Note: this is the translation of the conference paper "Laboratory stand for research of the hall effect" presented at "LabView in Education, Science and Engineering" conference in Moscow, Russia in 2009. Originally, it is available only in Russian language. This translation is made by one of papers authors for informational purposes only. Since original paper contained several English parts, like the name of publication, conference and abstract, these parts are left as is. Structure follows the original publication structure, which is different from IEEE publication recommendations. Note, that the sensor described and used in this laboratory stand was relatively new in 2009.

Remark: this conference resembled a "science project fair", with each team presenting their stand and brief description to be published in the conference almanac, following conference guidelines.

Laboratory stand for research of the hall effect

Gusev A.V., Denisov Y.S, Ivanov V.E.

Ural Federal University

620002, Yekaterinburg, Russia, ul. Mira 32 P-428

1. Problem statement

Laboratory stand is suitable for students with major in Electrical Engineering. Goal is to provide students with all necessary means for research of the principle of work for absolute magneto resistive encoder AVAGO AEAT-6012, connecting encoder to National Instruments compatible encoder, displaying encoder readings on LCD indicator and transmitting the data to personal computer. Stand is designed to be used as a practice exercise for courses teaching LabView to demonstrate integration of NI software with hardware which does not initially support it.

2. Used hardware and software

- Avago AEAT-6012 encoder.
- NXP MCB2300 development board.
- Personal computer with at least one available USB port.
- National Instruments LabView 8.6
- uVision Keil 3.80

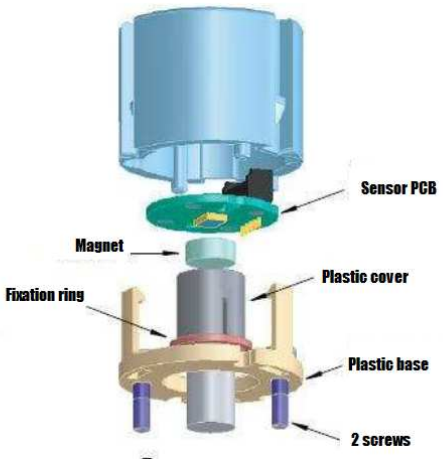
3. Laboratory stand implementation

Avago AEAT-6012 is an absolute contactless magneto resistive encoder with support for 12-bit operation mode and full range from 0 to 360 degrees, with resolution 0.0897 degrees/bit. Working temperature diapason is from -45 to

+125, which extends possible range of implementation. Sensor have small dimensions and is easy to install.

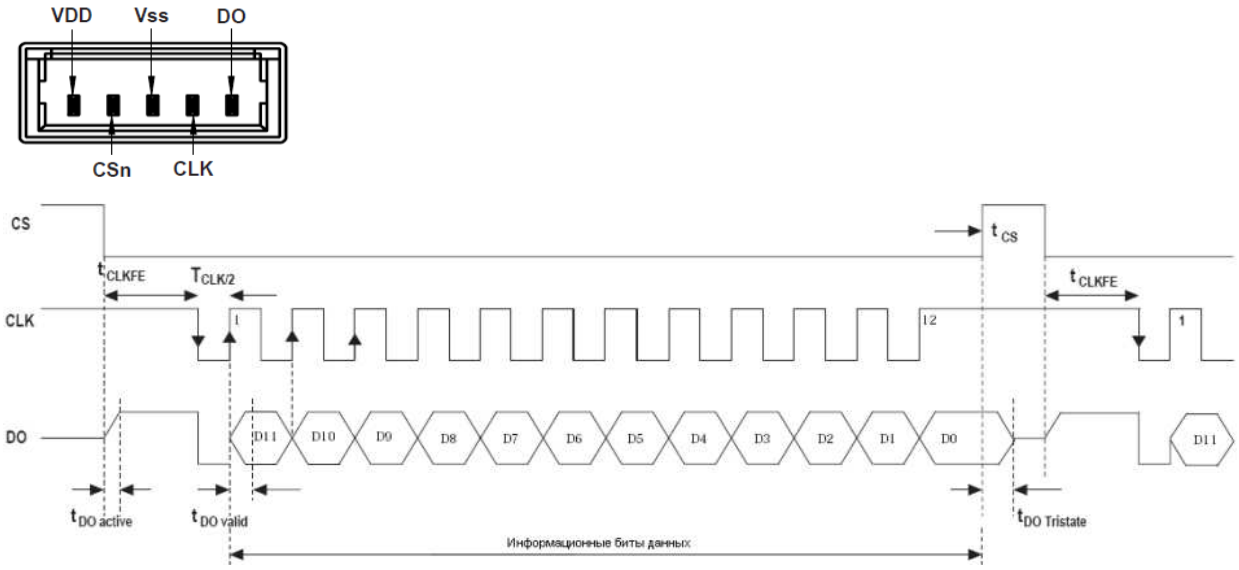
For data exchange between sensor and MCB2300 PCB, SPI serial interface is used. Data output from the sensor is in absolute code, with polling frequency being set up by the user with the maximum possible limit of 1MHz.

Interface uses three data wires (CS, CLK, DO) and two power wires (Vdd, Vss), with power voltage being 5 volts. CS is a "chip-selected" pin which begins the process of reading data from hall sensor, while reading rate is controlled by frequency of impulses on CLK pin. Data will be available at DO output pin, which supports Z-state, in which it will reside when chip is not selected for data output. This is the basic principle of SPI protocol used in many electronic devices.



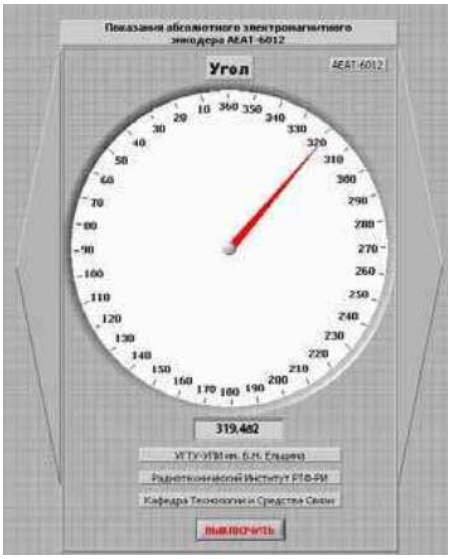
Img 1. Avago AEAT-6012 schematic representation

To research the sensor behavior, it was connected to MCB2300 development board based on LPC2368 controller with ARM7 TDMI-S core, sensor readings are displayed on MCB2300 embedded LCD.



Img 2. Avago AEAT-6012 pinout and timing diagram

Serial interface to exchange data between MCB2300 and PC with installed NI LabView was implemented as a software serial port over USB, with software realization of SPI interface in code for better understanding by students.



Data is visualized on the screen. Students may perform several experiments related to hall effect encoders research, consisting of, but not limited to estimating the error of readings, introducing several external noise events like using magnet to distort data readings, or connect the encoder to robot arm.

Stand successfully tested in laboratory teaching practicum.

Img 3. LabView VI front panel.

4. References

[1] "Avago AEAT-6012 datasheet." https://docs.broadcom.com/docs/AV02-0188EN