Exercise Report

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| --- | --- |
| **Subject of this exercise:** | “Introduction” (#1) |
| **Students:** | <me><myself> |
| **Course/code:** | <course>, <group> |
| **Date & time:** | 20<YY>. <MM>. <DD>. |
| **Location:** | BME, QBP <107/108/109/110> |
| **Lecturer today:** |  |

Equipment in use, device under test

|  |  |  |
| --- | --- | --- |
| Oscilloscope | Agilent 54622A | MY4< > |
| Signal generator | Agilent 33220A | MY4< > |
| Digital multimeter (6½ digit) | Agilent 33401A | MY4< > |
| misc.: ... | ... | ... |

Exercises

Basics

 Find and (if you have not yet done so) read carefully the safety regulations on the webpage about this subject. Try to find the slides containing many-many details and links about our lab instruments!

**We have read all safety instructions thoroughly and we understood it well.**

Oscilloscope

 Connect the oscilloscope with its clip probe to the output pins of the built-in square-wave generator. Do **not** have the signal found with the “AutoScale” button, but try to set the proper X (time) and Y (voltage) intervals manually first, then find the triggering criteria next. If you have a steady signal on the screen, then figure out its parameters first by visual observation, then with the cursors, and finally with the “QuickMeasure” feature of the oscilloscope!

We have wired up things like this:

 <e.g., connected this-and-that here-and-there, applied such-and-such settings>

We estimated the parameters with the different approaches as follows:

 <parameters like voltage levels, frequency, rise-time, overshoot, etc.>

That’s what we can see on the screen of the oscilloscope, with properly set and clearly visible cursors and measured values:

Signal Generator

 Connect the signal generator to the oscilloscope. Set a 1 kHz square wave with an amplitude of 4 VPP and a DC offset of +3 V. Check the output on the oscilloscope, preferably *not* using the “AutoScale” feature here either. Document the task and the results!

If someone wants to repeat this measurement any time in the future, then these steps have to be carried out:

 <the wiring and the settings, step-by-step>

We could see this figure on the oscilloscope:

The thing we will always remember from doing this is the following:

 Connect the “Sync” output of the signal generator to the other input channel of the oscilloscope, and observe this signal (actually, the two signals simultaneously) as well.

We have wired up things like this:

The oscilloscope had these nice figures for us:

That’s what we have learnt here:

Digital Multimeter

 Connect the digital multimeter with a T-adapter to the output of the signal generator. Set the square wave that we have used above, and compare the voltage (DC, AC) and frequency parameter readouts on the three devices!

Wiring:

 <we plugged our red & black banana jacks into this-and-that banana sockets because ...>

This was new for us:

 Repeat this task with sine- and triangle-wave signals as well! Also insert the waveforms measured for the other signals as well.

Wiring remained the same.

We have understood here that ...

 Your lecturer will give you a resistor. Measure its ohmic resistance with the multimeter, and then compare your result with the color codes seen on the small device - check if this piece is OK or not!

Wiring:

And, at last, now we know that yes, the measured value is within the specified tolerance. / ... no, it is not OK!

Power Supply

 Set a simultaneous +12 V, +5 V, and -5 V output voltage levels on the power supply. Check the result of your work with the digital multimeter!

Wiring:

 <Which banana sockets are in use?>

Voltage levels:

Spectral analyses

Analyze the spectrum of the square, triangle, sine and white noise waveforms using the DFT function of the oscilloscope and compare the results to the theoretical ones. How does the „Averaging” function affect the spectrum seen on the oscilloscope?

Wiring:

Scope pictures, conclusion:

Effect of averaging:

Add a 50% AM modulation to the previously generated sine wave (ratio of *fv* and *fm* should be 10) and check the signal in the time and frequency domains! Try to use the „Autoscale” function to find the signal!

We have wired up things like this:

Time domain waveform:

Frequency domain waveform:

Effect of “AutoScale”:

Signals with long time period

Set a square waveform with 2 VPP amplitude, +5 V offset and 20 seconds time period on the function generator! Try to measure the signal on the oscilloscope and insert a „nice” figure into the report.

Figure of the scope:

Process of the measurement:

Finally: self-checking this document

 Re-read your report, correct any grammatical (or stylistic) errors – even those that I had made while preparing the template. Check if your work is ready for handling-in and whether it complies with the standards that you would require from a *good* engineer!

Count of errors that we found/corrected while reading through our report again: