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Serial Port RS232 activated with on – line experiments in physics

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Abstract
On – line experiments are being efficiently applied in physics, by influencing not only scientific research, but also other activities, such as engineering, or education. Therefore, devices, programs and curriculums are produced and developed to help relevant activities. Most computers use external ports and electromagnetic signals to communicate with outer devices, i.e. the serial port RS232. From this perspective, RS232 is conceived as the first powerful interface in a row to establish good connections between devices. Programs with basic or authoring languages are developed to control communications between computers and simple on – line experiments. Other computer ports, such as: USB ports, camera, microphone, headphones, etc. are also used to communicate experimental and physical data.
Keywords: computer, serial port, on – line experiment, program, data, signal

Introduction

For many years now, computer technologies are being applied in physics, covering areas of both science and education with either virtual reality [1, 2], or reality [3, 4].
Apart from other things, computers provide physics with an ample internet – network of data [5, 6]; that's due to a specific external port. Furthermore, computers collect and, hence, analyze data on – line with experiments [7, 8]; that's due to specific external ports, such as RS232. Ambitious efforts are also made available to send data out of the computer and, hence, command activities.
The serial port RS232 is widely used in industrial engagements [9, 10] and Paravia [11], Logger Pro [12], or other producers, are keeping up with that in scientific research and science education. Partnership developments, such as Science – Technology – Engineering – Math, alias STEM, are demanding for further steps towards a scientific education based on computer technologies and accompanying devices, as necessary training, developing and applying accessories.
The application of RS232 with on – line experiments is the main goal of this research work, as introduced with this paper. It has been of great help to conduct a series of physical experiments and, also, understand how on – line devices are built and operate.

Theory

Actually, computers are electric – electronic devices operating on electromagnetic signals, which are produced by traditional, or modern, circuits [13, 14]. Consequently, any kind of communications with them should be accomplished by venturing the electromagnetic approach and following certain steps. First, a careful investigation should be paid to

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determine which pins are to be combined in a closed circuit, i.e. the ammeter circuit. To this aim, a DC ammeter of 1mA – 500mA is needed to verify the output of the serial port RS232. In case no ammeter signals are received, then, the port may be far dead, or the operating system is blocking it. *But, of course, these misfortunes are part of technical difficulties this kind of work is well known to be facing with.*
The table 1 below shows some of the RS232 pin combinations which have proven to be usefully activated with COM1, or COM2.

Table 1: RS232, COMs and pin assignments

Serial Port	COMn	Pins
RS232	COM1	Pin1Pin3 Pin1Pin4 Pin4Pin5
RS232	COM2	Pin1Pin7 Pin1Pin8
RS232 USB	COM3	Pin1Pin7

Second step, is programming. Simple, or advanced, programs are developed using basic computer languages, such as QBasic, QBasic45 and authoring languages, such as Delphi 2 Developer [15], or Visual Basic. Naturally, QBasic and QBasic45 have been very useful with the bilateral communication between the computer and on – line experiments, enabling us to send and receive data; while Visual Basic – Excel and Delphi have been useful with a lateral communication, enabling us to send data, only.
A proper communication program is to establish its own working regime and produce its own electromagnetic signal oscillations at the serial port, resulting in notable ammeter oscillations. Commands of open and close files stand at the core of the programs used to frequently produce such signals, either with COM1 or COM2; for example:

```
…
OUT &H3F8, 65
…
…
OPEN “COM1:75,N,8,1,BIN,CD1023,CS0,DS0,OP19,RB1,TB1” FOR OUTPUT AS #1 LEN = 1
…
CLOSE #1
…
```

QBasic, Visual Basic and Delphi programs are good enough to cause signal emitting from the serial port and, thus, commanding the outer closed electrical circuits at our will. Sounds, lights and oscillations are observed live on the circuits, meanwhile, proper results are simultaneously displayed on the screen. That’s an exciting example of sending data as RS232 port output.

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Furthermore, QBasic programs are also good to detect whether the outer circuits happened to be closed or opened, and by so, displaying different effects on screen. That's an even more intriguing example of receiving data as RS232 port input.
Third step is concerned with collecting, analyzing and displaying data in order to fit physical knowledge at the best. To this aim, either specific programing lines are requested, or other programs can be used as well, i.e. Excel.
Fourth step is concerned with the physical experiments to study on – line with and subject to the following paragraph.

Materials and Experiments

Physical experiments are selected and built carefully, in order to produce their own electromechanical signals. Attention for, the serial port has its own electromagnetic computer signals, as first detected. These computer signals can be confusing and misleading, for instance, when trying to receive data signals from the outer circuit on – line. To cease any computer signals out of the serial port, assigned pins are connected to the experimental circuit and extra – resistors are applied appropriately, as shown in figure 1 – schema 1; Ra and Rb.

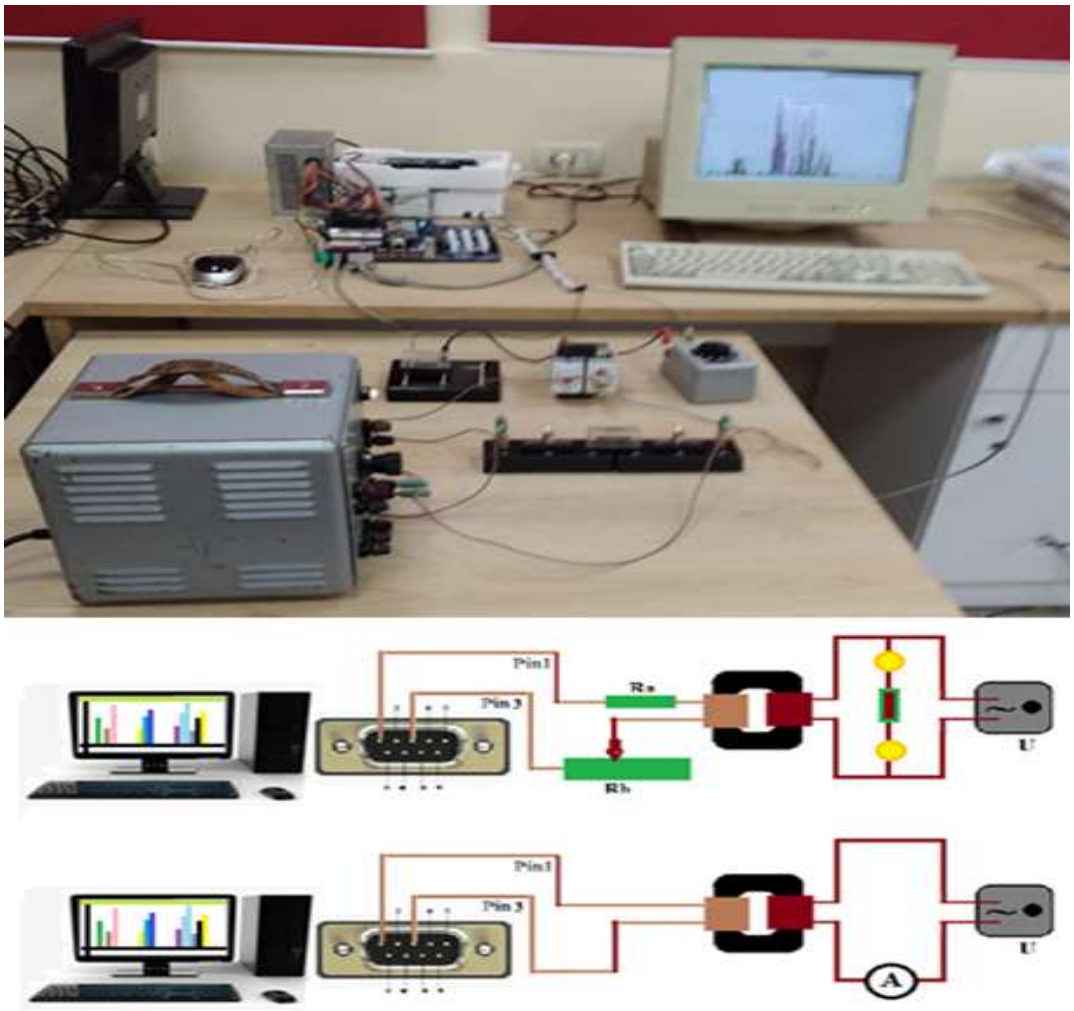

Figure 1: Physics Lab Reality and Virtual Schemas.

Materials: Computer with serial ports and programing environments, resistors, transformer, light bulbs, ammeter, alternating source, wires.
Experiment: The transformer is connected to the outer circuit and the serial port: the primary coil is connected to the circuit of an alternating source; the secondary coil is connected to the serial port, Pin1Pin3. Initially, the source is turned off, but, still, screen displayed signals. Consequently, the resistor Rb was set to 20000 Ohm and signals ceased. After that, the source's potential was increasingly set to other values until signals reappeared. Each turn, the resistor was set to higher values, to cease the new signal. This proceeding technique is repeated from U = 0 Volt to U = 12 Volt and respective values are showing with table 2. Considering the value of the first resistor Ra = 10000 Ohm, the total extra – resistance of the outer circuit is R = Ra + Rb, table 2.

Table 2: Experimental data – Values of potential and resistors

U (V) source	Ra (Ω)	Rb (Ω)	R (Ω)
0	10000	20000	30000
2	10000	20000	30000
4	10000	30000	40000
6	10000	40000	50000
8	10000	50000	60000
10	10000	70000	80000
12	10000	120000	130000

Table 2 shows that the ceasing resistance depends on the alternating potential and they are so in increasing proportion to each – other. To a fast impact, their relationship is swiftly obtained by looking at the graph, figure 2.

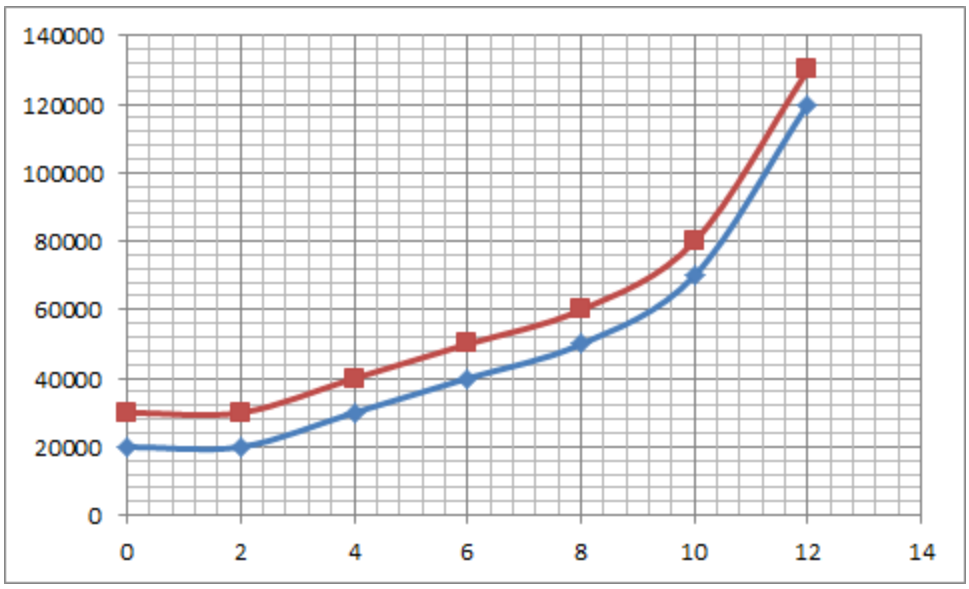

Figure 2: Excel – Graph display of experimental data, R = f(U).

A possible analytical formula to describe this relationship would be: $R = Ro + kUU$ although other ideas are to be taken into account.
Worth mentioning though, that, with increasing potentials, bulbs' lights went brighter on, but apparently undisturbed by the ceasing resistors.
Another schema, without ceasing resistors, is used to mobilize the computer to send data signals from the serial port to the outer circuit, figure 1 – schema 2. Instead of bulbs, an ammeter is connected in series to the primary coil, the potential of the outer circuit is kept still U = 6V and the computer program is controlling the circuit by commanding pulsing signals.

Conclusions

The serial port RS232, or RS – 232, can be successfully activated with on – line experiments in physics. Computer programs should be developed to send and receive data signals from the outer circuits connected on – line. With regard to physical knowledge, specific programs are needed to collect, analyze and display experimental data from the chosen experiments. Following a cautious step by step strategy, simple experiments are also successfully conducted and, hence, scientific ambitions grow further.
Working with RS232 and on – line experiments, increases the researchers' abilities to reach practical and theoretical wisdom by learning by doing. For instance, experimental activities demonstrate that inner computer signals should be ceased at the serial port, for the outer circuits to take over. Moreover, on – line experiments from all fields of physics can be conducted, i.e. hydroelectricity, thermoelectricity, electromechanical frequency generators, electromechanical resonances, photo effect, laser pulsing, and else.
On the other hand, practical works on – line and theoretical discussions help to realized on what principles manufactories produce sophisticated devices and robust applications too.

References

[1] Alion Alizoti, Rezart Çorati, Computer Simulation – A Pedagogical Approach, 1995, National Conference of Physics, Antalya, Turkey, September 1995
[2] Alion Alizoti, Colin White, Simulating with computer the physical phenomena, 1997, Third General Conference of the Balkan Physical Union, Babes Bolyai University, Cluj Napoca BPU – 3 Romania, Babes Bolyai University, Cluj Napoca BPU – 3 Romania, Balkan Physics Letters, Romania
[3] Alion Alizoti, Floran Vila, Zenun Mulaj, Polikron Dhoqina, CONTEMPORARY TENDENCIES IN PHYSICS EDUCATION, 2013, The 2nd International Conference "Research and Education in Natural Sciences Rens2013", University Luigj Gurakuqi, Faculty of Natural Sciences, Shkodër, Albania.
[4] Electron filmed for first time ever, February 22, 2008, https://phys.org/news/2008-02-electron.html
[5] PhET, Interactive Simulations, University of Colorado, Boulder, 2026, https://phet.colorado.edu/
[6] Physics Animations/Simulations, 2026, https://www.vascak.cz/physicsanimations.php

[7] Alizoti, A. (2021). Computer on - line to study the energy issue among collisions. Technium: Romanian Journal of Applied Sciences and Technology, 3(4), 57–62. Retrieved from https://techniumscience.com/index.php/technium/article/view/3611
[8] Alizoti, A. (2022). New technologies to detect electron beam signals. Technium: Romanian Journal of Applied Sciences and Technology, 4(10), 289–295. https://doi.org/10.47577/technium.v4i10.8156
[9] Xabar QOLDIRISH, Applications Of RS232 In Industrial Automation, Aug 30, 2025 Поглед: 109, https://srcyrl.kinsealhmi.com/info/applications-of-rs232-in-industrial-automation-17584471840367616.html
[10] "RS232 Tutorial on Data Interface and cables". ARC Electronics. 2010. Retrieved 2011-07-28.
[11] Vaio Stefano, Poiri Roberto, Sampler 2.00, 1996, G.B.Paravia & C.S.p.A., www,paravia.it
[12] Vernier LabPro, Vernier Software & Technology, 13979, SW MillikanWay Beaverton, Oregon 97005-2886, www.vernier.com, info@vernier.com Vernier, Science Education, 2026, https://www.vernier.com/?srsltid=AfmBOorqeuBbnIOIAckrHsYmCDIx9RirClOHpC4xBG6ha_d6WXcdBTGA
[13] O'Regan, Gerard, ed. (2008). A Brief History of Computing. London: Springer London. p. 28. doi:10.1007/978-1-84800-084-1. ISBN 978-1-84800-083-4.
[14] Alion Alizoti, Modern and Traditional Circuit Components to Produce Frequency Signals, 2024, 5th International Conference on Advanced Engineering Technologies, Bayburt, Turkey, ICADET 2024, Bayburt University, Bayburt, Turkey, ICADET 2024
[15] Colin White, Alion Alizoti, DELPHICAL, Delphi Computer Aided Learning. 2000, Fourth General Conference of the Balkan Physical Union, University of Sofia, Veliko Turnovo BPU - 4 Bulgaria, University of Sofia, Veliko Turnovo BPU - 4 Bulgaria, Balkan Physics Letters, Bulgaria