

DISTANCE REMOTE MEASUREMENT OF MAGNETIC FIELD

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SUMMARY

In the paper, sensing of magnetic field, communication between TEKTRONIX oscilloscope and computer via RS-232 and consequently measurement via Internet are described. The evaluation version of Control Web program has been utilized to allow a remote measurement. Designed program receives the data from Hall sensor by the digital oscilloscope. In addition the received data saves to the file on local computer and in following step distributes it to remote computer via Internet. Remote computer shows the shape of signals saved by oscilloscope using an external program. The created program also allows archiving the shapes to the file or opening the files with the shapes.

Keywords: virtual measuring, Internet measuring, automated measuring

1. INTRODUCTION

The main element of the digital automated measuring system is a digital control element, which can be represented by a digital signal processor or a personal computer. For analog to digital and vice-versa signal conversion are always necessary the A/D and D/A converters, too. The right function of the whole measuring system must be secured by a control measuring and evaluating program. Above mentioned three parts are the basic parts of any automated measuring system, but its individual design and interconnection may have various forms. The concrete realization of all above mentioned basic blocks is shown in Fig. 1.

2. CONTROL WEB AS BASIC SOFTWARE

The Control Web software is universal tool for development and visualization of control applications, data acquisition applications, saving and data evaluation and applications of interface human-machine. Definitely, this software respects

existing standards for user interface, data interchange, data access, communication in computer network and hardware interface for data acquisition and data control.

The Control Web works in operating system environment with implemented software interface Win32 and supports many of industry standards. The ASCII drivers have been used for serial communication as the part of Control Web. The Control Web contains HTTP server to allow for network communicating. The server is integrated to the system. It means that it offers static files also dynamically generated files based on being application. Furthermore, the data can be received from HTML data formulary and a virtual measurement set up can be activated depending on client's requests. As to applications, there is possibility to communicate with each other. By using Java applet, which is implemented to HTML pages, the data are also presented. Java applets are no much for Control Web applications, however they work in all WWW viewers JVM, including outside of Windows. By using only HTML installed

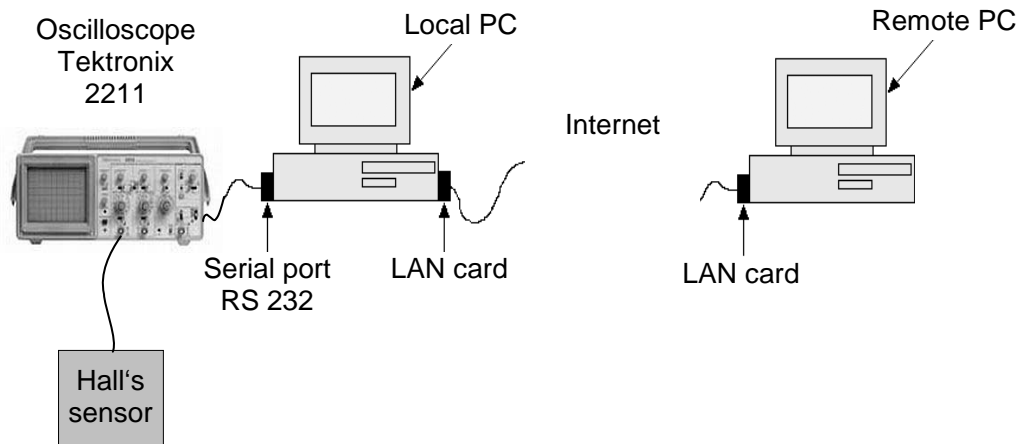


Fig. 1 General solution of distance remote measuring system

in HTTP server, the data are accessible to a WWW client that uses a very high number of computers. The only most poor image imaging tools can be used is main disadvantage.

3. OSCILLOSCOPE TEKTRONIX 2211 AS PRECISION A/D CONVERTER

TEKTRONIX 2211 is portable analog to digital oscilloscope. It includes two input channels. In analog mode, the frequency can range from 0 up to 50 MHz. In digital mode, it is from 0 up to 1 MHz.

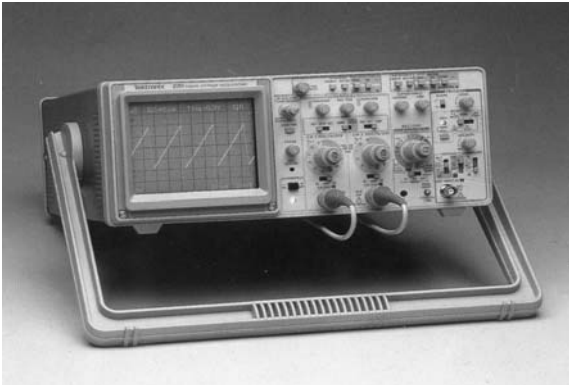


Fig. 2 Oscilloscope TEKTRONIX 2211

For our purpose it is sensing the output voltage of Hall effect sensor shown in Fig. 3, which is sensing the magnetic field in given position and in given axis direction. The oscilloscope is digitalizing the input analog signal to digital output data form, which are possible transfer to the local computer via RS 232 serial port.

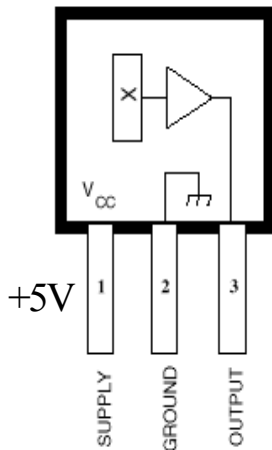


Fig. 3 Linear Hall effect sensor A351EUA

In the Fig. 4 is showed side panel of the oscilloscope, which is used for serial communication and for setting the communication parameters. This oscilloscope uses 9-pin DTE connector for serial communication. It is asynchronous transfer with transfer rate 300, 1200, 4800 or 9600 bps. Data string contains 8 data bits, start bit, stop bit, no parity.

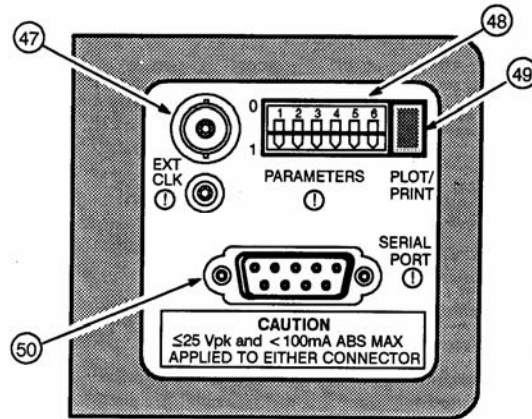


Fig. 4 Side panel of the oscilloscope that consists of the parts:

- 47 - Input for external timing signal
- 48 - Switch for setting of serial port
- 49 - Press button for launching of data transfer from oscilloscope to the PC
- 50 - Standard connector RS 232

4. DATA DECODING

Transferred data from oscilloscope to the file are in HP-GL language (Hewlett – Packard Graphic Language). These data consist of complete information about signal curve and description of oscilloscope parameters setting (when signal is saving to the reference memory). The data represent the signal as a vector and alphanumeric values from oscilloscope display. Examples of HP-GL commands can be seen on the example below.

- SP n; (Select pen)
- PU; (Pen Up)
- SC X_{min}, X_{max}, Y_{min}, Y_{max}; (Scale)
- PD; (Pen Down)
- PA x, y; (Plot absolute)
- LB text; (label)

In the Fig. 5 shows the example of how the data are stored in the notepad. The set of the data comes as the output of the oscilloscope. It is digital output data form, which we want to display in graphical form.

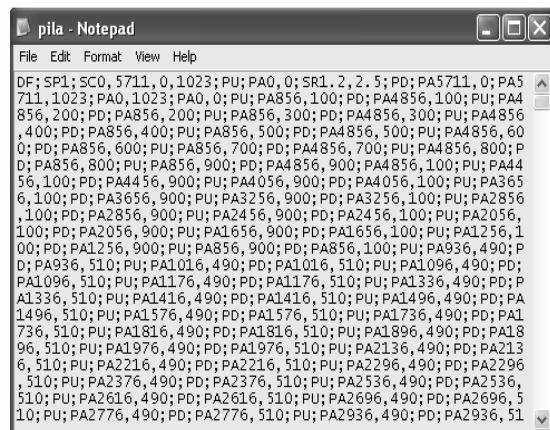


Fig. 5 The data acquired from oscilloscope

We can determine next oscilloscope settings from acquired data: time base, trigger, number of scanned channels, voltage range, signal mode (AC/DC), and curve image. We can derive U_{ef} , U_{max} , U_s from these data. For AC signal also frequency can be derived.

5. PROGRAM DESCRIPTION

By activating of the application the window named Oscilloscope - local is shown at computer monitor, which is connected to the oscilloscope. In the same moment, the window named Oscilloscope - remote at the monitor of remote computer is shown. Oscilloscope - local and Oscilloscope - remote are mutual connected applications made by using Control Web that communicate via protocols TCP/IP. The measured data are transported via serial link to local and via Internet to remote PC, where are saved to text file. At the moment when the transport has been finished, the data can be mutually processed in local and remote PC.

Therefore, the program description is valid for local also for remote computer. The same user interface is used for local and remote PC. Basic panel window of described program is shown in the Fig 6.

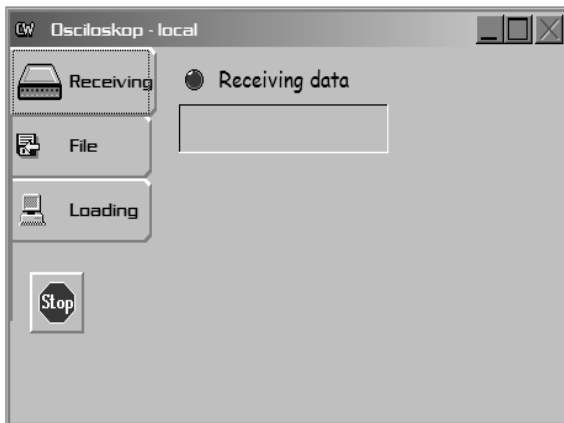


Fig. 6 The basic panel window

The basic window consists of 4 buttons: Receiving, File, Loading and Stop. After clicking on the button Receiving, the program waits for data from oscilloscope. The data could be transmitted. After clicking on the button File, we can insert file name and URL, Fig. 7.

After clicking on the button Loading, the program loads a saved file (Fig. 8) and consequently displays loaded curve by CtrlView program, Fig 9. In the cell "File Title" is necessary to insert the file name, where data are saved.

By button Stop the programs in local and remote PC are finished. Viewing of the measured curve by oscilloscope is shown in the next figure. We can arrange the measured curve by the next buttons (commands): rotation, shifting, zoom, change of color and saving of characteristic as image format.

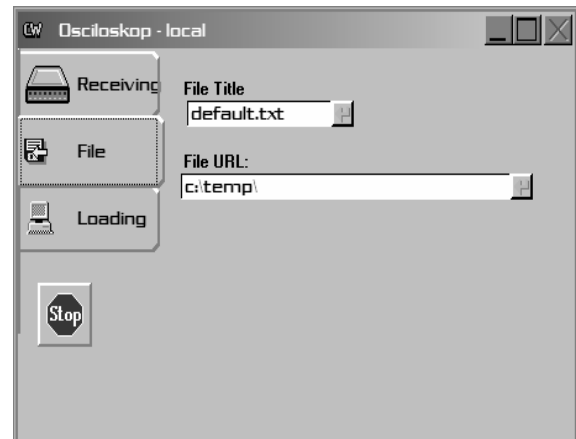


Fig. 7 Inserting file name and URL

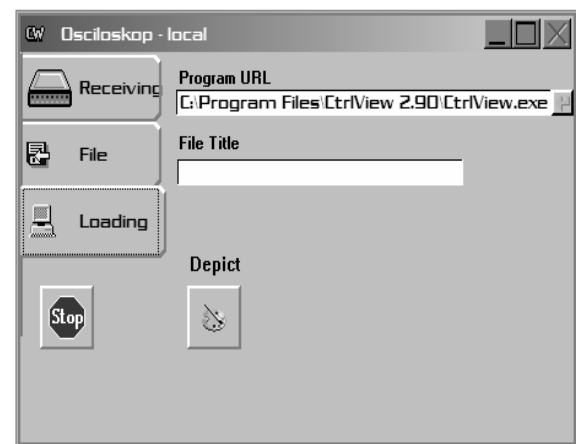


Fig. 8 Loading of saved file

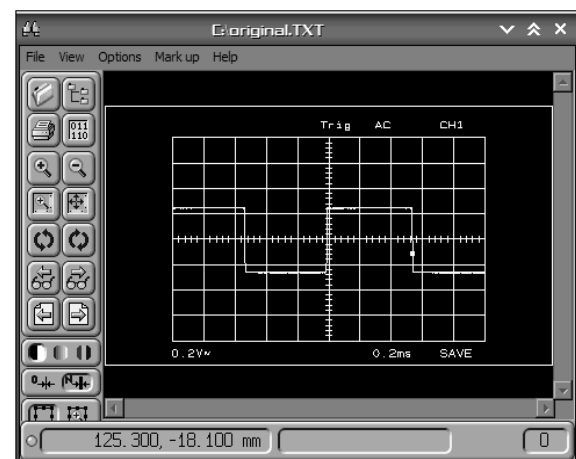


Fig. 9 Drawing of the measured curve

6. CONCLUSION

Receiving the measured data, their distributing to remote oscilloscope and saving after finishing are main features of the described program. All demonstrated results were obtained by developed program, which was designed for Win9x operating systems.

On the basis of above-mentioned facts it is evident, that the described solution can help to solve the problem of remote control of measuring and technological systems and such to improve the automation and information society

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BIOGRAPHIES

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Irena Kováčová - She finished her studies in 1982 at the Technical University of Košice, Department of Electrical Drives, area – Power electronics with excellent evaluation. From this time she has worked at the Department of Electrical Drives, first as an assistant lecturer and now as an associate professor. In 1988 she got her doctoral diploma. In 1991 she got the Award of the Minister of Education for the Development of Science and Technology. Her working interest is mainly focused on the field of power electronics, especially on the construction of converters and inverters with new perspective elements and computer simulation of new power semiconductor parts and devices.