

ECE 331: Logic Analyzer Tutorial

Summary

The logic analyzer is a very useful tool in digital hardware design. It displays a circuit's logic status on the screen and enables observation of each selected each signal as it changes over time. This tutorial will show you how to use the PC-based *NCI GoLogic* logic analyzer to monitor the signals in a simple counter (sequencer) application.

Learning Objectives

1. How to connect the GoLogic logic analyzer with the protoboard.
2. How to monitor the signals using triggering mode.

Resources

1. NCI GoLogic Logic Analyzer User Manual.
2. NCI GoLogic PC-based Logic Analyzer.

Procedure

Connect the logic analyzer to the protoboard

1. The NCI Logic Analyzer has female connectors as shown in Figure 1. A 5-pin pinstrip male connector is needed to connect the output of the counter to the logic analyzer.



Figure 2. Female connectors of Logic Analyzer

2. Connect A0, A1, A2 and A4 pins of group A from the logic analyzer to the four output pins of your circuit.
3. Provide a common the ground between the logic analyzer and your circuit by connecting the ground pin of group A of the logic analyzer to the ground pin of your circuit.
4. Turn on the logic analyzer's power supply. Plug the logic analyzer into the top USB port on your lab computer.

Setting up the Logic Analyzer

5. On your PC, open the logic analyzer's software: GoLogic

6. Select **Edit -> Setup** to complete the 3 logic analyzer setup steps. The setup menu will pop up.
7. Set up the sampling scheme by clicking **“Step 1: Sampling”** tab. GoLogic supports several sampling schemes from the simplest normal timing analysis to complicated combinational triggering modes. In this application just select the following as shown in Figure 2:
 - Sampling method → *“Normal timing analysis”*
 - Memory depth → *“1,048,576 samples”*
 - Frequencies → *“1 kHz”*

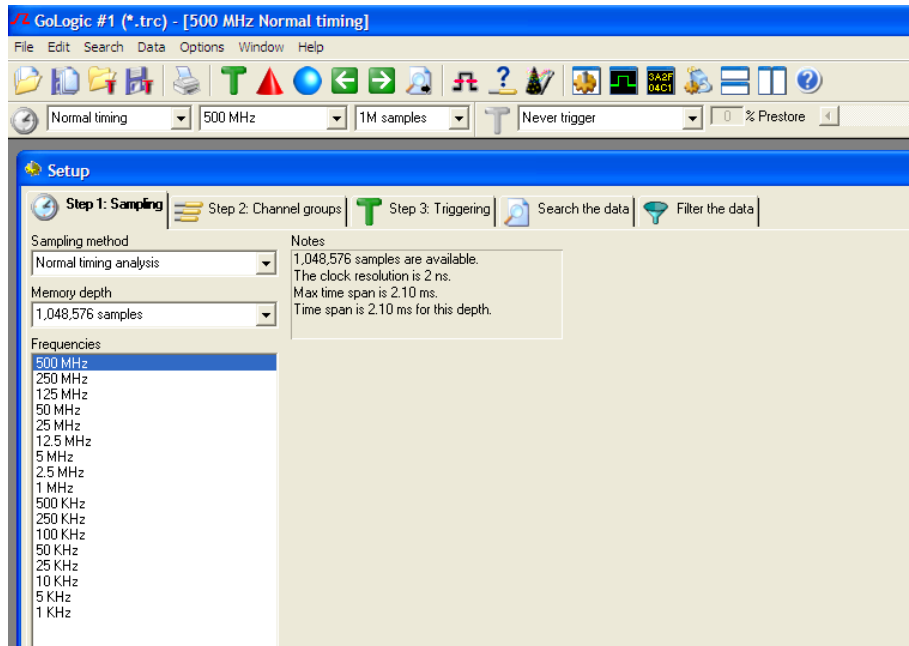


Figure 2. Step 1 of setup: sampling scheme.

8. Set up the channel groups by clicking the **“Step 2: Channel groups”** tab and selecting the signals that will be displayed. Click the bits: 0, 1, 2, 3 on *“Pod A”* and set them as group 1.
9. Set up the triggering method by clicking the **“Step 3: triggering”** tab. Choose *“Never triggered”* option from the pull-down menu (Figure 3). This means that the sampling process will continuously take place without any triggering mechanisms. For more triggering options, refer to the [GoLogic](#) user manual.

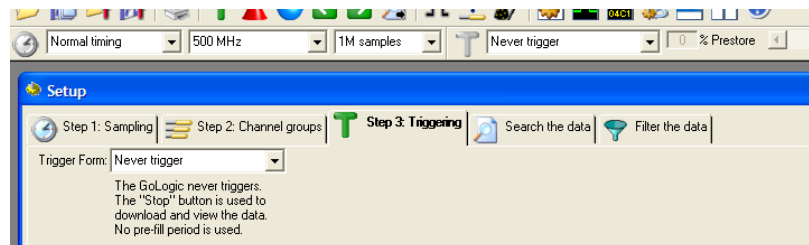


Figure 3. Step 3 of setup: triggering.

This completes the basic setup for the logic analyzer. Now we can start sampling the signals on the protoboard when the 4-bit counter/sequencer operates.

Setting up the Logic Analyzer

10. Open the GoLogic's waveform window by clicking the **“waveform”** button shown in Figure 4. Click the **“Go”** button. The logic analyzer will start sampling the signals immediately since no triggering schemes have been applied. To view the sampled waveform, click the **“Stop”** button; the sampling process will be halted and the data will be transferred to PC via the USB interface. You will see the waveform displayed on the waveform window after zooming-in an appropriate amount.
11. Observe each bit from group 1 and observe how each bit changes over time. Verify that it matches the expected sequence.

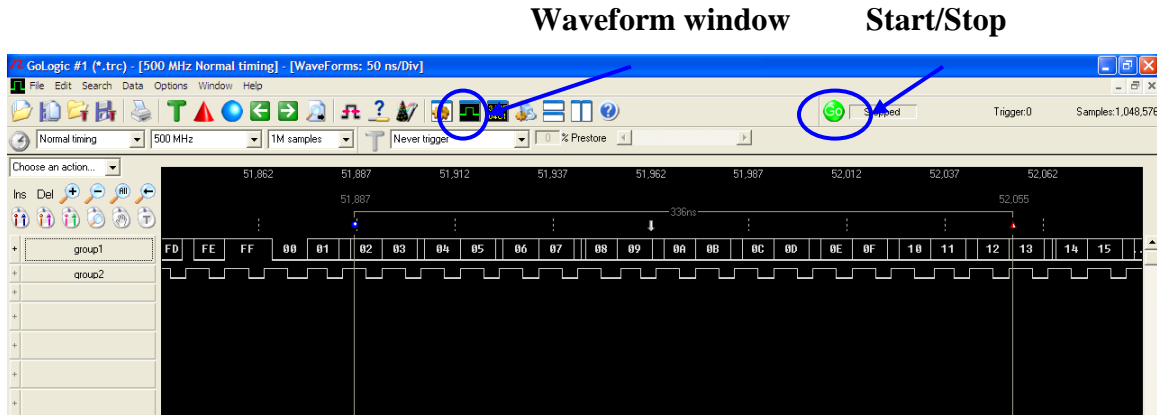


Figure 4. Sampled data of 4-bit counter design.