

AUTOMATION OF EXPERIMENTAL RESEARCH

EMULATOR FOR ADJUSTING AND IMPROVING THE MANAGEMENT PROGRAM OF MULTITASKS OF AFC/PFC ANALYZER CLARKE HESS 250

Liubomyr Ishchenko, Student; Mariana Baran, Ph. D., As.-Prof.

Lviv Polytechnic National University, Ukraine, e-mail: marion2008@ukr.net

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Abstract. Nowadays, digital technologies are successful in many areas substantially facilitating the lives of people. Different kinds of computers with special software are applied to manage devices. But the choice of an appropriate program is quite difficult. There the certain error not predicted previously at the stage of the software development may arise. For debugging this type of application, the physical device is needed. The latter may not be available due to its usage by other specialists. To solve such problems, the emulators that simulate the work of a particular system are developed. An article presents the problem of operating the control program multifunction gain-phase analyzer of Clarke Hess 2505 with calibrating coil system. The development strategy for its debugging is created and an emulator for debugging the gain-phase analyzer control program is implemented. It allows the leading engineer to establish the program operation, stability, and resistance to various problems.

Key words: Emulator; Debugging program; Calibration system of magnetometers.

1. Introduction

The technological process over the past few decades has grown significantly and continuously. The great number of devices was created based on various kinds of electronic components. These components perform different processes at different times.

Previously the results of the various devices experiments processed without a computer, which was not convenient, and took a lot of time. Creating the software for devices emulators can improve effectiveness work with devices and process the results in real-time.

One of the existing problems is creating the device interface for different buttons and switches in device operation modes. The solution is to create special programming languages and different operating systems (OS) on their basis. As a result, software for comfortable control of large devices using small personal computers and displaying the results of the execution process and the real system state was developed.

2. The Analysis of Operation Modes of the Gain-Phase Analyzer

Nowadays, the software development process takes a lot of time. The deadlines for delivering tasks can reach up to several work months or even more. It depends on several reasons: the number of employees in the company, organization, enterprise, etc.; the complexity of the problem, which is determined by the features of various development methodologies. As a result, it divides into subtasks and relies on different subdivisions.

Since developers may not always predict a complete list of software use scenarios. The end-user

may stumble upon a certain kind of error, about which report to the developer for their subsequent solving. Errors might be caused by different factors, including the use of hardware resources, which prevents the implementation of input information processing.

Almost all of the users eventually encounter such a problem, that the program does not respond to any actions, for example using the control buttons, closing the program, etc. This usually happens because not only custom applications use system resources. The program performs necessary actions for some time. That is happening at the expense of the system call that reaches the program, which restores work. A similar problem is during the next research using the multifunctional gain-phase analyzer Clarke Hess 2505 (Fig. 1).

This experiment applies to the calibration of inductive magnetometers, in particular LEMI (Fig. 2) [4]. The general list of hardware equipment consists of the analyzer, Helmholtz coils (Fig. 3) [5], amplifier, and some kind of PC to display and set initial values and get the output, which facilitates the work of the use engineer [3]. Communications are performed through a serial port. Firstly, data is stored in the buffer and later subsequently transmitted in the sequence.

The user cannot affect the system processes. If he uses the system resources then it is a possible uncontrolled situation with lost important data. This shortcoming is a critical and difficult prediction in the development stage of the analyzer control program. For solving the problems, you can use an edit of several lines of code, or the complete development of a whole test system that simulates the work of a particular system, device, or their groups. Therefore, the creation of an emulator, which simulates a work of analyzer, is an actual task.

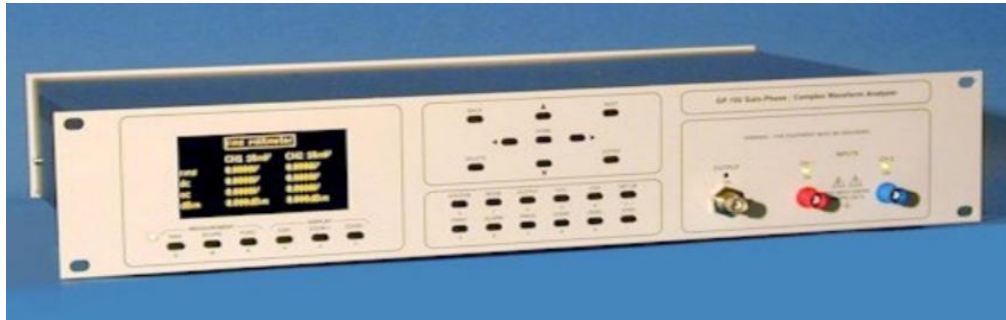


Fig. 1. Multifunctional gain-phase analyzer Clarke Hess 2505



Fig. 2. Magnetometer LEMI-120



Fig. 3. Laboratory installation for analysis the Helmholtz coils using the multifunctional gain-phase analyzer

3. Development of the Gain-Phase Analyzer Emulator

The emulator [8] is a software system that allows you to create an exact program copy of a computer model or other computer hardware. It simulates mobile phones for testing developed software, operating systems, and others. For example, emulator tests and improves the platform operation for users' purposes.

In this paper the developed emulator simulates one of the operation modes of the multifunctional analyzer. On Fig. 4 the interface of the analyzer control program is depicted. The work begins with the selection of a serial port for communication. The “Start” and “End” fields contain information about the initial frequency of the range and the final. The “Steps” is the number of steps in the defined range. “Amplitude” is the signal level at the output of the analyzer. In the “Speed” field you introduce

the speed of each step calculation. The lower speed gives higher accuracy due to the great number of measurements at one point, from which the average value is selected. "Freq" is the initial and final frequencies of the range on the graph, allowing the user to stretch or narrow for convenience in a visual study of graphics. "Graph" is a field that allows selecting the type of graph (amplitude at the output of the analyzer and frequency, the amplitude at the input analyzer and frequency, phase and frequency, conversion rate, and frequency).

The values in the relevant fields send to the analyzer after the work start for further research. At the result output data is displayed in the table that can be saved and displayed in the graph for a detailed analysis.

Relying on the functionality of the control program and documentation of the device itself the task is formulated. Firstly, for this mode to receive data is necessary to know when the measurement results submit to the control program. Secondly, we need to output this data. Additionally, the emulator needs to provide the possibility of displaying the finished table of the results and the construction of the graph based on its.

One of the necessary features is a selection of a serial port, through which the emulator commutates with the control program. It is necessary to provide the ability to send data with a specific delay to configure the control

program. Thus, under any conditions the resulting data display correctly.

4. The Research Results of the Designing the Emulator

Emulator work begins with the selection of a serial port through which is carried out the communication with the control program. For its choice displays all unused serial numbers connections. It is convenient and necessary for providing the existing commutations security. Since the user selects the port then the program activates other items for further operation.

The emulator designs in such a way that it always "listens" whether any data has come from the control program. The "Start" command comes with all commands and given values. It starts the entire debugging process.

There are three modes of sending available messages for the user. This method allows you to configure the data exchange manually or automatically. The user can send only one command in the manual mode. The emulator records in the appropriate fields everything data, commands, and most user manipulations. That content a user can save for further analysis and possible modification of the control program. The result of the developed program is located in Fig. 5.

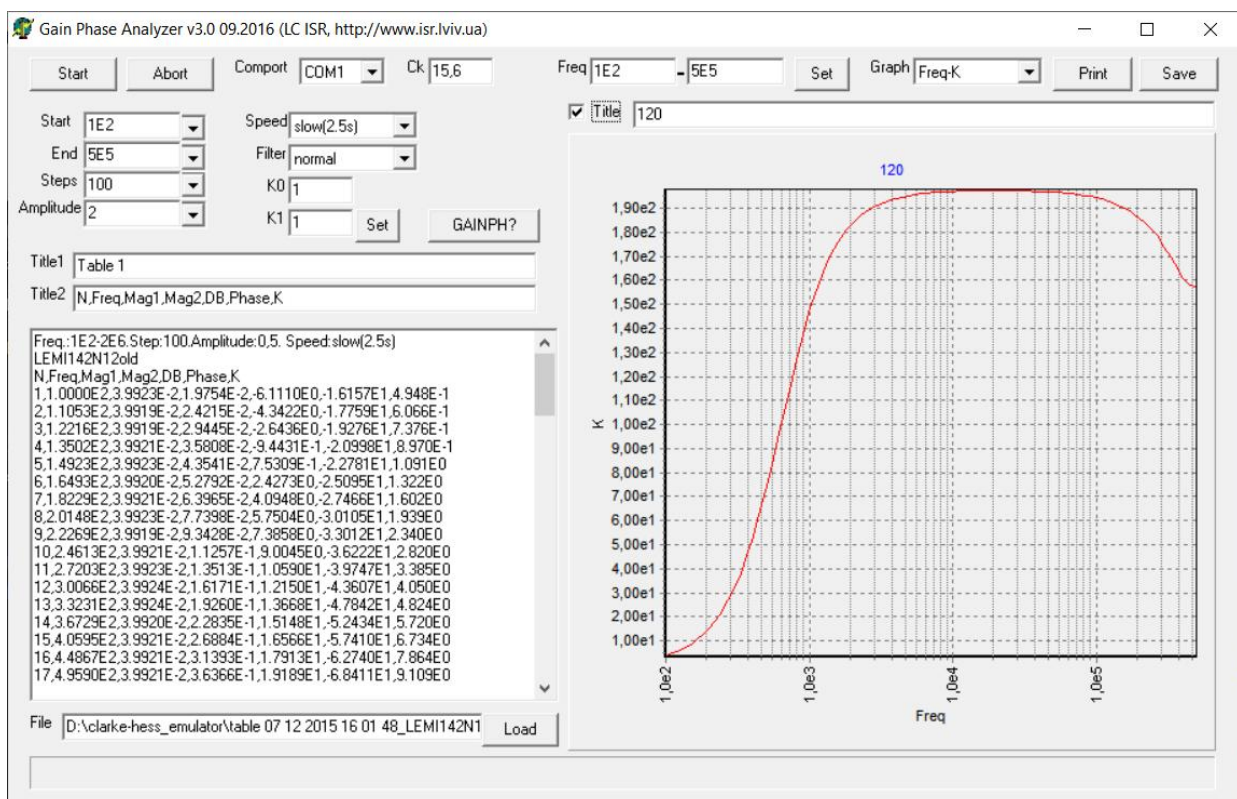


Fig. 4. Program Management

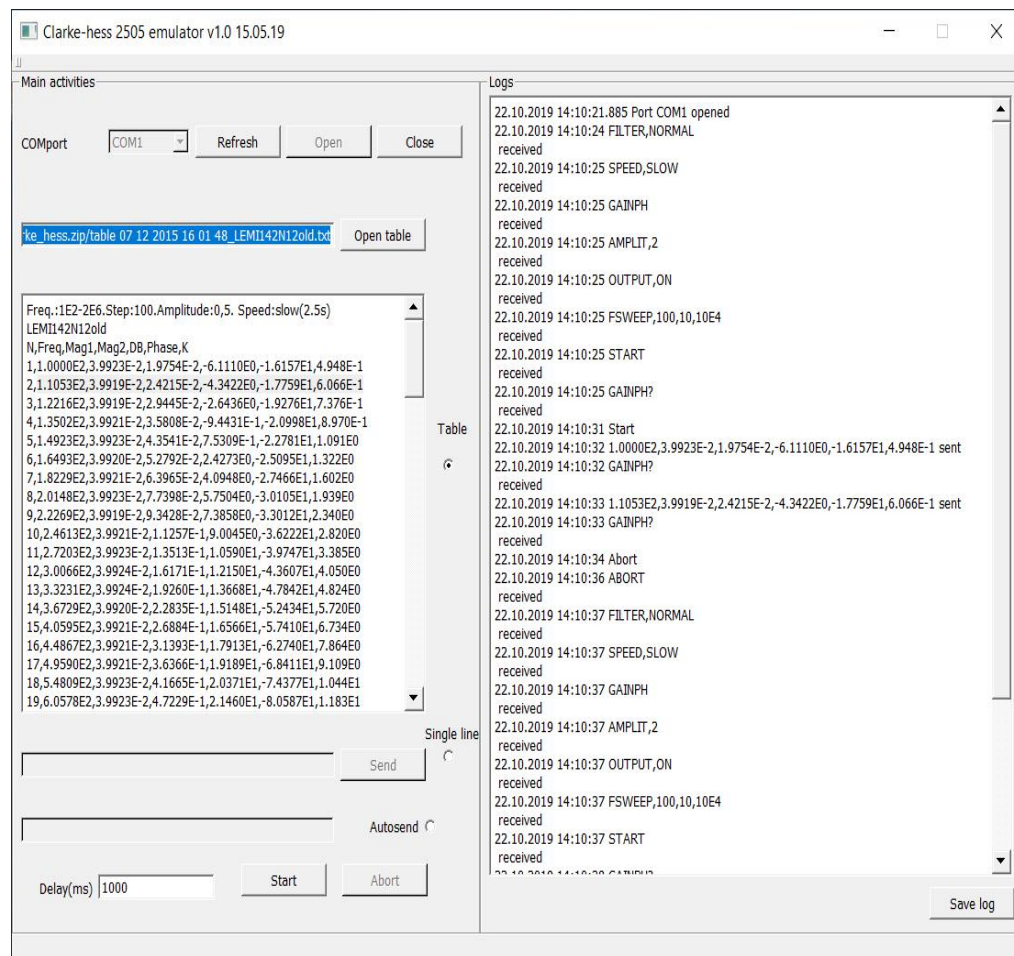


Fig. 5. Emulator interface

5. Conclusions

In this paper the developed software for an emulator of multifunctional gain-phase analyzer Clarke-Hess 2505 is considered. The characteristics of this emulator are the following:

- displaying unused serial ports in the system;
- ability to choose one of three command sending modes;
- ability to choose a table to simulate a true experiment;
- setting the delay;
- displaying of actions taken during the use;
- saving obtained records.

Due to the developed emulator application the control program of a multifunctional gain-phase analyzer is redesigned. The proposed emulator solves the optimization problem as well as the system resources optimal usage.

6. Acknowledgment

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7. Conflict of Interests

There is no conflict of interest while writing, preparing, and publishing the article, as well as mutual claims by the co-authors.

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