

## COMPUTER AIDED EQUITHERMICAL ADJUSTMENT IN THERMAL MANAGEMENT

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***Abstract:** The paper describes the possibilities of communication adjustment system with superior layer, represented by software package created by PAUFEX Co. for adjusting of regulator using ekvithermical regulation by scanning temperature of water in central heating and outdoor temperature with servo-unit controlling converter vent.*

***Key words:** Ekvithermical regulation, outdoor temperature, Servo-unit controlling converter vent.*

### 1. INTRODUCTION

Question of computer aided outdoor temperature compensation goes out from its utilization in regulation processes. In our case this idea is represented by micro-processing system used in thermal management, which was developed by Paufex Company Presov, Slovakia. This system provides following operations:

- outdoor temperature compensation of central heating equipped with three or four way converter vent
- recording of outdoor temperature, output and input valve of central heating 's water, and the temperature of warm water with recording cycle 15 minutes, storing of information for 1 month period and possibility of loading these information into computer via RS323 interface.
- temperature measuring of warm water
- regulation of circulating pump.

### 2. DESCRIPTION OF USED REGULATION SYSTEM

Used system is a cap of outdoor temperature compensation regulation by scanning temperature of water in central heating and outdoor temperature and regulation of servo-unit controlling converter vent. Through selected modes (time mode PROGRAM1 and PROGRAM2, mode of permanent damping, mode of permanent heating a off mode) and

selection of equithermical curve it can be controlled asked temperature of central heating's water. The main goal of solving our proposition was performing of basic equithermical curve numbering through computer using our software application.

There are available eight basic equithermical curves. Movement of curves in direction of Y axis is given by selected mode. There is possibility to choose 4 (1-4) levels for movement of curve, however for each level it is possible to do movement selection in range from -50 to +20 °C.

In mode of permanent damping system adjust the temperature of central heating according to basic equithermical curve moved about movement set up for level 4.

In a mode of permanent heating system adjust temperature of central heating according to basic equithermical curve moved about movement set up for level 1.

In case of both time modes (PROGRAM1 and PROGRAM2) system adjust the temperature of central heating according to equithermical curve moved about movement following the level instructions set up for each time partition. The system has one week working cycle. Working week is divided in 3 parts (Monday to Friday, Saturday and Sunday). In off mode system shuts off the converter vent of central heating and the circulating pump. System in case if it is in mode of permanent damping or in time modes (by equithermical curve No. 4) and the temperature outdoor temperature is above 5°C disconnects the circulating pump too. Adjusting system also ensure the antifreeze protection of central heating (in case when the central heating is off and the outdoor temperature falls under 1°C or the outgoing temperature of central heating water is under 5°C.).

Certainty of this system is storage of measured temperatures with a measure cycle 15min.

In cases of long-time disconnection of central heating system ensure periodical usage of convert vent to prevent its damage.

Upper level of this system is represented by computer. Software application, which was programmed to handle described problem was build in FoxPro with usage of SQL language commands. The usage of this software was allowed by shape of recorded values, which satisfy exaction of relational tables, where information of database are located in tables of defined structure with appropriate numbers of rows and columns.

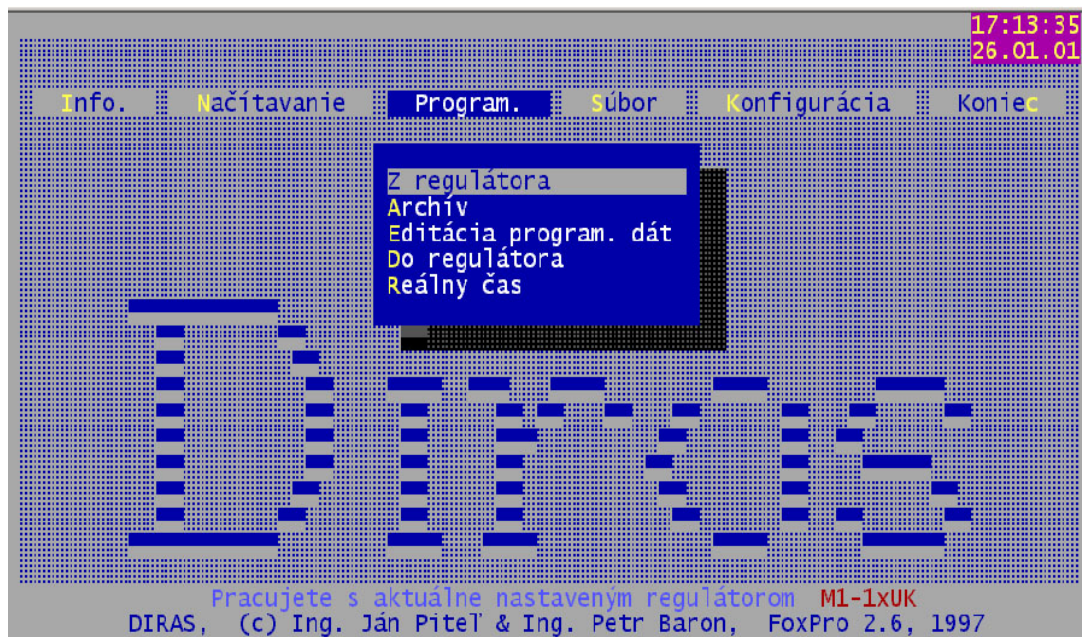


Fig. 1. Software environment of outdoor temperature compensation controlling

### 3. COMPUTER AIDED OUTDOOR TEMPERATURE COMPENSATION

Relational database is defined by data sorted in tables equivalent to database files. Such table is generated by rows and columns. Each object has its relative in one row in relational table. Columns contain individual data about objects involved in table, which are to be stored, meanwhile each separately created table is represented as a relation – in mathematic sense as a subgroup of Cartesian conjunction of group of objects and a group of attributes. In case of multiplex occurrence of one attribute is in more than one table, there is possibility of merging these tables (factorization). Further operations are filtration (selection of rows according to defined key) and projection (selection of columns from one or more tables).

Software application is able to show records of measured temperature in four text files formats (according to their filename extension) or in one database file. The whole system of outdoor temperature compensation efficiency is ensured by its managing by computer. Programming is executed via menu PROGRAM. (Fig. 1). After confirmation of entry “Z REGULÁTORA” computer loads needs information from regulator. Transfer speed, name of working directory, amount of transfer delay or repeating of transfer in case of mistake in communication is adjustable in a line menu “Konfigurácia”. At the loading of instructions to database those are processed with use of software utility. Possibility of editing this database is interposed thru communication window (Fig. 2). after its activation from the menu bar “EDITÁCIA PROG. DAT” (Fig. 1).

Desktop is divided in five service utility screens (Fig. 2):

- Štartovacia obrazovka – starting screen
- Nastavovanie parametrov – parameters set up
- Teploty - temperatures
- Zmena režimov – modes selection
- Ovládanie výstupov – output control

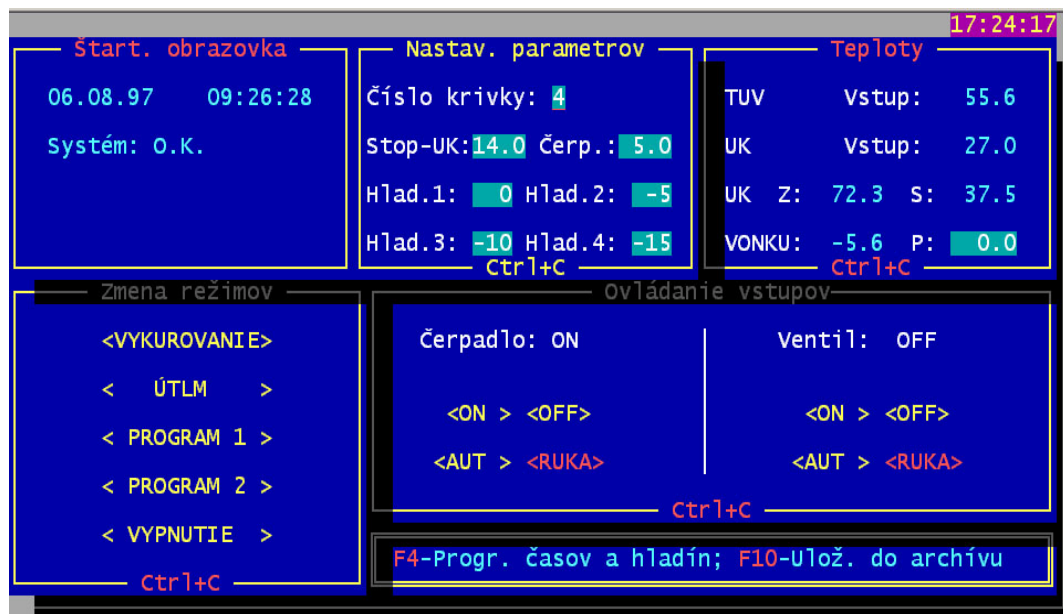


Fig. 2. Environment of control data editing

Starting screen contains of actual time, date, system status (ERROR or OK) and selected mode of adjusting.

Screen of parameters set up contains following information:

- Number of active equithermical curve
- Average outdoor temperature of automatic central heating (10 – 20)
- Levels for selecting equithermical curve

Screen of temperatures contains following information:

- Real temperature of central heating's water
- Requested and real temperature of central heating's water
- Real and average outdoor temperature

Screen of modes selection contains so called text buttons. By activating one of these buttons system working mode could be changed. This change also appears in starting screen. Text

buttons are also contained in screen of output control. This screen is divided, extra for circulating pump selection and modification of adjusting and extra for adjusting and selection of convert vent.

In case of requirement for saving of managing instructions, are these stored in registry file, where windows for saving of information is automatically activated according to place of appearance of managing system. Application allows to review and program of time programs (Fig. 3). Screen is divided in several parts separately for time mode PROGRAM1 and PROGRAM2 and working cycles Monday-Friday, Saturday and Sunday.

Set up parameters are imported in regulator via menu bar PROGRAM and DO REGULATORA. System communicates with regulator. In case of error, is an error message showed on screen of computer.

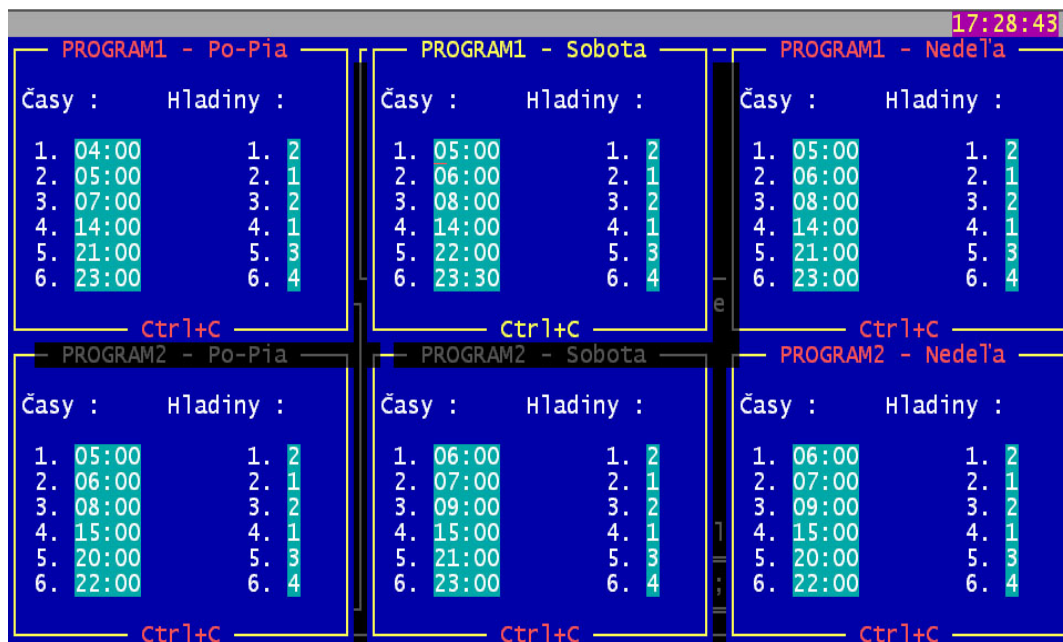


Fig. 3. Environment of control data archiving

#### 4. CONCLUSION

Used hardware interface for communication between computer and devices is RS232C. RxD, TxD and GND signals are used. Transfer rate is adjustable between 9600 and 19200 Bd. Systems of this level don't initialize communication themselves. They only answer to prompt initialized by upper level. Physical parameters of asynchronous line is from 9600 to 19200 Bp, without parity 8,2.

To each information, which has entered in the adjusting system, have to exist a appropriate respond. This answer always contains a number of prompt information. Answer

for registrations information could be positive with code OK (00H) or negative with erroneous code (FEH) and 1 bite error code.

Described regulation system communicates with upper level, which is represented by computer. This connection arranges our system among wider systems of measuring and regulation. This way of regulation station handling make work with system much more easier and at last it eliminates possibilities of creation of mistakes caused by incorrect instruction import to system directly thru regulation station controlling unit.

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