MŰEGYETEM 1782

Measurement Automation Lab Report

Subject: Microcontroller Laboratory Exercise

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Preliminary Task:

The first task is to identify the serial cable. The serial cable has 9 pins on both ends. One side should be connected to the conventional pc and the other end should be connected to a low pass filter channel model.

First Task: Construction of eye-diagram

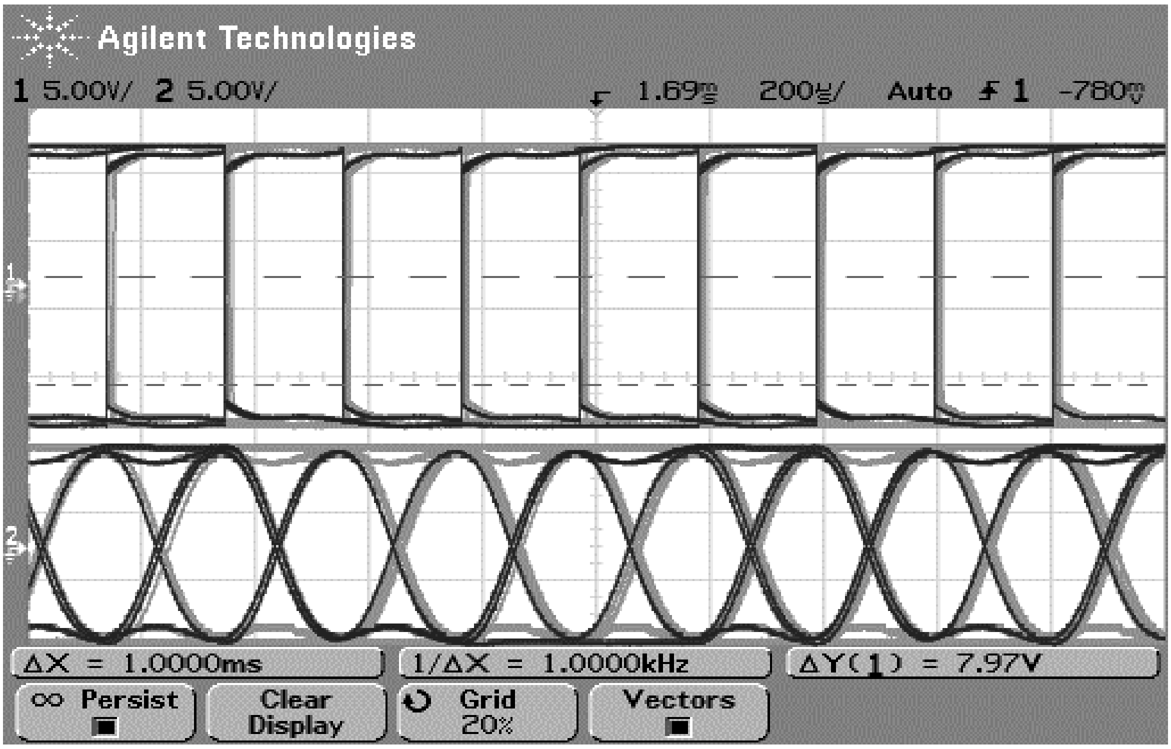
Further through the task, we will try to create an eye diagram and show it in the oscilloscope.

After passing through the low pass filter, our original signal will be attenuated. We can not maintain high data rate when the bandwidth is narrow. If we need larger data rate, we need larger bandwidth.

After we pass the square wave through the low pass filter ,we will see a eye diagram in the oscilloscope. Originally the eye diagram of a square wave is generally very sharp, but when the wave is passed through the low pass filter, the signals eye diagram will be smooth around the edges due to rejection of high frequencies due to application of the low pass filter.

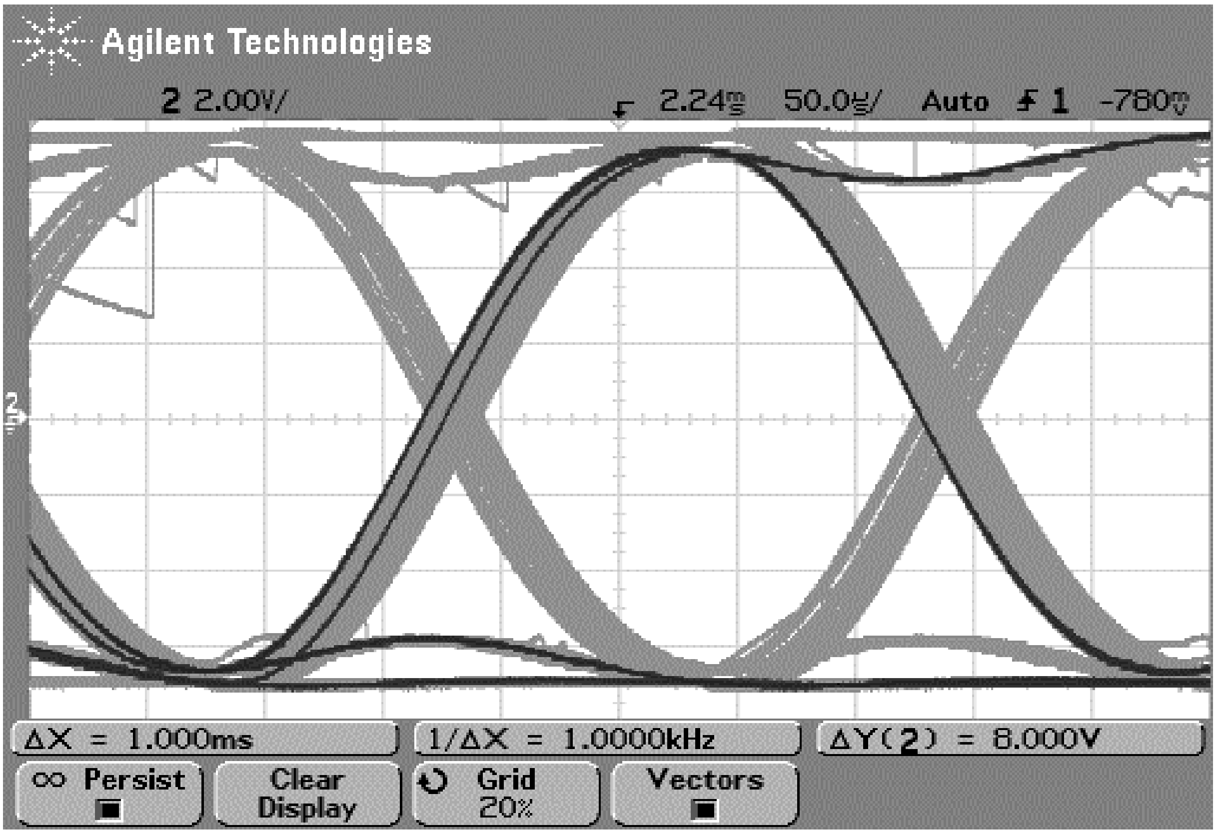
Sampling interval should be taken from the middle of the openness of the eye diagram.

To get the output from the low pass filter, we will connect the PC_TXD and SGND and connect it as the input and connect it to the oscilloscope as well. And from the output, we will connect it to the second channel of the oscilloscope.

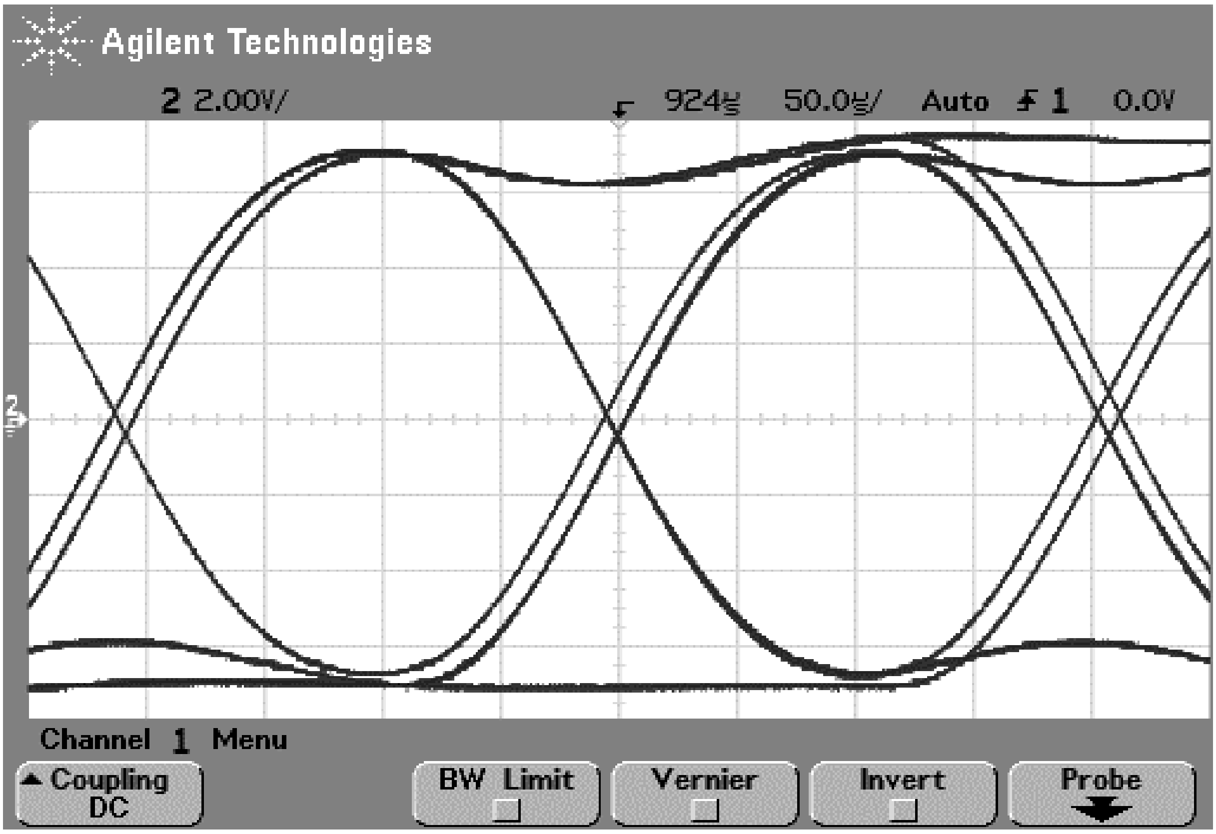


If we want to analyze effect of infinite persistent, we can see that this option int he oscilloscope shows also the previous values of the eye diagram.

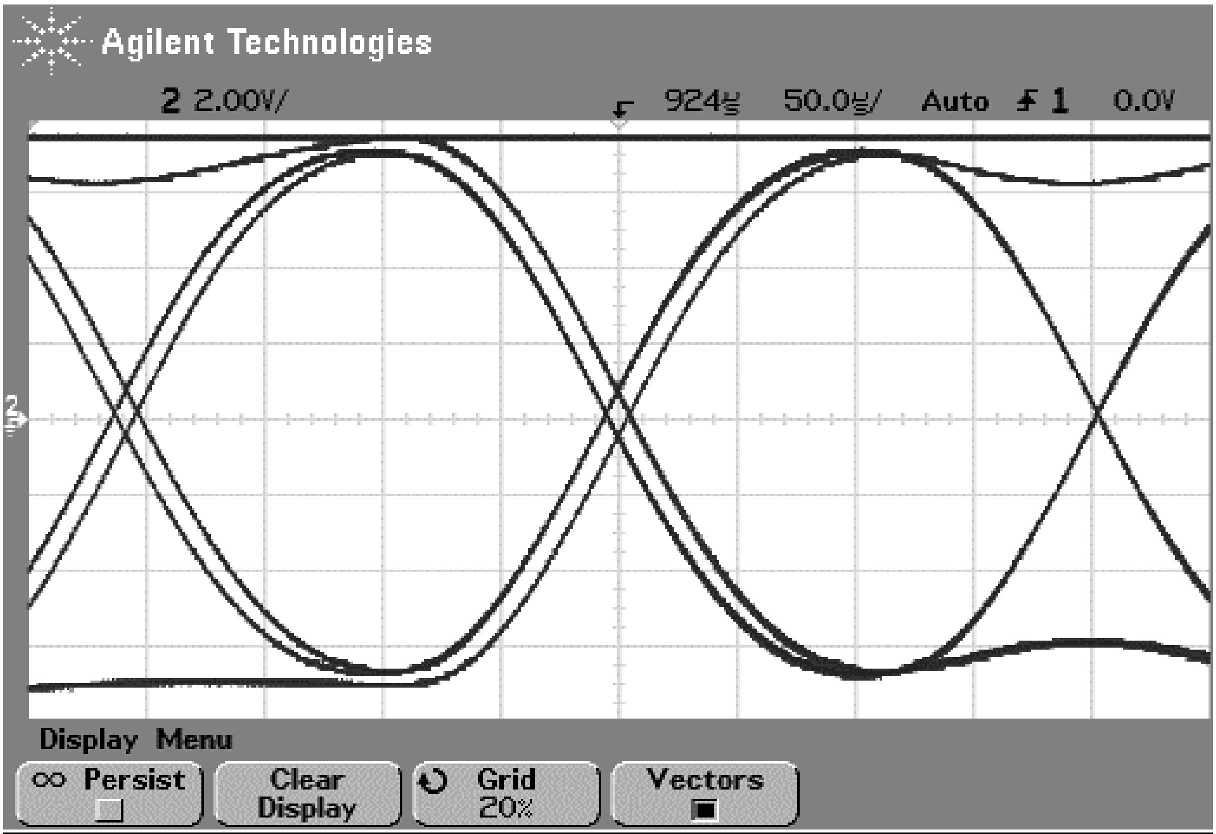
With INFINITE PERSISTANCE:



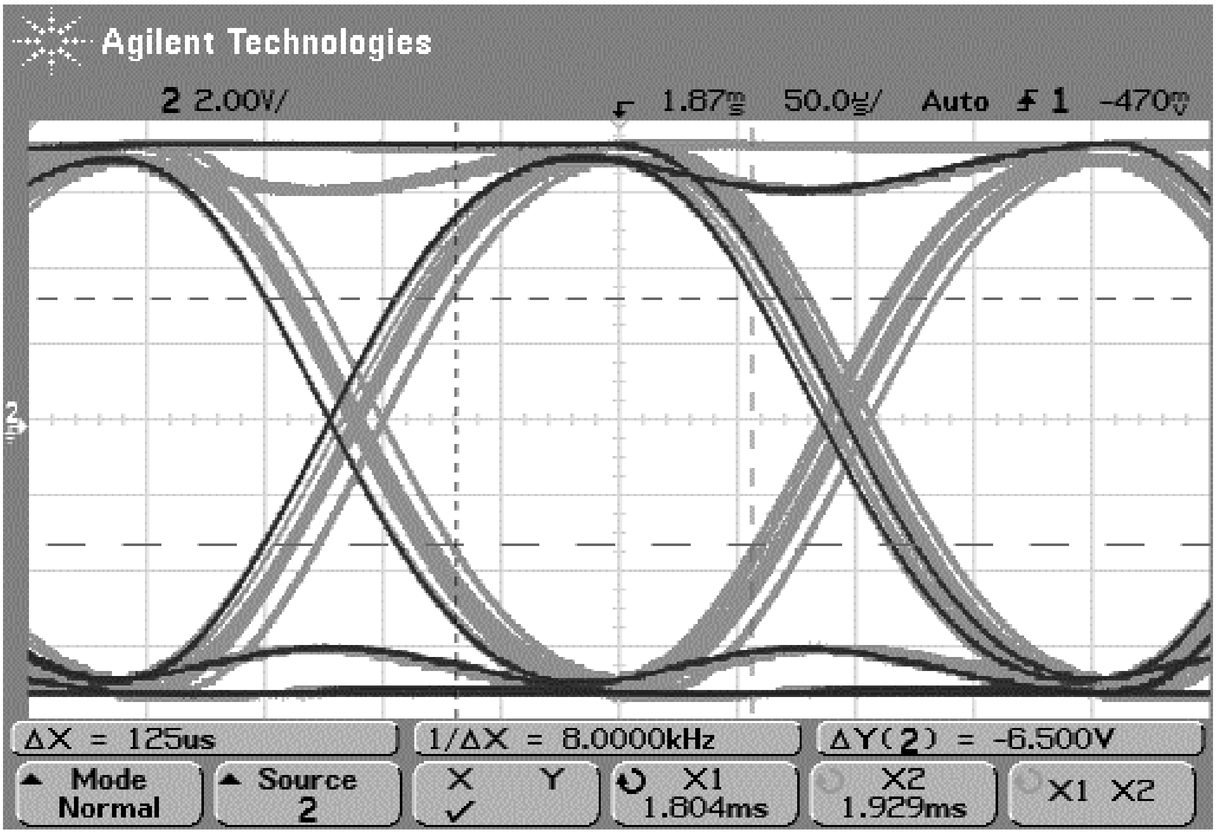
With INFINITE PERSISTANCE:



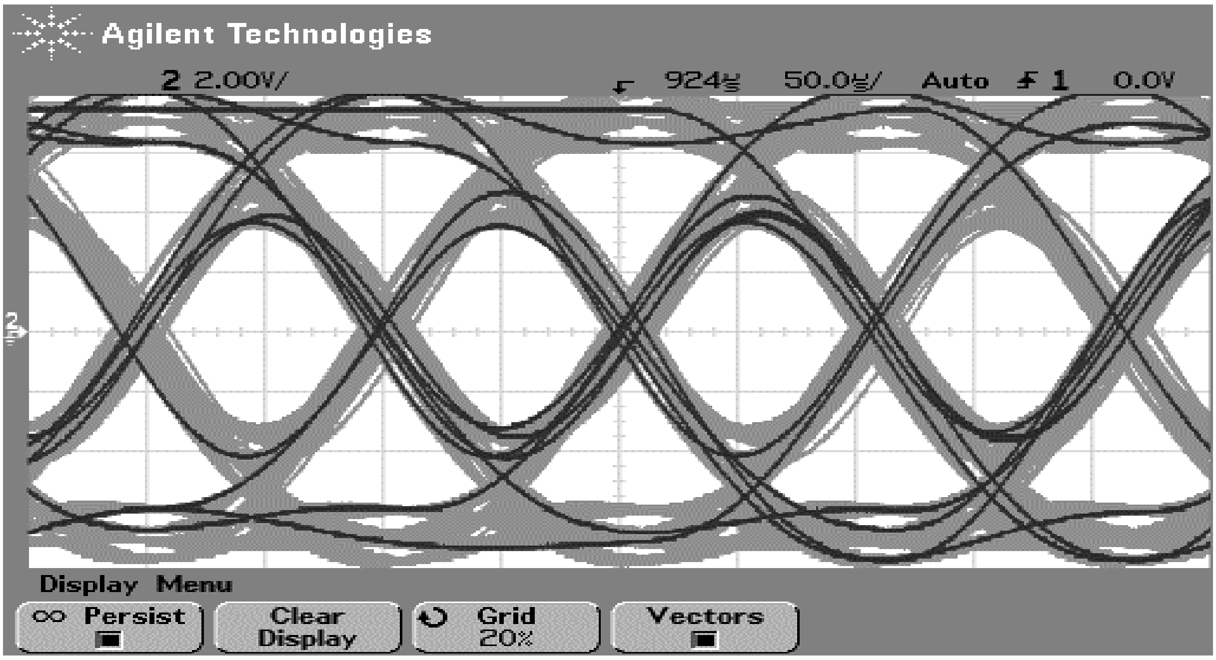
Baud rate 4800:



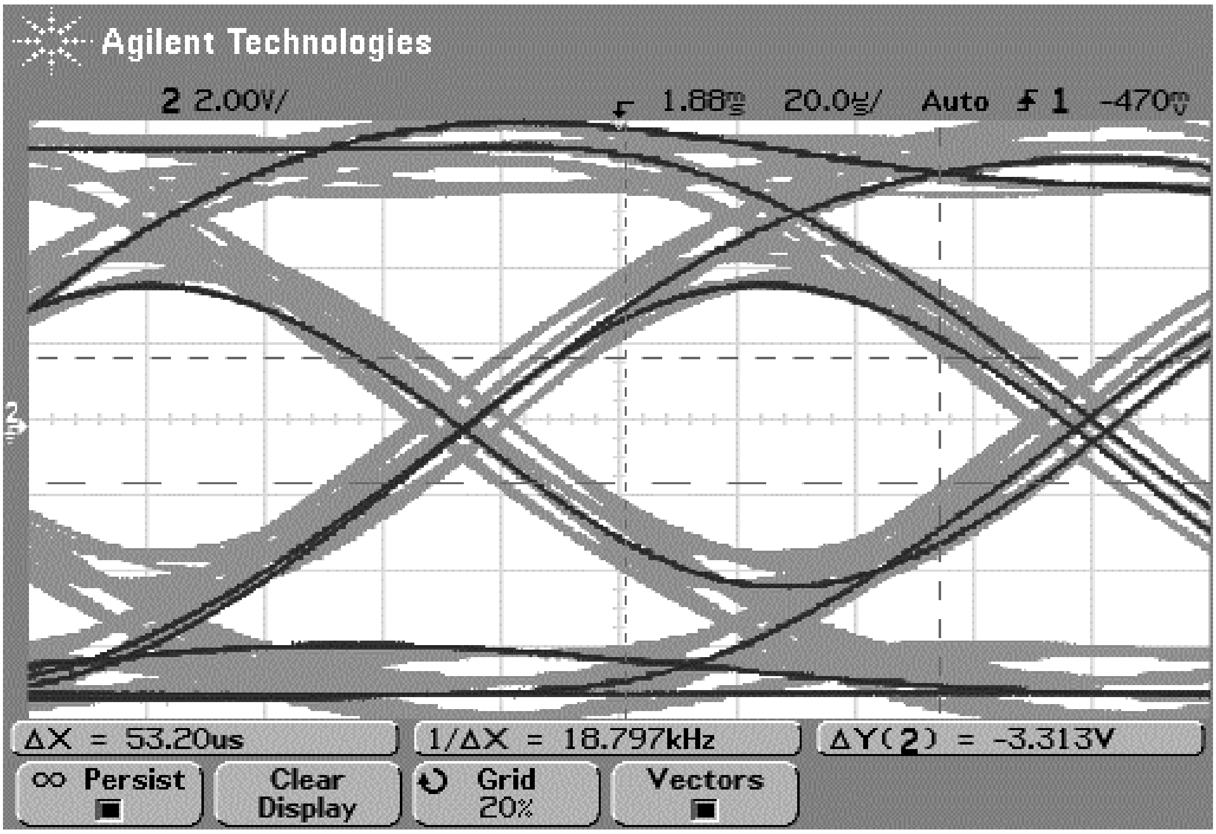
Baud rate 4800: with openness on cursors



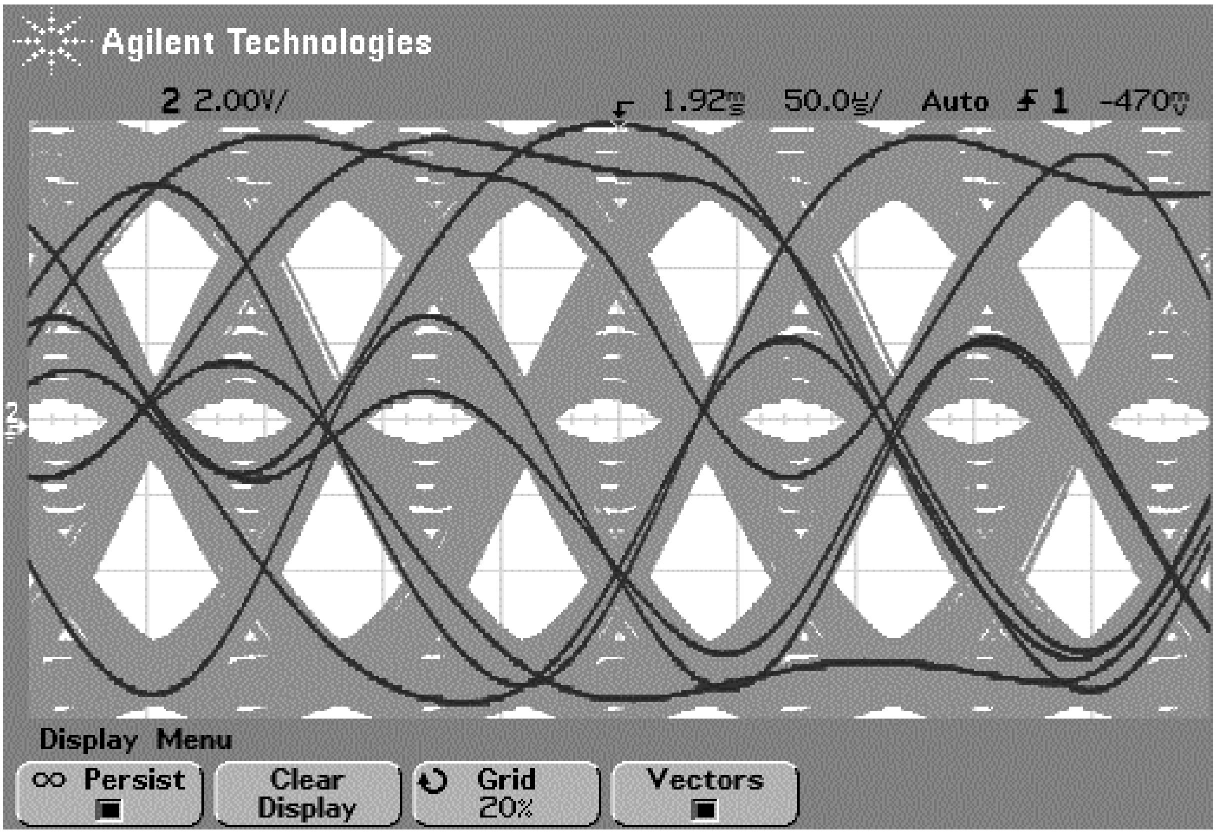
Baud rate 9600:



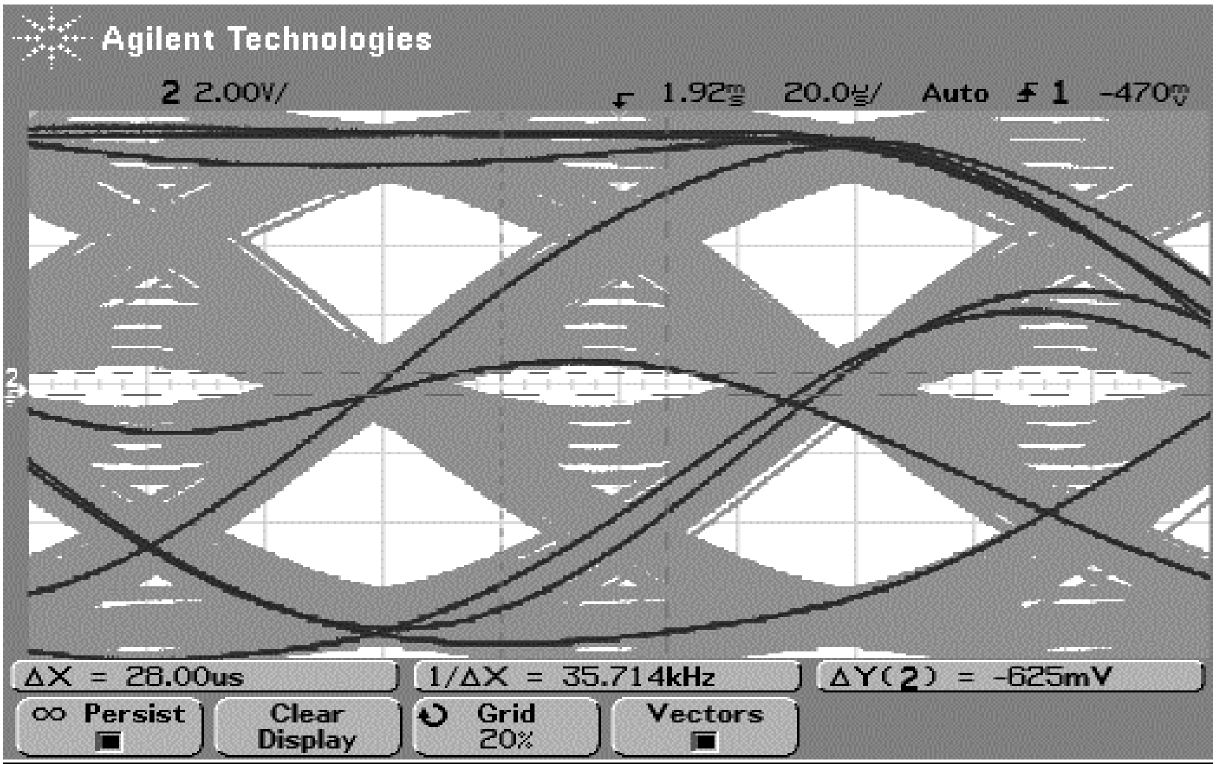
Baud rate 9600: with openness on cursors



Baud rate 12800:



Baud rate 12800: with openness on cursors



Second Task: Measuring voltage with a LabVIEW controlled multimeter

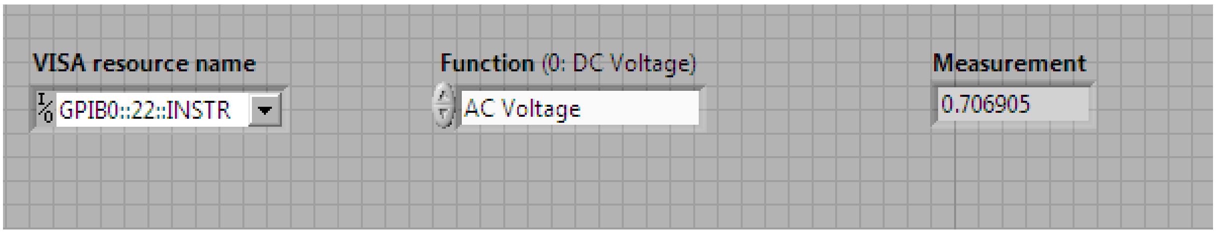
In this task we will be working with the single measurement.vi. First we will connect the AWG(Arbitrary Waveform Generator) with the Digital Multimeter and after that the Digital Multimeter to the conventional PC , so that we can measure the voltage also with the VI of the pc as well. For this task, we will be using a sine signal with 2 Vpp amplitude and 1KHz frequency. We need to remember to put HIGHZ from the output settings as well.

After that we also need to connect the Digital Multimeter to oscilloscope to verify our claim.

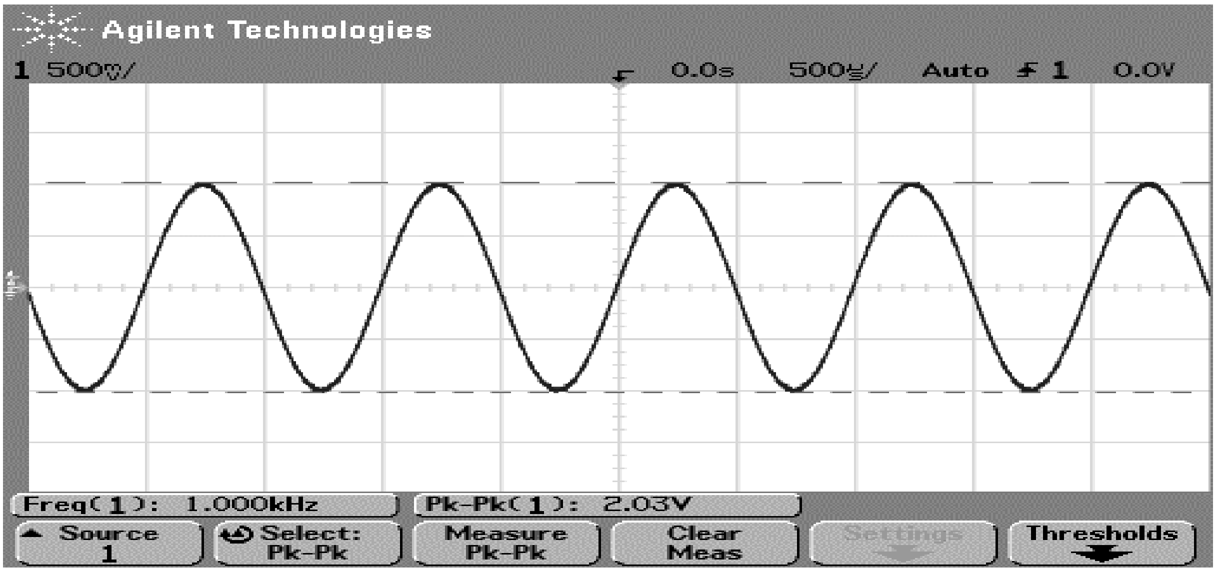
It is important to know the function blocks that are used in the VI, such as Initialize.vi, Configure Measurement.vi, Read (Single Point).vi, Close.vi. These can be found in the Instrument I/O/Instrument Drivers subpalette of the Functions palette.

Data from AWG and Digital Multimeter:

Data from VI:



Data from Oscilloscope:

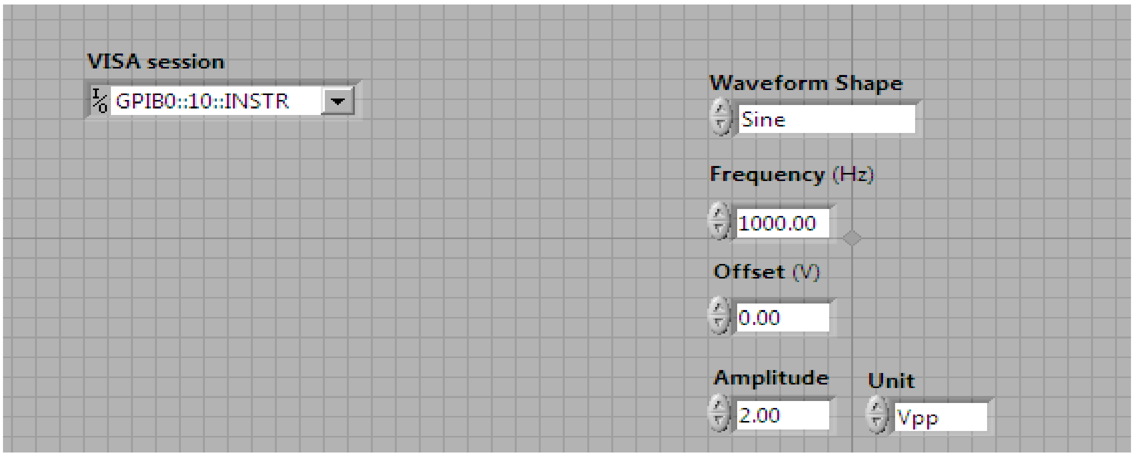


Now from the above pictures we can see that the values of the Vpp from the oscilloscope, Digital Multimeter and the VI multimeter are exactly the same. So we can conclude that the VI works as expected.

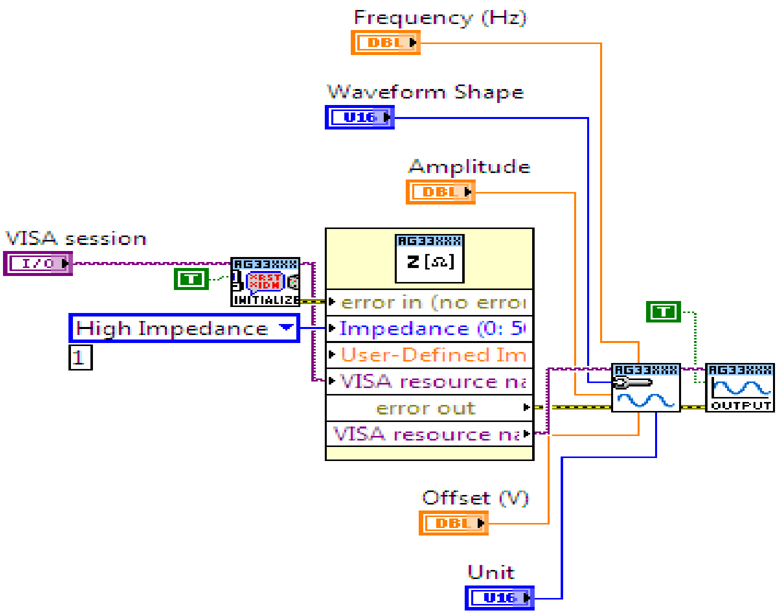
Third Task: Generating a sine wave with function generator in the LabVIEW environment

In this task , we will use VI as a function generator to generate sine SIGNAL WITH A 2 Vpp, 1 KHz Frequency. After that we will use the configure function to configure the HIGH IMPEDANCE in the VI. After that we can generate the waveform correctly. When we give the parameters in the VI, the parameters will be tranferred to the AWG and from there it will be graphed int he oscilloscope as well.

Parameters In the VI:



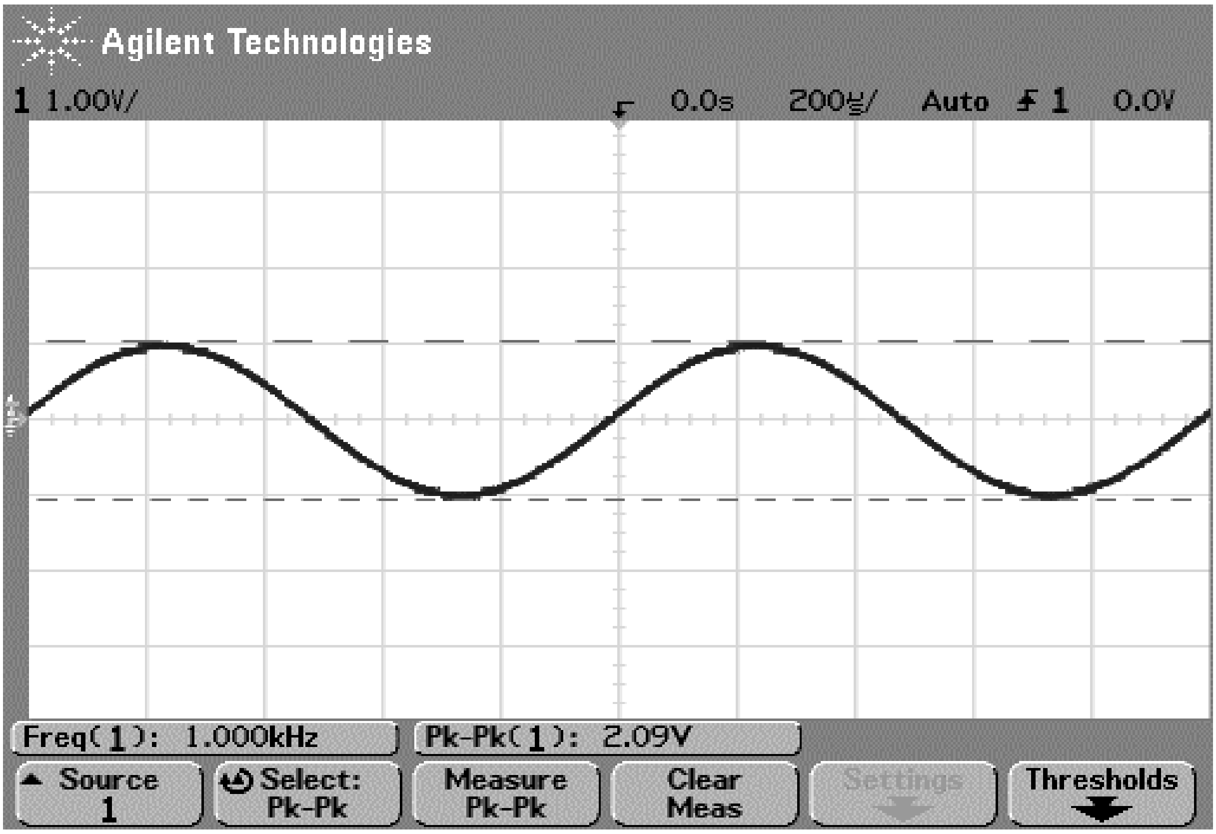
The CONFIGURE file configuration:



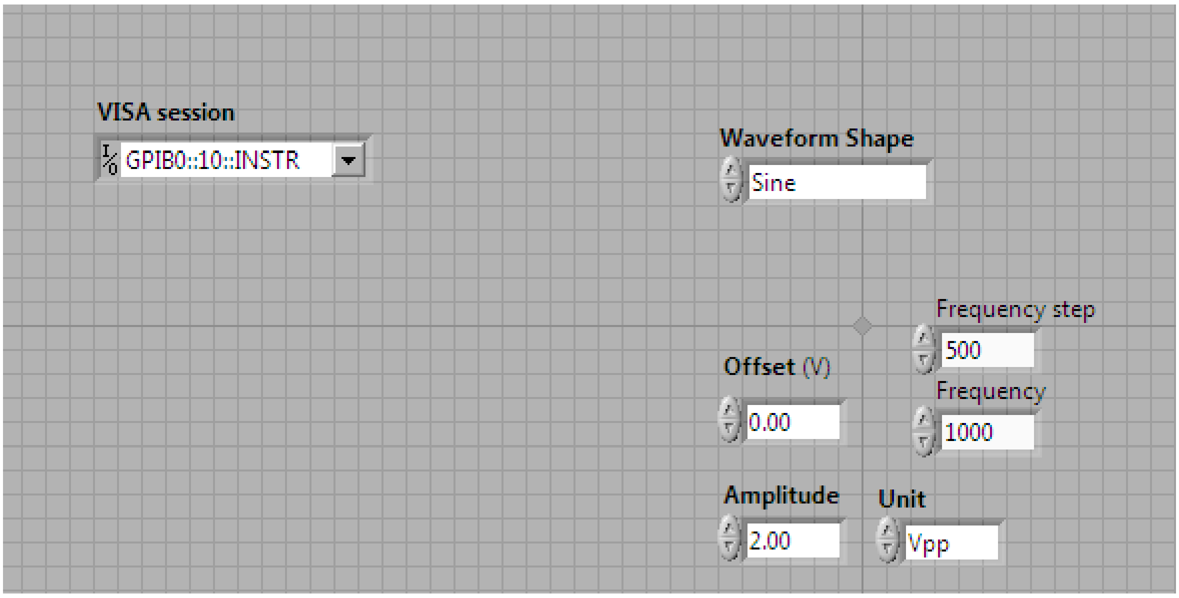
Task 3.2:

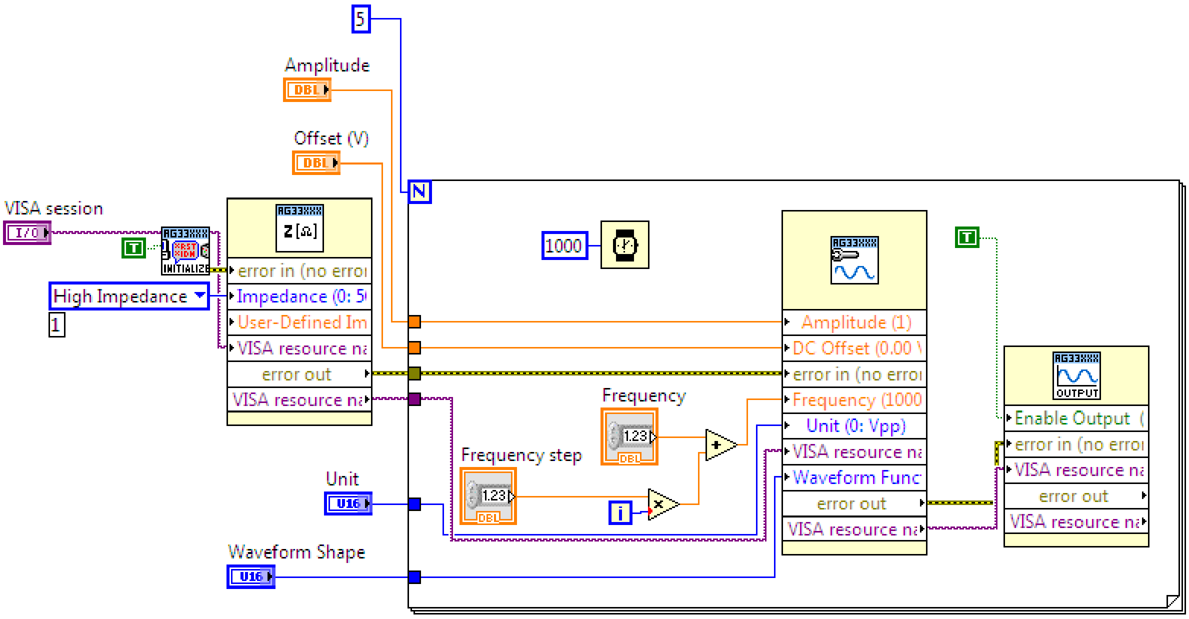
In this task we will modify the Block Diagram such that the frequency of the signal generated by the function generator take each of the following values, one after the other: 1 kHz, 1.5 kHz, 2 kHz, 2.5 kHz, 3 kHz. We also should be aware of the fact that each of these signals should appear at the output for 1 second. For that we will use the Wait functionality.

Oscillopscope view of the signal:



To do so, we have to modify the front panel and the block diagram in the following way:





Fourth Task: Constructing a measurement system for determining the magnitude response

In this task we have to re-use and modify the previous taskd codes and integrate them into a single program to construct a virtual instrument controlled that will help us to measure the magnitude response of the analog model channel automatically. Also we will be able to determine the upper cutoff frequency. Our main goal here is to make the measurements automated and finding the characterization parameters.

We will measure the absolute value of the amplification in the frequency range of 500 Hz to 15000 Hz. We will use the waveform generator and the multimeter for this task.