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SIGNAL GENERATOR DESIGNED IN LabVIEW PROGRAM

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ABSTRACT: In this paper the authors present a virtual signal generator that contains two independent channels. It was choosed the LabVIEW Tool for designing the generator, because it permits a practical graphical interface with the user. The generated signals can be visualizated using the indicated displays of the virtual instrument, as on a real osciloscope using a data acquisition board.
KEYWORDS: Signal generator, Noise signal, Spectral analysis

❖ INTRODUCTION

Signal generators are electric devices that are used as time variable voltage sources with a specified waveform and adjustable amplitude and frequency. These instruments are used in electrical laboratory at controlling, adjusting, measuring the electrical signals.

❖ LabVIEW IMPLEMENTATION OF THE SIGNAL GENERATOR

INPUT DATA

The parameters of generated signals can be introduced in program using appropriate control elements: rotary buttons, pushing buttons, circular dial.

The signal generator is designed using two independent channels. Generated signals can be sinusoidal, rectangular, triangular, slope, continuous component. Input parameters: offset, frequency, amplitude and phase can be introduced using numeric control elements described in figure 1.

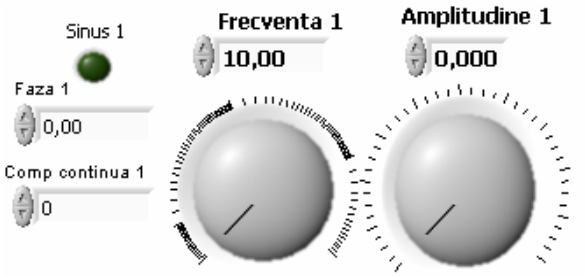

Fig.1. Numeric control elements

Signal selection can be made using two inputs multiplexers.

BLOCK DIAGRAM

The elements from block diagram that introduce the input data are presented in figure 2. In order to obtain different types of signals, the electric scheme contains *Simulate Signal* blocks that can be set to generate the desired signal.

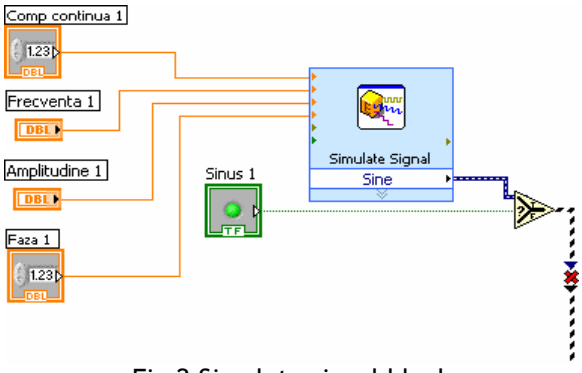

Fig.2 Simulate signal block

The electric scheme can realize signal reversing operations, half wave and full wave rectification. Full wave rectification is done using *modulus* mathematical block [3]. Half wave rectification is made according with the following principle: signal is reversing, the result is subtracting from the full wave rectificated signal. The obtained signal is a half wave rectificated signal and amplified twice. The result is divided by 2, and the final signal represents the half wave rectificated signal (figure 3).

Each signal can be viewed with noise. The noise level can be adjusted. There were chosen the following noise types: Uniform, Gaussian, Periodic random, Bernoulli, MLS Sequence, Gamma, Poisson, and Binomial.

Noise signals are generated using *Simulate Signal* blocks set with *Numeric* and *Boolean* control elements [2].

In order to obtain a continuous functioning, all elements of electric scheme are introduced in a *While* structure. Loop condition represents the *Stop* button placed on Front Panel.

Time base scheme of the indicator display is presented in figure 4.

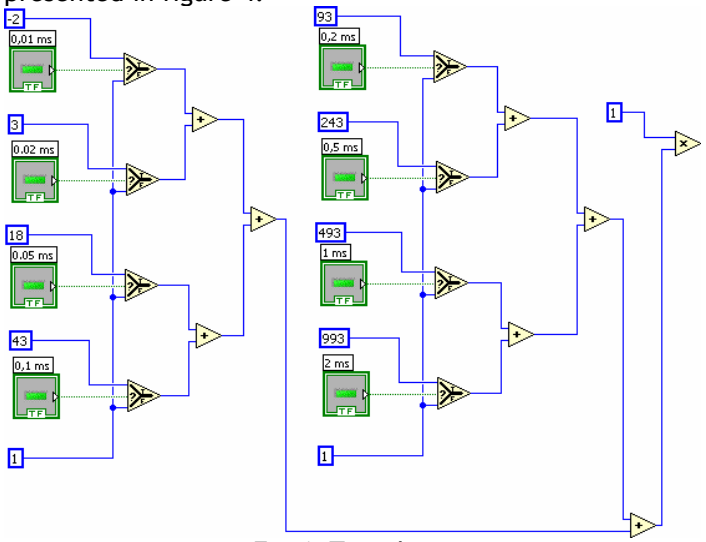

Fig.4. Time base

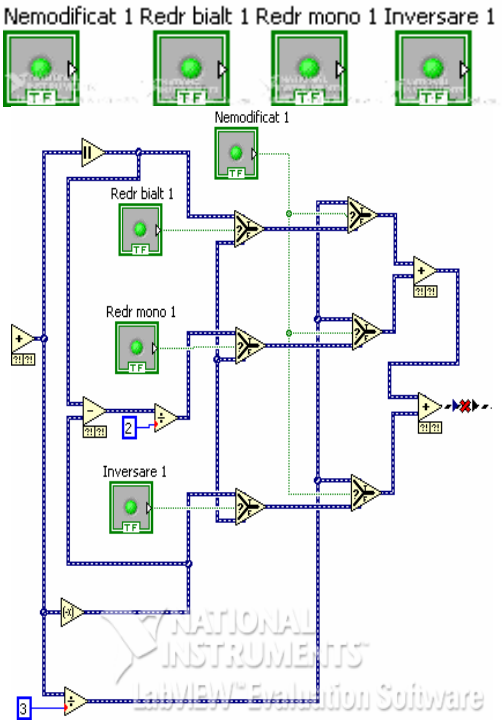

Fig.3. Rectification scheme

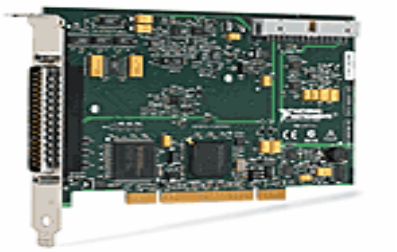

Fig.5. Data acquisition board PCI-6221

The signals can be followed on a real oscilloscope display if it is connected to an analog input of data acquisition board, like NI-6221 (figure 5).

Characteristics:

- 16 analog inputs, 250kS/s, resolution 16 bits
- 2 analog outputs, 833kS/s, resolution 16 bits
- 10 digital I/O compatible TTL
- 2 counter/timers on 32 bits
- digital trigger
- compatibility with Windows (2000/NT/XP), Linux
- integration with software components LabVIEW, CVI, Measurement Studio for Visual Studio NET

Figure 6 presents the front panel of the application.

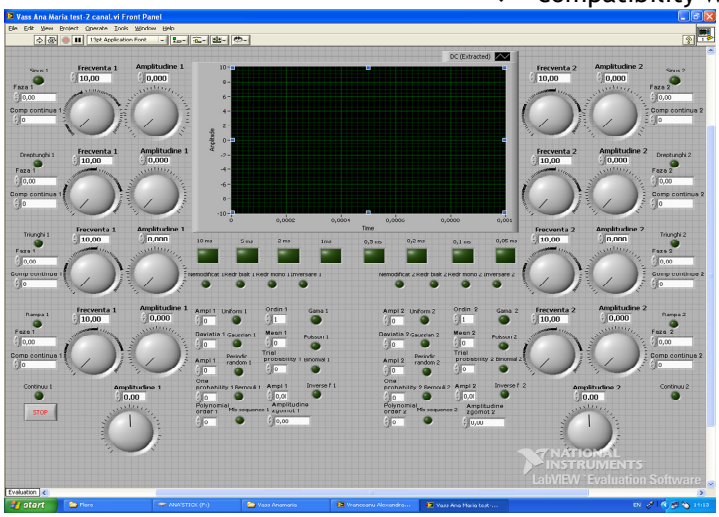

Fig.6. Front panel of the application

❖ CONCLUSIONS

This application becomes very useful in electrical laboratorys, because it is a virtual instrument that simulates a real oscilloscope on two independent channels. In this way there can be simulated different types of signals that can be viewed on the virtual display. Using a data acquisition board [1], these virtual signals can be transformed in real voltage signals.

❖ REFERENCES

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