

Research & Development
Ultrasonic Technology / Fingerprint recognition



DATA SHEETS

&

OPBOX

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Technical description of the OPBOX device

1. Power supply:

85-264V AC or 110-370V DC, 47-440 Hz, Standard IEC 320 connector (widely used in computers), with switch. Sealed lead-acid battery, allowing approximately 4 hours independent work. Battery control circuit. Battery can be changed without special knowledge.

2. General information about the signal acquisition unit:

A/D

converter:

- Resolution: 8 bits
- Sampling frequency: 50 or 100MHz¹

Analog

parameters:

- Input channels: 2: send&receive and receive
- Input amplifier gain: 0dB, 6dB, 14dB, 20dB, 26dB, 34dB, 40dB (hardware amplifier on the card)¹ additional 33dB in echo mode (amplifier in the pulser&receiver box) total possible gain: 110dB (with software amplification)
- Minimal sensitivity: 0.1mV/Div -1mVpp (with additional software amplification)
- Maximal sensitivity: 50mV/Div - 0.5Vpp
- Averaging: 1 - 256
- Bandwidth: 0,1 - 25MHz
- Input impedance: 50Ohm, 10pF

Data buffer: 256, 512, 1K or 16K¹

Trigger: internal (software), external, max 2 kHz

Delay time: measurement accuracy better than 1ns

Pulser: Step pulser, 50V -300V in 8 levels (the voltage depends on the used transducer), 20ns edge falling time, separate match sized box

Interface: Parallel (Centronics DB25 - female)

Power supply: 220 or 110V, 4 hours work with the internal battery Sealed Lead-Acid

Size: 255x295x50mm

Weight: 2700g

¹ - software controlled

3. Block diagram of the box:



4. Signals on the external connectors:

DB9 (connection with OPGUD sender&receiver box):

- Uin - measured input signal; SYNC_OUT- pulse generator control;
- STEP/TRG - step motor control or external trigger input (software selected);
- ZERO (TTL-input signal) - position marker (e.g. generated by an optical or mechanical sensor).
- Ureg (out) - software controlled voltage (2-10V, 8 steps) used for pulse amplitude control of the OPGUD pulser&receiver units; (STEP and ZERO Signals are not used with the normal version of the device, only together with scanners)

BNC:

- Uin - measured input signal (used in transmission, TOFD or other modes, where two transducers should be used);
- EXT_TRG external trigger input; Allows to use this device as oscilloscope for any kind of signals in the allowed input range.

5. Characteristic of the OPKUD card:

It can work in two modes:

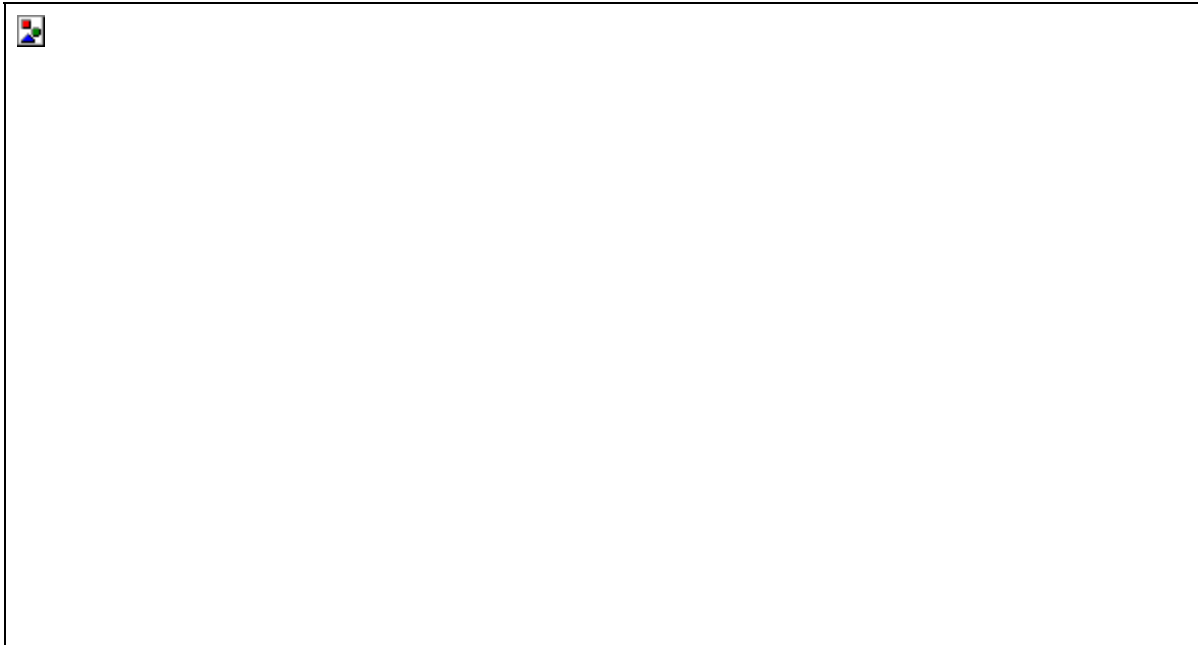
- Automatic: The measurement is controlled with the software and the sync_out signal triggers the measured unit (scan A and B)

- Classical oscilloscope: measurement is controlled by the external trigger signal.

One of the most important features of the card is a precise synchronization between the transmitter trigger signal T_NAD and the moment when the sampling of the input signal starts.

This time (t_{pom}) is software programmable in the range of 0 - 255 ns with a resolution of 1 ns and has stability within the range of 0.1 ns. It is particularly important in the case of scanning devices, since it allows to achieve a very small time skew between different positions (channels). 1 ns would correspond to a clock frequency of 1 GHz which is much higher than the actual frequency used.

6. Automatic measurement mode

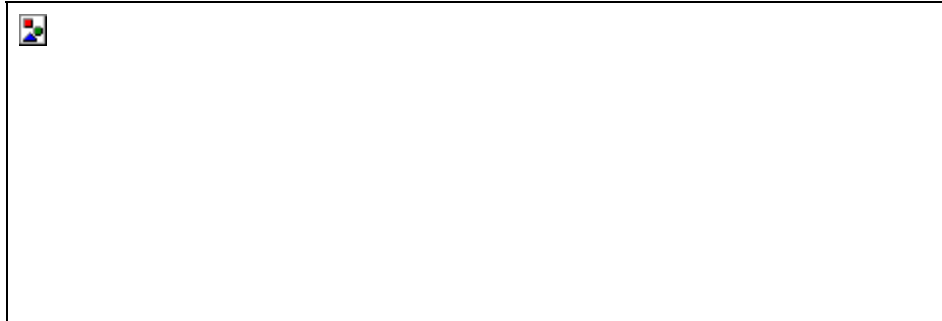


The card in its standard version can operate with a moving measurement head (rotating or moving linearly) as well as with a multiplexer circuit switching measurement channels. It can control a step motor (through a driver unit).

- ZERO is a marker of the reference position of the measurement head;
- STEP is a signal controlling the step motor driver unit or the multiplexer;
- T_NAD triggers the transmitter circuit, it is synchronized with the STEP signal in such a way that
- a pulse on the STEP signal is followed by a delayed pulse on the T_NAD signal as shown in a figure below.

- The delay is introduced in order to eliminate potential interference from the step motor.

7. Oscilloscope mode



In this mode, for each EXT_TRG pulse, a single T_NAD pulse is generated (the STEP signal is not generated). This permits a precise synchronization with the clock signal generated on the card and therefore guarantees good repeatability of measurement results. In the case when the measurement circuit cannot be triggered, the repeatability of measurement results corresponds only to the clock resolution (10ns).

8. Input amplifier:

Software controlled gain of: 0dB, 6dB, 14dB, 20dB, 26dB, 34dB, 40dB, AC coupled 50 Ohm input impedance. Additional 33dB in echo mode (amplifier in the pulser&receiver box) Total possible gain: 110dB (with software amplification) Noise: lower than 5 uV.

9. Characteristics of the OPGUD pulser&receiver:

This device contains a broadband step pulser and receiver, that can work with almost any transducer in the main frequency range of about 1-30 MHz.

Transmitter operation:

The rising edge of the Trig_In signal initiates the transducer charging process which takes about 3 μ s. After this time, a transistor switch which discharges the transducer is turned on. The amount of time needed for the transducer to be discharged depends on the transducer used, but (for the normal transducers) is not longer than 40 ns. The amplitude of the pulse is controlled with the software and can have 8 steps between about 50-350 V (slightly depends on the used transducer).

Receiver operation:

After generating the pulse, a switch opens the input of the receiver and after about 10 microseconds the device is ready to receive the signals coming from the transducer. 33 dB amplifier is included.

10. Software:

Included with the card is software which operates in both the automatic and oscilloscope mode. It also has a spectrum analysis function and many functions, that are useful in Ultrasonic NDT.

Software is written in Lab Windows CVI (National Instruments), drivers for Lab View, examples written in C and Pascal are included.

11. Connection with the computer:

Standard parallel (Centronics) cable (included).

12. Additional notices:

In the current version of the device, there is no analogue trigger input. All the control signals generated by the card can be modified according to specific customer requirements. For instance, a number of T_NAD pulses can be generated between consecutive STEP pulses, the frequency of the STEP pulses can be modified etc.

13. Future versions of the device will include:

- Programmable sampling frequency with more frequencies;
- The possibility to switch off the amplifier in the OPGUD box;
- Separate input for 12V supply (auto battery);
- Increased sampling frequency to at least 200 MHz;
- PCIMCIA interface.