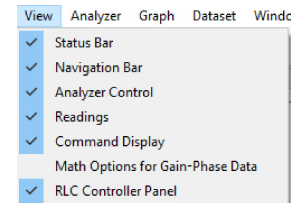


## Calculation of the Predicted Overall Feedback Loop Transfer Function

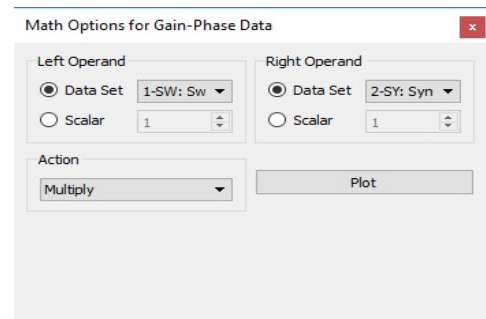
Before you install the various resistors and capacitors of the compensation network in the circuit, you would probably like to know what the overall feedback loop transfer function will look like. After all, you may want to do some tweaking before you solder everything in. Predicting the loop gain is easy. Here are the steps:

1. Display both the modulator transfer function and the amplifier transfer function on a gain-phase graph. If you followed the steps in the previous sections, they are already displayed. Note the data set number of each of the two data sets (the modulator gain and phase curves are a data set and the amplifier gain and phase curves are another data set).

2. If it isn't already open, select the Math Options for Gain-Phase Data in the View program menu. In the "Math Options for Gain-Phase Data" window, set the left operand to the number corresponding to one data set and the right operand to the number corresponding to the other data set. This will usually be 1 and 2 if only two data sets are displayed. Select the "Multiply" action, and then click the button called "Plot".

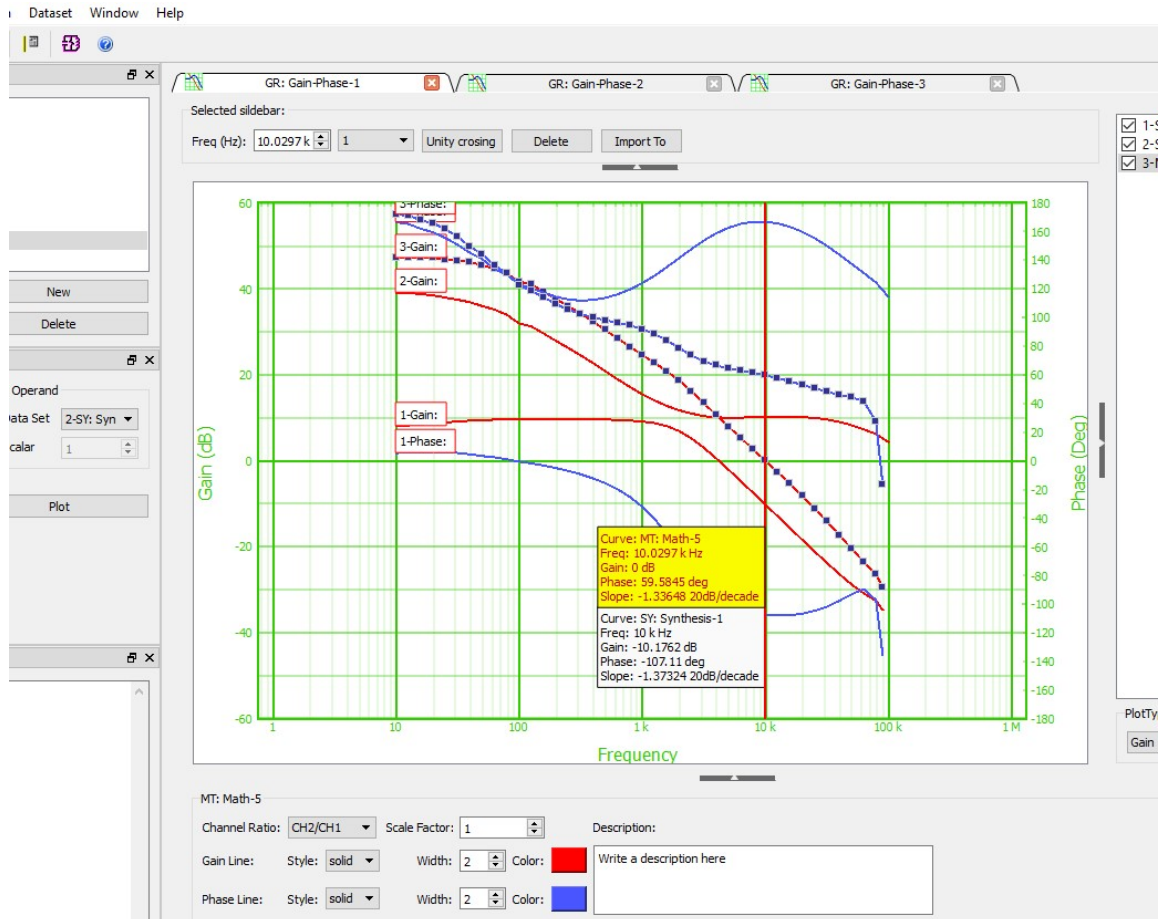


3. When you click the "Plot" button, the loop transfer function will appear on the graph as an additional data set. It will be "selected" and you will be able to see the individual data points. The loop gain should cross the 0 dB line at approximately the frequency you chose as the desired loop frequency and the phase margin should be approximately the phase margin you asked for. The differences between actual and desired values are caused by rounding off the component values and by the limitations of the op-amp selected. If you don't round off the component values and you do set the gain and bandwidth of the op-amp at high values, the actual and desired values will be identical. In real life, however, you have to use available components and real op-amps and the predicted results will be very close to the actual measurements.



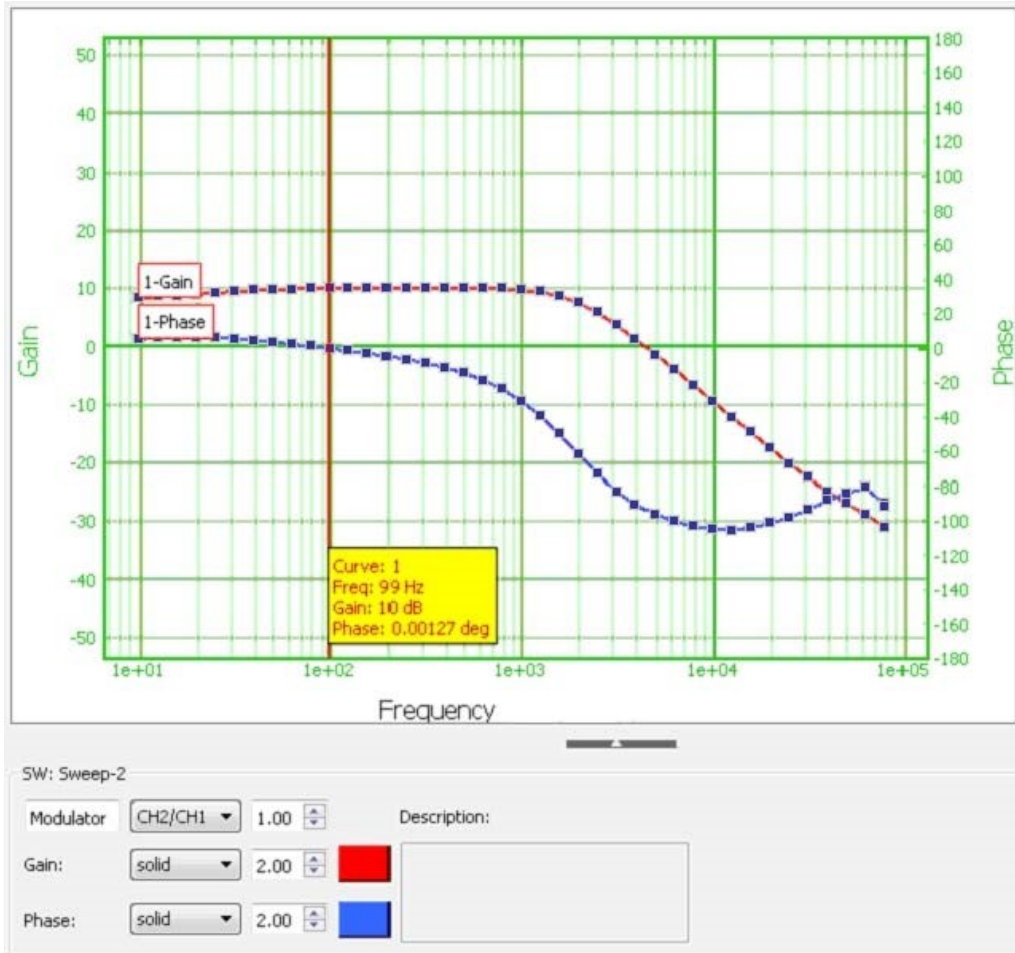
4. If you want to document the results, select (click on) only the final gain and phase plots and add slide bars by clicking on the slide bar icon (the one with the yellow vertical line). Slide bars are keyed to data sets so the slide bar icon is available only when one data set is selected. You can have as many slide bars as you want, but two is usually a nice number. You can put one slide bar on gain crossover and the other on phase crossover. That will give you numerical readouts of the loop bandwidth, phase margin, zero phase bandwidth, and gain margin. As a final

touch, you can add a text box by clicking on the text box icon (with the “A” on it). A brief description of the source of the data and the time and date it was created are entered automatically in the box. You can edit or add to this information to document the model and serial number, test conditions, values of the various components, or anything else you think will be of value when you or someone else looks at the plot.



## Display Documentation Features

This section details the documentation feature that can be added to the graph displays. The Slide Bar and its associated window are useful for tracking and displaying data values at a specific frequency.



The screen shot above shows the display documentation features for Venable System version 6 software plots.