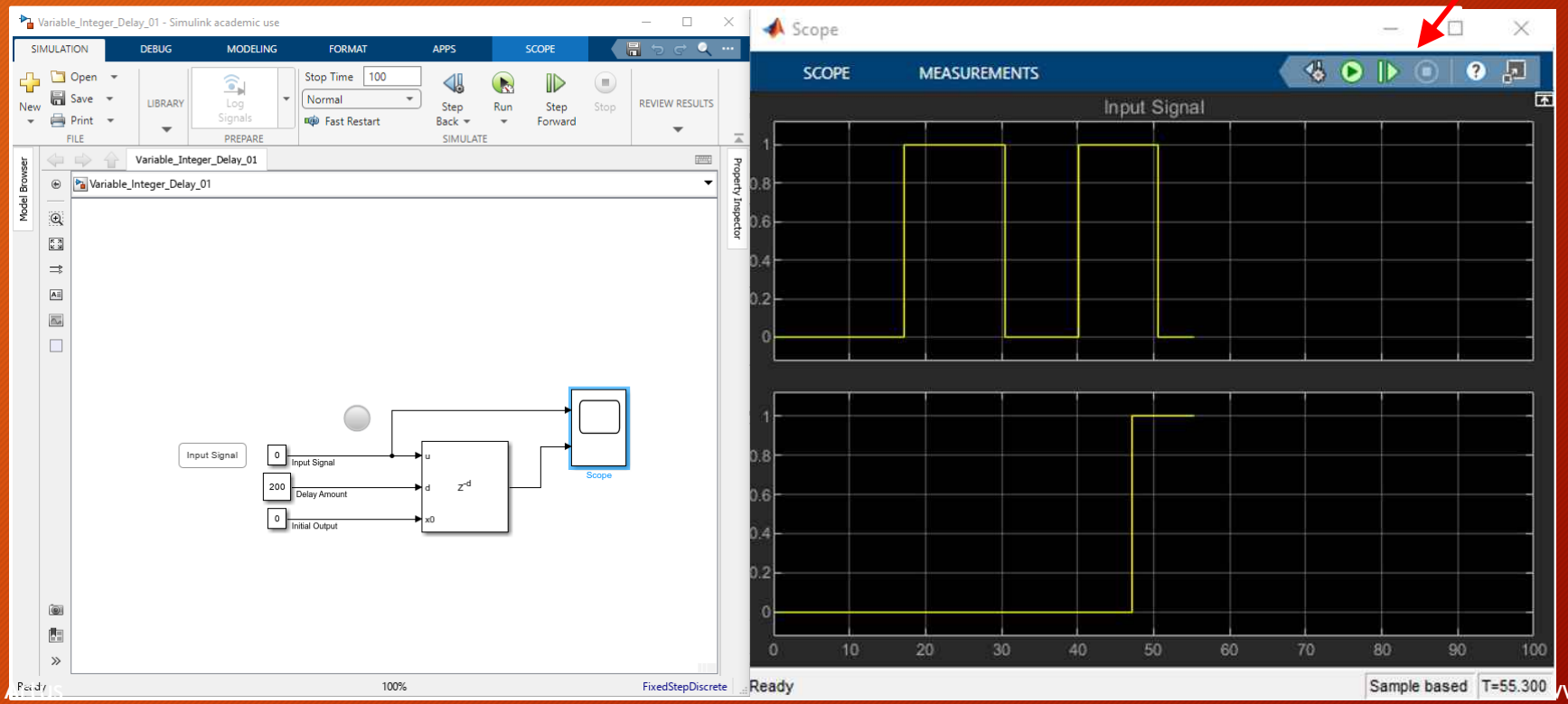


Change Sample time from “inf” to “-1”

Use Scope Controls to Run the Simulation

- The Scope has controls that allow you to run the simulation
  - Before executing the simulation, double click on the Scope icon
  - The Scope will pop up
  - Position the scope so you can see both the Dashboard Controls and the Scope
  - Control the execution with the Scope controls (if that work for you)
  - Use Dashboard controls to control the simulation dynamically





References

References

1. The MathWorks' User Guide for Simulink
   https://www.mathworks.com/help/pdf_doc/simulink/simulink_ug.pdf