JPRS-ESA-84-031

15 August 1984

East Europe Report

SCIENCE & TECHNOLOGY

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CONTENTS

CZECHOSLOVAKIA

Selections on Computer Technology in CSSR
(SDELOVACI TECHNIKA, No 3, 1984) 1

Computers Yesterday and Today, by M. Okrouhlik
Monolithic 8-Bit Converter, by Jiri Jilek
Microcomputer-Aided A/D Converters, by Peter Mifkovic
Yield of U 8080
Tesla Catalogue of Electronic Parts

Next Stage in JSEP 3 Development
(VYBER INFORMACI, No 2, 1984) 31

EC 1027 Computer System
(Josef Cmiral; VYBER INFORMACI, No 2, 1984) 34

GERMAN DEMOCRATIC REPUBLIC

Television Viewer, Radio Listener Statistics Given
(RADIO FERNSEHEN ELEKTRONIK, No 3, 1984) 39

Microelectronics Research Coordination Viewed as Inadequate
(Hans Steinhagen; RADIO FERNSEHEN ELEKTRONIK, No 4, 1983) 40

New Electronics Standards Announced
(RADIO FERNSEHEN ELEKTRONIK, No 4, 1984) 43

Rostock EDP Cooperative Outlined
(RECHENTECHNIK-DATENVERARBEITUNG, No 5, 1984) 45

ROMANIA

Current Concerns in Fields of Hydrology, Meteorology
(C. Diaconu; STIINTA SI TEHNICA, Jun 84) 47

SELECTIONS ON COMPUTER TECHNOLOGY IN CSSR

Computers Yesterday and Today

Prague SDELOVACI TECHNIKA in Czech No 3, 1984 pp 86-89

[Article by Eng M. Okrouhlik, CSc]

[Text] We have been witnessing an exceptionally tempestuous developmennt in computer technology over the past several decades. Only 20 years ago a computer with a 64-kilobyte memory required a large air-conditioned room with many operators, while today we can accommodate 0.5 megabytes on a desk (e.g., the Hewlett-Packard 9845 model) and 48 kilobytes just about fit into a pocket (the HP075C personal minicomputer with dimensions of 25x13x3 cm weighing 730 g). Computation speeds have increased during the period of computer development by more than 1000 million.

The abacus was used in antiquity for mechanizing such mathematical operations as addition and subtraction. It was used by ancient Chinese, Greeks, Romans--and is used to date by the Russians and Japanese. Methods facilitating the easy multiplication of multidigital numbers on abacus can be found in older literature [1].

The first mechanical aid for easier addition and subtraction of numbers with automatic transfer of order was the "calculating machine" devised at age 18 by the French mathematician, physicist, philosopher and writer Blaise Pascal (1623-1662). The device is described in Diderot's Encyclopedia of 1751. Some 50 specimens remain preserved to this day.

Charles Babbage (1792-1871) started designing in 1822 a "differential calculating machine" which he demonstrated before the Swedish Academy of Sciences in 1833. In 1848 he started designing the so-called "analytical engine," also based on a mechanical principle, which, however, resembled in its operational capacity and arrangement today's computers. The computation sequence was perforated onto the so-called Jacquard cards that were used to control the operation of weaving looms. The machine, after performing each operation, stored the results in a "number storage"--today we would call it memory--and picked up a card containing the next instruction. The calculator could progress forward or backward in the sequence of instructions and perform recurring parts of computation--cycles. Due to mechanical difficulties attendant to the machine's construction, it was not finished by either himself or his son, Henry Prevost Babbage. Nevertheless, the lofty appellation of computer pioneer justly belongs to Charles Babbage, because he managed to conceive the principle of a programmable digital computer with a century's lead in time.

The designer of the first actually operating computer in today's meaning of the word--i.e., a machine performing a sequence of logical and mathematical operations with a set of input data in accordance with the intent programmed into it--was Konrad Zuse (b.1910) in 1936. His Z1 computer, which he built at home, was constituted primarily of relay circuits and operated in binary logic. Another electromechanical model, the Z3 built in 1940, made it possible to introduce the program by perforated tape and performed arithmetics with a floating decimal point. The German Reich Patent Office refused to award patent privileges to his invention on the grounds that "the technical design is not sufficiently advanced." The computer was destroyed during one of the air raids on Berlin. K. Zuse devised additional Z4 and Z5 relay computers after the war that operated reliably at Zurich University and at the Leitz Optical Plant until 1955.

The first computer in the United States was a single-purpose electron tube device built in 1937 by John Vincent Anastasoff at Iowa State University. Several other computers for processing single-purpose problems turned up in the United States during the 1940's.

The ENIAC computer (Electronic Numerical Integrator and Calculator), which originated at the University of Pennsylvania in the United States, is erroneously often referred to as the world's first computer. Nevertheless, its prior claim to the title is based on the fact that it was suited for general programming and was fast for the ten-prevailing conditions--it performed up to 5,000 operations per second.

The first postwar computer in Europe was the British EDSAC, built at the University of Cambridge. The second in Europe and the first in the socialist countries was the Czechoslovak SAPO automatic computer [2-4].

The SAPO computer project started out under the supervision of A. Svoboda in the Department of Mathematical Machines of the Central Mathematical Institute as early as 1951. The first computation was carried out in September 1957 and it was launched into operation in full configuration in February 1958. Its implementation was participated in by the Laboratory for Mathematical Machines of the CSAV [Czechoslovak Academy of Sciences], the Physical Research Facility of Czechoslovak Heavy Machine Building Plants (drum memory) and Tesla-Elektronik (the relay part). The SAPO computer used binary arithmetic, 32-bit word length. Its drum memory had a 1,024-word capacity and the computer operated at a speed of 5 machine operations per second. Dust caused a fire in the relay part of the machine in February 1960. Even though only 2 percent of the equipment sustained damage by fire, it was decided not to repair the machine.

The development of the SAPO computer brought valuable experience to our designers that enabled them in subsequent years to come up with the EPOS computer, which was activated in 1962. The EPOS, formed by 300 electron tubes and 1,000 polarized relays, was a very advanced concept for its time--external time sharing, modular concept, the reliability provided by its self-correcting code [5].

The first computers used a program on perforated tape or on punch cards. The computer read off sequentially the individual instructions and processed in accordance with them the input data, which it read off in the same manner. These were computers with so-called external control. The computer did not have at its disposal all the data recorded in the program, but only the part that was in its scanning device at the moment. The entire process was considerably accelerated by storing the program in an expediently accessible internal computer memory designed in 1948 by John von Neumann and, moreover, made it possible for the computer to modify the processed program in accordance with the data input.

In the early 1950's computers came to be equipped with ferritic memories consisting of a network of magnetic cores. The latter were magnetized into two possible states whereby they represented the value 0 and 1 and were thus able to store binary information.

The continuing progress in electronics led to ever smaller, faster and more reliable computer components. After relays and electron tubes that were used for devising flip-flop circuits there came semiconductor diodes and transistors.* This marked the period of the second generation of computers.

The subsequent progress of computer development was considerably affected by the advent of integrated circuits, which were independently invented in 1959 by Jack Kilby (Texas Instruments) and Robert Noyce (Intel Corporation). Integrated circuit technology formed the basis for the third generation of computers.

In the 1960's there appeared on the world's markets the so-called large computers of manufacturers such as IBM, CDC, Borroughs, Univac in the United States, ICL in Great Britain, Elliott in France, etc. The increase in the number of computers is relatively slow--only 440 computers were registered in various countries of the world in 1964. Each computer represented at the time a multimillion-dollar investment and its use was limited mostly to military, nuclear and space research.

The increasing density of integration of components in a single integrated circuit--which can be seen in Figure 1, the vertical scale of which is logarithmic--led to reductions in the price of computer components and of computers themselves and then also to the origin of microprocessors (Frederico Faggin--Intel Corp--1971). Computers built with microprocessor components are designated as machines of the third-and-a-half to fourth generation.

The number of computers started rapidly increasing by the late 1960's and the early 1970's. For example, IBM 360/370, CDC 3300, 6600, in socialist countries the EC series divided into small computers EC1010, 1020, 1021, 1025, 1027, medium EC 1030, 1033, 1040, 1045 and large EC 1050 and 1060. Minicomputers, microcomputers and calculators made their appearance later.

*The foundations for the development of the transistor were laid by the research of the American physicists John Bardeen, Walter Houser Brattain and William Bradford Shockley in 1946-1948.

Minicomputers were initially built as small computers that in comparison to large computers were characterized by small dimensions and a limited memory--as a rule 64 kilobytes--and also a small number of peripheral devices. They used 16-bit word length, which was a logical selection at the time, because 16 bits are just enough for direct addressing 2^{16} = 65,536 memory cells. Representatives of the mentioned category were, e.g., HP-2100, HP-21MX from Hewlett-Packard, PDP-11 from Digital Equipment Corp. and many others. In addition to imported minicomputers, we find today in our country Czechoslovak minicomputers ADT 4316 and 4500, the SMEP [system of small electronic computers] series (SM3, SM4 and SM52/11) and the ELSLA JPR 12 R minicomputer.

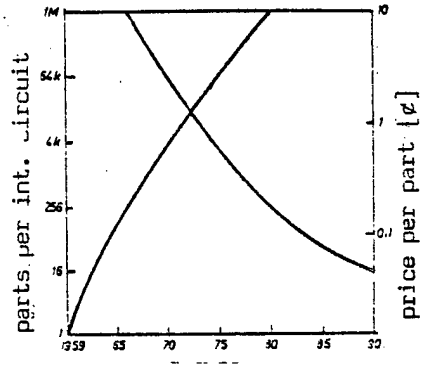


Figure 1. Graphic representation of the increasing number of parts per integrated circuit and the decreasing price per part

Increasing density of integration made it possible to equip minicomputers for the same price with larger memories, the capacity of which reached 2 to 4 megabytes by the late 1970's. Large memories facilitated multiprogramming and a greater passage of data through the computer, but the 16-bit word started to prove to be a great limitation, because it called for complicated addressing of the memory provided by the program. Top minicomputers of the early 1980's come equipped with 100-megabyte disks and facilitate multiprogramming for dozens of users, operate with virtual memory, have at their disposal many higher programming languages such as FORTRAN 77, COBOL, PASCAL, APL, BASIC, special languages for sorting of data, for graphic interpretation of results, etc. A representative of minicomputers of this category is, e.g., the HP-1000 A 900 model 19, which has a memory expandable up to 6 megabytes, a 12.5 megabyte virtual memory, matrix and vector processes, etc.

Complications caused by 16-bit words in addressing memory led in the early 1980's to the design of a minicomputer using a 32-bit word, which makes it possible to address directly more than 4.10^9 memory cells. Seven such minicomputers appeared on the market as early as 1981. By way of example, let us name the Eclipse MV/8000 from Data General, VAX-11 from Digital Equipment Corp, and Series 50 from Prime Computer.

Microprocessors were originally 8-bit computers with memory on the order of approximately 4 kilobytes, programmable in machine code, meeting single-purpose requirements. Among their best known producers are Intel, Motorola, Texas Instruments, Zilog, etc. Currently available in the CSSR are 8-bit

microcomputers Mikrosat (VUAP [Research Institute for Means of Automation] of ZPA [Plants of Industrial Automation] Prague), SAPI-80 and JPR 1 (Tesla Strasnice), SM50/40 (ZVT [Computer Technology Plants] Zilina), MSS 80 (Tesla Kolin), etc., available in the form of modular systems with a minimum of software. The capabilities of microprocessors with increasing integration kept improving the microprocessors became the basic modular block in digital watches, video games, automatic washing machines, ski lifts and calculators. They also led to a considerable proliferation of personal computers (Commodore Pet, Apple, HP-75, Sharp 15000) which usually have an approximately 48-kilobyte memory and work, as a rule, with the language BASIC. Their producers make also provisions for their connection to peripheral equipment and to other computers--with the personal computer playing the role of an intelligent terminal. The representative of a simple and inexpensive computer is the Sinclair ZX-80, with dimensions of 25x18x0.5 cm, which with a 1-kilobyte memory and a translator of the language BASIC cost in 1980 77.95 pounds sterling*. The top scientific and technical computers include models 85, 86 and 87 from HP. In the 87 model the memory is expandable up to 640 kilobytes, offers a selection of programming languages and operational systems, connection of many additional peripheral units, etc.

Our market offers in this category the EMG777 desk calculator from Hungary, programmed in BASIC, equipped with graphic display, an elastic disk and the M3T intelligent terminal from Metra Blansko, equipped with ASSEMBLER and BASIC with a possibility for connecting additional peripheral units in accordance with the IMS-2 standard.

The 8-bit word became too short for microprocessors as well and so in the early 1980's we witnessed their transition to 16 bits (iAPX 86/88--Intel, MC6800--Motorola, Z8001, Z8002--Zilog). These then formed the basis for microcomputers, which are difficult to differentiate at first sight from existing minicomputers. The Intel 86/330 microcomputer based on the 8086 microprocessor offers to its user 320 kilobytes of memory, a 1-megabyte elastic disk, a Winchester-type disk (i.e., a nonremovable disk which runs in a medium perfectly sealed from the ambient atmosphere for improved reliability and higher density of recording) and languages PASCAL, FORTRAN 77, BASIC and COBOL. It is offered for under $20,000 (January 1982). But development does not stop even here. Zilog announced a 32-bit Z80000 microprocessor in 1981, the 32-bit Intel 432 microprocessor came on the market as early as 1979. Hewlett-Packard introduced in 1983 a 32-bit desktop microcomputer with a 2.5 megabyte working storage and a 55-ns processor cycle (See [6]).

In addition to very large computers, such as the IBM 3033 model or the CDC 7600, of which around 100 existed in 1980 worldwide, in the latter half of the 1970's there started to appear the so-called supercomputers or giant computers.** In the first generation they were the CDC Star 100

*The same producer offers in 1983 the ZX-Spectrum model with 48 kilobytes of user memory for $250.

**Supercomputers are characterized by high operational speed, extensive operational memory and a large and easily accessible reserve memory.

and ASC (Advanced Scientific Computer) from Texas Instruments in 1974. Four DCD Star and seven ASC computers were installed by 1980. In the second generation of supercomputers they were the Cray-1 (1975), CDC Cyber 203 (1976) and Borroughs Scientific Processor (1977). Depending on their operational principle, supercomputers can be divided into vector and parallel computers.

Vector computers (CDC Star 100, DCD Cyber 203, 205, Cray-1) come with special technical equipment providing for fast and effective performance of vector operations of the type x^Ty and $ax + y$ where x,y are large-dimensional vectors ($n > 100$). For example, addition of the vectors indicated in Figure 2 occurs simultaneously for 64 registers with 64 bits each (i.e., containing one real number in semilogarithmic form). Each operation has a certain rise time, the computer's speed decreases with successive scalar operations. Data regarding computation speeds of vector computers are shown in Table 1.

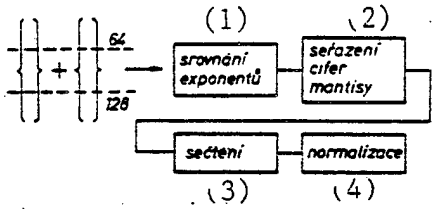


Figure 2. Grouped diagram of vector addition

Key: (1) Comparison of exponents
(2) Arrangement of mantissa digits
(3) Addition
(4) Normalization

Table 1. Vector-type computers

(1) Počítač rok zavedení	(2) Doba cyklu procesoru [ns]	(3) Počet arit. operací s reál. čísly za 1 s [v mil.]; reálná čísla representovaná 32/64 bity		
		+	×	/
CDC Star 100 1974	40	100 / 50	100 / 25	50 / 12,5
Cray — 1 1975	12,5	80 / 80	80 / 80	25 / 25
CDC Cyber 205 1976	20	200 / 100	200 / 100	25 / 12,5

Key: (1) Computer / year of introduction
(2) Processor cycle duration [ns]
(3) Number of arithm. operations with real numbers per second [in millions]; real numbers represented by 32/64 bits

The second generation of supercomputers differed from the first generation in that it had built-in fast scalar processors for nonvector operations. The memory of Cray-1 and CDC Cyber 205 computers is 4 million 64-bit words. Twenty Cray I computers were installed by 1980. The price of supercomputers in 1980 ranged between 5 and 15 million U.S. dollars. The Cray X-MP computer undergoing testing at the present time is considered to be the fastest contemporary computer, with a processor cycle duration of 9.5 ns (See [7]).

Parallel computers (a representative of which is the Bourroughs Scientific Processor) consist of several identical processors and their requisite memories. Each processor processes the same sequence of instructions for various data in parallel. Algorithms for parallel computers, their synthesis, analysis and implementation are described (with quotation of many references) in, e.g., [8]. The BSP computer uses 16 parallel processors, its overall memory is 8 million 48-bit words. The number of bits reserved for the mantissa is 36, 1 bit for the mantissa sign and 11 bits for the exponent. The processor cycle duration is 160 ns. Effective speed for basic arithmetical operations with a 48-bit real number is shown in Table 2 (see also [9-11]).

Table 2. Effective speed

Parallel Computer 1977	Arithm. Operations			
	+	x	/	SQRT
Number of arithm. operations with a 48-bit word per second [in millions]	50	50	14	8

Another parallel computer comes from the ICL company. It uses 4096 microprocessors and was installed at the computer center of Queen Mary College in London in June of 1980 [9]. A computer from the same company was used in experimental operation even earlier (1974) (then called a multiminicomputer) and made use of 18,432 processors arranged into a 128x144 network. We can envision the use of this computer in the solution of a physical problem described by a system of partial differential equations with two spatial coordinates and time. In the solution of such a problem on an ordinary computer by the method of networks, we generate for the spatial network a two-dimensional field of variables that we count by means of differential formulae and store them in memory for the individual time "planes." In parallel processing, we can use one processor for each junction point of the network and process the values of variables in the problem simultaneously. The processor's demand on time in multiplication was 40 ns, which represents 25.10^6 multiplications per second [12].

The continued increase in computer speeds is starting to be limited by the length of electric conductors between individual components--in addition to continued miniaturization, higher speeds could be attained by use of the so-called Josephson effect. B.D. Josephson (Nobel prize laureate for physics in 1973) laid the foundation for a new sphere of phenomena, the so-called weak supraconductivity. Weak supraconductivity is connected with very weak critical currents and very weak magnetic fields on the insultaion barrier between two supraconductive electrodes at temperatures approaching absolute zero. The thickness of the insulation barrier is on the order of tens of atoms. The Josephson effect can be used to devise instruments that by far exceed the specifications of top instruments for the detection of magnetic fields and magnitudes that can be converted to measure magnetic flux [13]. The Josephson effect can also be used for devising a flip-flop circuit with switch-over time less than 8.10^{-10} of a

second (see [14]). The IBM company succeeded in 1979 in producing an integrated memory circuit based on the properties of the Josephson effect. It is envnsioned that a prototype Josephson computer will be available by 1984. It should be the size of a shoe box, operate in a liquid helium bath at a temperature of -269°C, and will allegedly perform 70.10^6 operations per second (see [15]).

The decreasing price of computer hardware is leading to a shift away from centralized computation systems to systems employing distributed intelligence. Independent intelligence helps us to obtain peripheries which enable the central unit to become free of their time-consuming monitoring and control and, in addition, there are also springing up independent centers for data processing formed by minicomputers, personal computers and intelligent terminals. It is obvious that the connection of independent intelligent devices leads to difficulties in communication and control, so intensive efforts are under way toward unification of data transmission that would facilitate the establishment of computer networks either over short distances (LAN--local area network) or over longer distances by means of telecommunications (telephone, television networks and telecommunication satellites).

Thus we encounter the term "distributed data processing." This denotes a system of data processing in which a group of users dynamically shares data sets, programs and computer facilities at various locations. In solving a problem recourse is had to computer means that provide the most effective processing.

The first step toward the implementation of distributed data processing in the 1970's was the introduction of terminal networks by producers of large computers. This made interactive data processing available to a larger number of users simultaneously and considerably increased the computers' capacity for handling a large volume of information.

It is characteristic of terminal networks (see Figure 3) that they call for more complex terminals* which have their own address, a buffer memory, and must be capable of properly reacting to instructions from the operator as well as from the host computer. The computer must have suitable software for controlling the operation of the terminals that facilitates the sequential call-up of individual terminals and provides for compliance with the communication procedures.

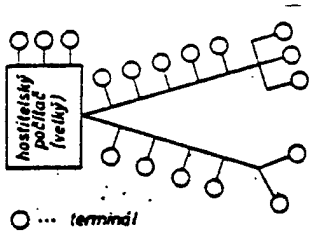
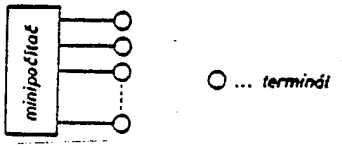


Figure 3. Example of configuration of terminal network
Key to box: Host computer (large)

*In English terminology they are referred to as "smart terminals," as opposed to "dumb terminals," which are devices such as a teletype (TTY)--it prints out the received symbol or transmits it from the keyboard. In addition, there are also the so-called "intelligent terminals," equipped with their own intelligence. [Footnote continued on next page]

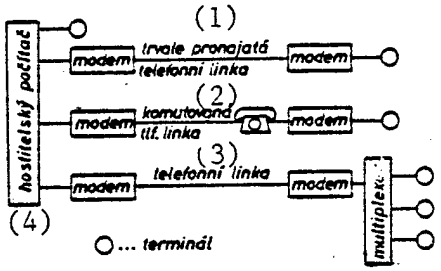
Minicomputer terminal networks. Minicomputers are essentially destined for interactive data processing: they also process smaller volumes of data and, consequently, use simple (dumb) terminals--without any procedural set-up--that are connected to the minicomputer directly (see Figure 4) via converters for input and output (input/output interface cards). Mutual communication is provided for by the control program for controlling peripheries (driver, handler), which forms a part of the minicomputer's operating system.

Figure 4. Diagram of terminal connections to minicomputer
Key to box: Minicomputer



Terminals are connected to computers over longer distances by the telephone network, either rented out permanently or commuted by telephone lines (Figure 5).

Figure 5. Example of connection of terminals to computer via telephone network
Key: (1) Permanently rented-out telephone line
(2) Commuted telephone line
(3) Telephone line
(4) Host computer



The use of a telephone line and a host computer can be improved by utilization of the so-called multiplex, which facilitates the connection of several users to the same line by periodically assigning to each user a certain period of time in which to transmit or receive information.

Local networks (LAN--local area network) are used for connecting terminals, computers, measuring instruments, office equipment (processors for text processing) and data sets into a single unit, over relatively short distances, within a single building or enterprise. Local networks differ from terminal networks in that none of the connected computers plays a control role. Depending on the producer, there are again many ways of providing for data transmission in a local network--problems arise at the point when local networks (set up by different producers) need to communicate with each other. Ethernet and Cambridge Ring are the most widely used systems at the present time.

Ethernet is introduced as a standard equipment by the Xerox, DEC and Intel companies for devices that are capable of independent operation--computers, minicomputers, personal computers, intelligent terminals, etc. When a terminal wants to send out a message, it first examines the state of the

[Footnote cont'd] They can operate as terminals, are usually equipped with an external memory (magnetic tape cassettes, elastic disks), and can be equipped for processing of graphic information. In contrast to alphanumeric terminals which process text, they are called graphic terminals.

transmission line. If it is free it starts transmitting, whereby it simultaneously compares what is in the line with the contents of its buffer memory, which contains a copy of the message being transmitted. If the contents are not identical, it is assumed that there occurred a collision with a message transmitted from some other point. Both transmitting points become silent, wait for a certain randomly determined time and attempt to retransmit the message. In view of the high transmission speed of 10 megabits per second, the probability of message collision is small. Messages are transmitted in blocks which contain up to 1,500 kilobytes of data, the recipients and senders address and control symbols. Ethernet cannot transmit telephone calls and pictorial data (see [6]).

Cambridge Ring is a local network developed in Great Britain at Cambridge University. Users are interconnected by a circular network. Through the network circulates a finite number of information carriers--blocks which are read by each terminal connected to the network. When a terminal wants to transmit a message, it fills the closest empty block with data. The terminal for which the message is destined changes the control bit in the block, thus acknowledging receipt of the block. The block continues to circulate, returning to the sender who discerns by reading the value of the control bit that the message had been received and that the block can be reset to clear for subsequent transmission. The system has been offered in Great Britain by the Logica VTS company since 1981 (see [6]).

The GPIB (General Purpose Interface Bus) can be considered to be a certain type of local network for connecting measuring instruments, peripheral units and a minicomputer or a personal computer by means of a uniform bus bar made up of 16 conductors, 8 of which transmit instructions and eight of which transmit data. However, one of these devices must assume a control function. The connection system in the CSSR is prescribed by the IMS-2 standard. It is the equivalent of the IEEE-488 standard originated by the Hewlett-Packard company (HP-IB). At the present time there are more than 1,000 devices from 170 producers, including Czechoslovak ones, which are compatible with the listed standard (see [10]).

Another rapidly developing system for data transmission is the connection of terminals, computers, their peripheral units and data sets via the public telephone network with television sets in households. In Great Britain the system is called Viewdata or Teletext, in France Teletel and in the FRG Bildschimtext. Initially the systems facilitated one-way transmission of information regarding the weather, movie theater programs, etc. The television sets are gradually being equipped with supplementary keyboards, and the television set owner thus becomes the user of a terminal through which he can obtain information of an encyclopedic nature stored in the relevant data banks, tend to his banking affairs or communicate with other users of the system, play computer games or store into the computer his own programs and run them. However, in doing so he deprives himself of watching television programs.

We could find many examples of the use of computers, terminals and networks. The important point is that computers, minicomputers, personal computers and computer networks serve various purposes and it is up to us, the users, to make the correct selection before the expended investment of the amount of programming involved prevents from deciding to find a substitution for the selected computer.

A computer can be our patient and invaluable helper, but it will not give us any more than we put into it and will punish us for every ill-advised program.

Lady Ada Lovelace, a close friend and collaborator of Charles Babbage, wrote in this regard as early as 1844: "The analytical engine has no intention of creating anything. It will do only what we manage to tell it to do."

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Monolithic 8-Bit Converter

Prague SDELOVACI TECHNIKA in Czech No 3, 1984 pp 93-95

[Article by Eng Jiri Jilek: "ZN427 A/D Converter"]

[Text] The ZN427 A/D is a fast 8-bit monolithic converter operating on the principle of successive approximation. It comes equipped with a three-state output for easy connection to a microprocessor bus bar. The integrated circuit contains a D/A converter, a fast comparator, logic for step-by-step approximation and a reference source (Figure 1). It is also possible to use an external fixed or variable source of reference voltage, thus expanding the circuit's applications. The input signal can be unipolar or bipolar. Conversion time is 10 μs at maximum time pulse frequency of 900 to 1,000 kHz. The properties of the converter are guaranteed for a temperature range of 0° to +70°C (variant E8) and -55° to +125°C (JE). The converters come in a plastic or ceramic DIL 18 casing. The output is compatible with TTL and CMOS logic. Its basic properties are specified in Table 1.

General Description of Circuit

The ZN427 converter operates on the principles of successive approximation (see Figures 1 and 2). When the pulse "0" reaches the terminal connector $\overline{WR}$, i.e., the start of conversion, the output $\overline{BUSY}$ is brought from state 1 to state 0, MSB is brought into state 1 and the remaining bits are in state 0 whereby we achieve at the output from the converter half the value of the reference voltage, i.e., $U_{REF}/2$. The voltage is compared by the comparator with the input voltage U_{IN} and at the next descending edge of time pulses occurs a decision whether the datum is to be converted to 0 (when $U_{IN} < U_{REF}/2$) or left in state 1 (when $U_{IN} > U_{REF}/2$).

At the same descending edge bit 2 is brought to state 1, so that the voltage obtained at converter output is $U_{REF}/4$ or $U_{REF}/2 + U_{REF}/4$, depending on the MSB state. The mentioned voltage is again compared with U_{IN} and during the next trailing edge there occurs a decision regarding the state of bit 2 and, simultaneously, bit 3 is brought to state 1. The procedure is repeated for all eight bits. During the ninth trailing edge of time pulses the terminal connector $\overline{BUSY}$ transfers to state 1, which announces the end of conversion.

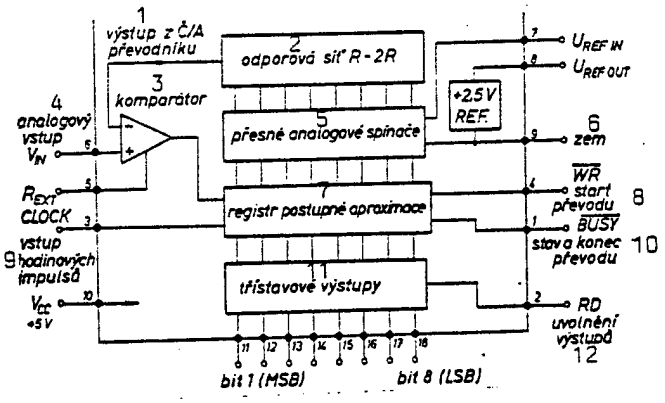


Figure 1. Group layout of ZN427 A/D converter

Key:
1. Output from D/A converter
2. R-2R resistance network
3. Comparator
4. Analog input
5. Precision analog switches
6. Grounding
7. Register of step-by-step approximation
8. Start of conversion
9. Time pulse input
10. State and end of conversion
11. Three-state outputs
12. Clearing of outputs

Table 1. Basic specifications of ZN427 converter at 25°C

Resolving power	8 bits
Linearity error	max. ±0.5 LSB
Differential nonlinearity	±0.5 LSB
Conversion time	10 μs (max.)
Feed voltage	5 V, -3 to -30 V
Current consumption	25 mA (up to 40 mA)
Power dissipation	125 mW
Reference voltage (internal)	2.56 V (dyn. resistance 0.5 Ω)
External reference voltage	1.5 to 3 V
Max. time frequency	1 MHz
Time pulse width	min. 500 ns
Transfer from 00000000 to 00000001	15 mV
Transfer from 11111110 to 11111111	2.550 V

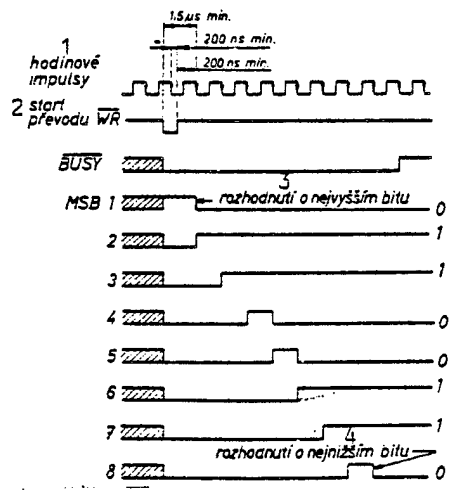


Figure 2. Timing diagram of ZN427 converter

Key: 1. Timing pulse
2. Start of conversion
3. Decision about the highest bit
4. Decision about the lowest bit

The terminal connector RD (i.e., clearance of outputs) is usually in state 0 in order for the three-state bus bar to be in a state of high impedance. The data regarding the result of conversion can be read off by feeding signal 1 to the terminal connector RD, where by the reading is non-destructive. The terminal connector $\overline{\text{BUSY}}$ can be connected with the terminal connector RD, so that valid data are automatically cleared.

The insuring of reliable functioning of the converter requires the starting pulse fed to input $\overline{\text{WR}}$ to meet several conditions in relation to time pulses, as shown in the chronological diagram in Figure 2. Progress of the conversion applies for the digital datum 01100110. To facilitate orientation, the three-stage outputs are shown as if already cleared during conversion, while in reality they remain closed until the conversion is completed.

The value of the output $\overline{\text{BUSY}}$ during conversion is 0. At the moment when it transfers to 1 at the end of conversion, the output data are valid. This output can be used in the microprocessor system as "request for interruption."

The starting pulse--which can progress asynchronously and independently of the timing pulses--sets the MSB output to state 1 and the remaining outputs as well as the end of conversion to state 0. The initial setting (reset) is done by the trailing edge of the starting pulse, and for the period when $\overline{\text{WR}} = 0$ the converter is blocked. The conversion itself does not start until the first active trailing edge of timing pulses which

comes after the starting pulse has assumed state 1, at which moment a decision about the MSB state is made. The shortest duration of the starting pulse must be 250 ns in order to achieve reliable resetting to zero of the converter's logic circuits. Otherwise, the duration of the starting pulse is unlimited.

In order to achieve a reliable setting of MSB the time difference between the trailing edge of the starting pulse and the first active trailing edge of the timing pulse must be at least 1.5 μs.

In order to achieve reliable cycle timing of the converter, the leading edge of the starting pulse $\overline{WR}$ must not progress within 200 ns of the active (trailing) edge of timing pulses. The ideal position of the leading edge of the starting pulse is when it progresses in coincidence with the leading edge of timing pulses.

Source of Timing Pulses and Synchronizing Curcuits

The method of obtaining timing and synchronizing pulses depends on the system in which the converter is to operate. As long as the converter operates in a microprocessor system it can be controlled the same way as RAM memory and can be also addressed accordingly [1-3].

The advantage of using timing pulses from a microprocessor is that the duration of conversion is known precisely and coincides with the machine cycle. Thus, input data can be read with a precisely known delay, namely after the ninth timing pulse at the soonest, counting from the end of the $\overline{WR}$ pulse. The reading operation can also be commenced by means of the output pulse $\overline{BUSY}$ that can be used for generating a request for interruption.

The described method cannot be used in some microprocessor systems, e.g., because timing pulses are not led out or their freqnency is too high, or because the conditions specified in Figure 2 have not been met. In such a case it is possible, e.g., to use the source of timing pulses with synchronization, as shown in Figure 3a.

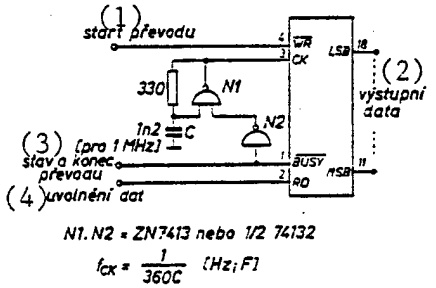


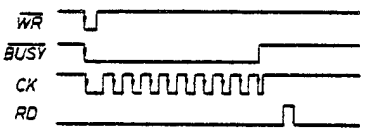
Figure 3a. Synchronized source of timing pulses

Key:
1. Start of conversion
2. Output data
3. [for 1 MHz] / state and end of conversion
4. Clearing of data

The integrated circuit N_1 is connected as an astable multivibrator which does not oscillate as long as the circuit N_2 is bringing the logic 0 to its second input, occurring at the moment when output $\overline{BUSY}$ is in state 1. The pulse "start of conversion $\overline{WR}$" changes the level of $\overline{BUSY}$ from state 1 to 0 and N_1 starts to oscillate. As soon as the conversion is completed, the level 1 on output $\overline{BUSY}$ stops operation of N_1.

As the pulse "start of conversion" (see Figure 3b) also simultaneously starts the timing pulses, it can occur at random. The only condition is that it must be longer than 250 ns, at the same time, must be shorter by 200 ns than is the first timing pulse. The first timing pulse in the case of the mentioned circuit is always longer than others, because C_1, starts from a fully charged state, while in subsequent cycles it is charged to a value between the upper and lower level U_{T+} and U_{T-} of Schmitt's circuit.

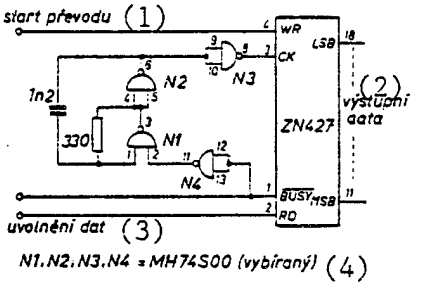
Figure 3b. Chronological diagram of circuit in Fig. 3a



The ZN7413 and ZN74132 are 2x4 and 4x2 Schmitt's circuits, respectively. Because they do not have the specified configuration in our series, we tested a generator of timing pulses using the MH74S00 na circuit (see Figure 3c).

Figure 3c. Synchronized source of timing pulses with MH74S00

Key: 1. Start of conversion
2. Output data
3. Release of data
4. (Selected)



Annotation to the Converter's Circuits

All logic inputs of the converter are arranged as emitter followers so that they consume only low input current and are compatible with CMOS and TTL logic. The D/A converter operates with voltage switches and uses the R-2R resistance network with value of R = 4 kΩ.

The internal reference source is equivalent to a voltage reference (Zener) diode with a voltage of approximately 2.56 V and low dynamic resistance. The series resistor R_{REF}, which is connected between terminal connectors 8 and 10, has a value of 390 Ω and generates rated current of 6.4 mA. A 4.7 μF blocking condenser must be connected between terminal connectors 8 and 9. In operation with the internal reference source the terminal connector 8 ($U_{REF\ OUT}$) is connected with the terminal connector 7 ($U_{REF\ IN}$). Up to five ZN427 converters can be fed from a single reference source (without requiring a change in R_{REF}), which provides good agreement between the values of converters operated in parallel.

The internal reference source can also be used for other circuits, whereby it can supply or consume current up to 3 mA. It is also possible to use the external reference source in a voltage range of +1.5 to 3.0 V and low dynamic resistance. The converter also operates with a voltage lower than 1.5 V, but the conversion time becomes prolonged.

An equivalent circuit of a fast comparator is shown in Figure 4. The comparator's differential amplifier is connected to positive voltage of +5.0 V (terminal connector 10) and by terminal connector 5 to negative voltage ranging between -3.0 to -30.0 V via resistance R_{EXT}. After the comparator attains the optimum current which ranges between 25 to 150 μA, R_{EXT} must be selected in accordance with the relation

$$R_{EXT} = |U_-| .15\ k\Omega\ .$$

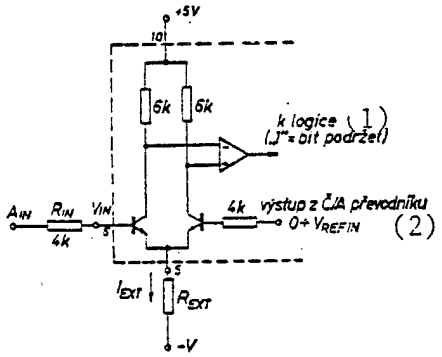


Figure 4. Equivalent circuit of comparator
Key: 1. To logic ("1" = bit hold)
2. Output from D/A converter

Values of R_{EXT} for the most commonly used voltages are plotted in Table 2. The recommended nominal value of comparator current is 65 μA, but the comparator is insensitive to its changes in the above-mentioned range.

Table 2. R_{EXT} resistance values for varying voltages (-U)

$-U$	R_{EXT} [kΩ] ±10 %
−3 V	47
−5 V	82
−10 V	150
−12 V	180
−15 V	220
−20 V	330
−25 V	390
−30 V	470

The D/A converter output is connected via the 4 kΩ resistance network to one side of the comparator. The analog input that is to be converted to a digital value can be connected directly to the comparator's second input (U_{IN} terminal connector 6). To achieve optimum thermal stability, the source of analog input voltage should also have an internal resistance of 4 kΩ.

Unipolar Connection

The basic connection for unipolar operation is shown in Figure 5, while Figure 6 shows circuit connection for unipolar operation in a range of input voltages A_{IN} = 0 to U_{REF}, including components. For input voltages higher than the basic range 0 to U_{REF} a divider must be used at the converter's input. An input voltage that is lower than the basic range must be amplified.

The values of resistance R_1 and R_2 are selected so as to achieve equal voltage between U_{IN} and U_{REF} when input A_{IN} shows the full value of measured voltage. Thus, the full range is given by the relation

$$A_{IN\ FS} = (1 + \frac{R_1}{R_2}).U_{REF} = G.U_{REF}.$$

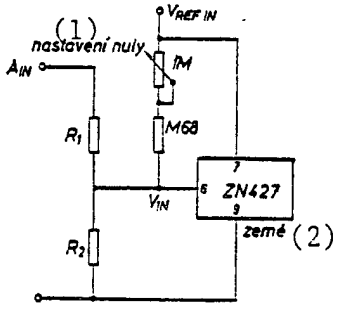


Figure 5. Basic layout for unipolar operation

Key: 1. Zero setting
2. Grounding

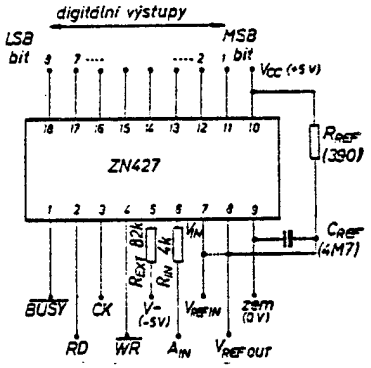


Figure 6. Connection for unipolar operation at input voltages range of A_{IN} = 0 through U_{REF} (including components)

Key to top line: Digital outputs

Achieving adaptation of the comparator's input circuit makes it necessary that $R_1 \parallel R_2 = R_{IN} = 4\ k\Omega$. Thus, the requisite values of resistance R_1 and R_2 are

$$R_1 = 4\ G\ [k\Omega]$$

$$R_2 = \frac{4G}{G-1}\ [k\Omega]$$

From these relations can be compiled Table 3 for $U_{REF\ IN} = 2.5$ V.

Table 3. Values of R_1 and R_2 Resistance During Unipolar Operation

Input	G	R_1	R_2
+5 V	2	8 kΩ	8 kΩ
+10 V	4	16 kΩ	5,33 kΩ

Full Value Setting

In view of the tolerances of resistances R_1 and R_2, the U_{REF} tolerance and the error at full converter range, a trimming capacitor must be incorporated into the value of resistance R_1 for calibration of the full range (gain). In the case of using an internal source of reference voltage and 2-percent resistances, the trimming condenser must have a value of at least 5 percent of its nominal value.

Zero Setting

Due to offset of the D/A converter and comparator there occurs transition from level 0 to 1 at a typical value of 15 mV fed to the comparator input (see basic data) which corresponds to +1 1/2LSB at reference voltage of 2.56 V. Thus, there is a need for taking measures to achieve this transition at a value of 1/2 LSB, i.e., at 5 mV. This can be achieved by introducing into the comparator input a low positive voltage by means of a potenciometer P_2 and resistance R_3. The actual values of a circuit for unipolar operation at input ranges of +5 V and +10 V are shown in Figure 7.

Figure 7. Values of components for unipolar operation at input voltage range = 0 to 5 V and 0 to 10 V

Key: 1. Amplification
2. (Full range)
3. Zero
4. Full range
5. Tolerance of resistances
6. Tolerance of potentiometers

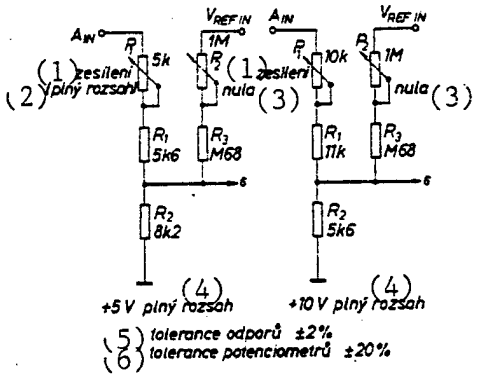


Table 4. Setting point for unipolar operation

Input Range $+FS$	$\frac{1}{2}$ *LSB*	$FS - 1\frac{1}{2}$ *LSB*
+5 V	9,8 mV	4,9707 V
+10 V	19,5 mV	9,9414 V

$1\ LSB = \frac{FS}{256}$

Setting Procedure During Unipolar Operation

1. Feed in a continuous sequence of starting pulses at intervals which allow for complete conversion and monitor digital outputs.

2. Feed input voltage of value "full range--1 1/2 LSB" to A_{IN} and set "amplification" so that bit 8 (LSB) on the output just oscillates between levels 0 and 1 whereby the state of all other bits is 1.

3. Feed input voltage of value 1/2 LSB to A_{IN} and set with potentiometer "zero" until bit 8 just oscillates between levels 0 and 1, whereby the state of all other bits is 0.

Table 5. Coding during unipolar operation

Analog input voltage A_{IN} (nominal medium value)	Output code (binary)
FS — 1 LSB	11111111
FS — 2 LSB	11111110
3/4 *FS*	11000000
1/2 *FS* + 1 *LSB*	10000001
1/2 *FS*	10000000
1/2 *FS* — 1 *LSB*	01111111
1/4 *FS*	01000000
1 *LSB*	00000001
0	00000000

$$1\ LSB = \frac{FS}{256}$$

Bipolar Connection

In bipolar operation the input into the converter is shifted by half of the full range by connecting resistance R_3 between the terminal connectors $U_{REF\ IN}$ and U_{IN} (see Figure 8).

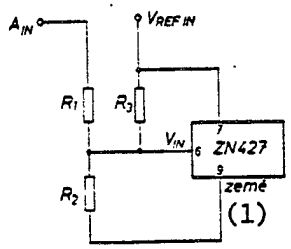


Figure 8. Basic connection for bipolar operation

Key: 1. grounding

In this connection it applies that when

A_{IN} = -FS then there must be U_{IN} = 0

A_{IN} = +FS then there must be $U_{IN} = U_{REF\ IN}$

When the range is full $\pm G.U_{REF\ IN}$ then the above conditions are met by values

$$R_1 = (G - 1).R_2,$$

$$R_1 = G.R_3.$$

The attainment of adjustment of input further calls for a parallel combination of resistances on the order of $R_1 \parallel R_2 \parallel R_3 = R_{IN} = 4\ k\Omega$.

From these conditions we obtain nominal values of resistances R_1, R_2 and R_3

$$R_1 = 8G\ [k\Omega]$$

$$R_2 = \frac{8G}{G - 1}\ [k\Omega]$$

$$R_3 = 8\ k\Omega$$

The lowest bipolar range $\pm U_{REF\ IN}$ (which corresponds to the basic unipolar range 0 through $U_{REF\ IN}$) is obtained when

$$R_1 = R_3 = 8\ k\Omega \text{ and}$$

$$R_2 = \infty$$

Assuming that reference voltage is $U_{REF\ IN} = 2.5$ V, we obtain the nominal values of resistances shown in Table 6.

Table 6. Values of resistances R_1, R_2 and R_3 in bipolar operation

Vstupní rozsah	G	R_1	R_2	R_3
±2,5 V	1	8 kΩ	∞	8 kΩ
±5 V	2	16 kΩ	16 kΩ	8 kΩ
±10 V	4	32 kΩ	10,66 kΩ	8 kΩ

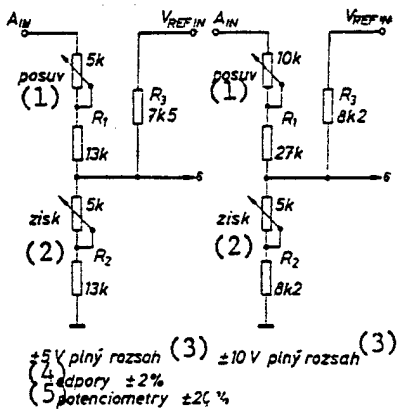
$$1\ LSB = \frac{2\ FS}{256}$$

Key: Vstupni rozsah = input range

A negative value of full range (shift) is set by changing R_1 around the nominal value in a ratio to R_3. A positive value of full range (gain) is set by changing resistance R_2 in relation to R_1. Actual circuit values for bipolar ranges ±5 V and ±10 V are shown in Figure 9.

Figure 9. Component values for bipolar operation with input voltage ranges A_{IN} = ±5 V and ±10 V

Key:
1. Shift
2. Gain
3. Full range
4. Resistances
5. Potentiometers



Setting Procedure During Bipolar Operation (See Tables 7 and 8)

Table 7. Setting points for bipolar operation

Vstupní rozsah ±FS (1)	— (FS — 1/2 LSB)	+ (FS — 11/2 LSB)
±5 V	—4,9805 V	+4,9414 V
±10 V	—9,9609 V	+9,8828 V

$1\ LSB = \frac{2\ FS}{256}$

Key: Input range

1. Feed in a continuous sequence of starting pulses at intervals which allow for complete conversion and monitor digital outputs.

2. Feed input voltage of value -(FS - 1/2 LSB) to A_{IN} and set with potentiometer "shift" until bit 8 (LSB) flickers between 0 and 1 and all other bits are 0.

Table 8. Coding during bipolar operation

Analog input voltage A_{IN} (nominal median value)	Output code (binary shifted)
+ (FS — 1 LSB)	11111111
+ (FS — 2 LSB)	11111110
+ 1/2 FS	11000000
+ 1 LSB	10000001
0	10000000
— 1 LSB	01111111
— 1/2 FS	01000000
— (FS — 1 LSB)	00000001
— FS	00000000

$1\ LSB = \frac{2\ FS}{256}$

3. Feed input voltage of value +(FS - 1/2 LSB) to A_{IN} and with potentiometer "gain" keep setting until bit 8 (LSB) flickers between 0 and 1 and the value of all other bits is 1.

4. Repeat procedure listed sub 2.

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Microcomputer-Aided A/D Converters

Prague SDELOVACI TECHNIKA in Slovak No 3, 1984 pp 97-98

[Article by Eng Peter Mifkovic: "A/D Converters Using Integrating Amplifiers and Microprocessor Systems"]

[Text] Introduction

Converters of analog voltage to digital form (abbrev. A/D) for microcomputers commonly find application as compensational types, as also indicated by catalogues of IO [integrated circuit] producers. The application of other types is less common. The objective of this contribution is to point out the advantages offered by the use of two types of converters operating with an integrating amplifier. It is a two-cycle integrating converter and a converter with a simple intermediate conversion in time (details in [1]). In either case, the converter logic with counter is replaced by a microcomputer.

Two-Cycle Integrating Converter

Its simplified layout is shown in Figure 1, time behavior in Figure 2. Measured voltage U_x is fed via coupler S_1 to the input stage of the integrating converter I, normal voltage U_n via coupler S_2. The converter's output is monitored through comparator K, which is connected to the microcomputer's input. Couplers S_1 and S_2 are controlled by means of microcomputer outputs 01 and 02.

The time behavior graph clearly shows the operation. Measuring voltage U_x is fed to the input of the integrating amplifier during constant time T_n in the first part of the measuring cycle. The thus integrated voltage is discharged to zero during the second part of the cycle by normal voltage of opposite polarity in time T_x. For intensity of the measured voltage,

$$U_x = \frac{U_n}{T_n} T_x.$$

Suitable selection of T_n (multiplies of line voltage period) makes it possible to achieve considerable suppression of interference voltage of network frequency. The integrating amplifier must be reset to zero prior to the cycle.

Thus, the measured voltage is converted to time measurement for which we use a microcomputer. The following are selected as the input/output circuits of the microcomputer:

a) standard data,
b) inputs with interruption,
c) use of timer.

One of the possible circuit configurations of the converter is shown in Figure 3.

Figure 1. Two-cycle integrating converter

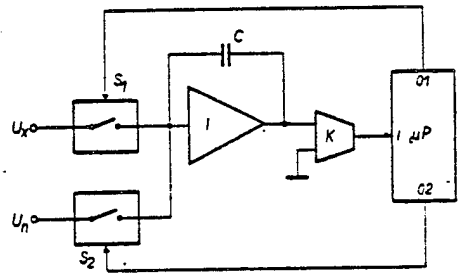


Figure 2. Time behavior for figures 1 and 3

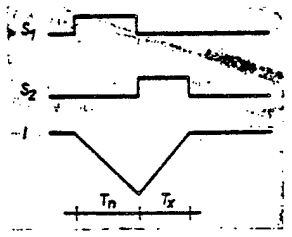
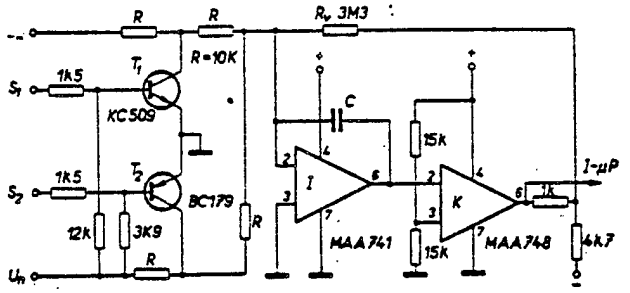


Figure 3. Wiring of two-cycle converter



Bipolar transistors T_1 and T_2, which are excited by a logic TTL signal, are used as couplers. Integrating capacity C is selected in accordance with the required time T_n so that the integrating amplifier operates in linear region. The integrating amplifier is held in a state of equilibrium by feedback (resistance R_v); there can occur a case when the comparator output starts oscillating, but that does not effect its function. The resistances R are precise and stable.

The precision attainable with the described connection is approximately 0.1 percent, with an approximately 2 ms conversion speed for a 1-bit converter. The conversion speed for microprocessor systems without a timer (with

counting cycle) is limited (10 to 30 s per counting cycle), for a 10-bit converter it is about 20 ms. Input voltage U_x range is 0, +5 V (adjustment by change in resistance network R).

A/D Converter With Simple Intermediate Conversion in Time

A simplified layout is shown in Figure 4, time behavior in Figure 5. Microcomputer output blocks the saw-tooth voltage generator, the output of which is compared with voltage 0 V (comparator K_1) and the measured voltage U_x (comparator K_2). Outputs of comparators are led to microcomputer inputs. Time between the two comparisons is $T_x = k$. U_x is measured by the microcomputer by means of a suitable subprogram. After completion of the cycle the saw-tooth voltage generator is brought into a holding state.

Another connection variant can be obtained by seeing that saw-tooth voltage starts precisely from 0 V. The comparator K_1 can be left out and time is measured from the moment of release of the saw-tooth voltage generator. The microcomputer's input/output circuit design is identical to that of a two-cycle converter.

Figure 4. Converter with simple intermediate conversion in time

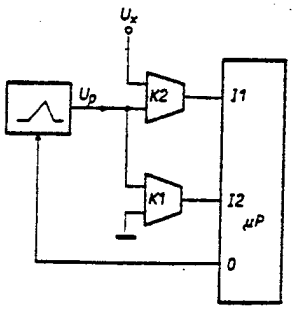
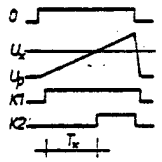


Figure 5. Time behavior to Figure 4



One of the possible circuit configurations is shown in Figure 6, the time behavior in Figure 7. The different progress in comparison to Figure 5 is caused by the design of the saw-tooth voltage generator. Operation (except for the reverse succession of comparisons) is identical to Figure 4.

Figure 6. Wiring of converter with simple intermediate conversion in time

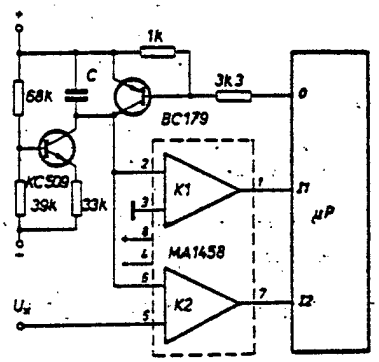
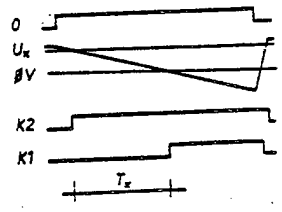


Figure 7. Time behavior to Figure 6



Software

This will differ according to what microcomputer inputs are used (data or interrupting), and/or whether the system has a timer. Similar programs are adequately described in the literature.

Conclusion

Advantages:

--both of the described converters can be built from available components;

--suppression of interference voltages and higher accuracy (up to 0.01 percent) in the case of a two-cycle integrating converter;

--simple connection and low price.

Disadvantages:

--longer conversion time;

--microcomputer blocked during conversion (except for some methods using timing).

The described converters are sure to find many applications, due mainly to their simplicity and retained acceptable standards of performance.

BIBLIOGRAPHY

1. Matyas, V., "Electronic Measuring Instruments," State Publishing House of Technical Literature 1981.

Yield of U 8080

Prague SDELOVACI TECHNIKA in Czech No 3, 1984 p 98

[Text] Published references to the yield of integrated circuits (the number of usable circuits from the total number of circuits on a plate) are infrequent, so it takes reading between the lines to know that, e.g., China produces more than 100 types of circuits of high and medium degree of integration, including type 2101 memories with a yield of 15 to 30 percent. Plates of 1.5 inches--which are not always circular due to irregularities in monocrystal growth--are also used to produce type 8080 microprocessors with chip dimensions of 4.57x5.41 mm with an average of 34 chips per plate, of which 1 to 3 chips are usable, representing a 2.9 to 8.8 percent yield.

BIBLIOGRAPHY

1. Baker, S., "People's Republic of China: On the Way Into the Age of Microelectronics," ELEKTRONIK 1982, No 8, pp 28-32.

Tesla Catalogue of Electronic Parts

Prague SDELOVACI TECHNIKA in Czech No 3, 1984 p 119-120

[Review of "Katalog elektronickych soucastek, konstrukcnich dilu, bloku a pristroju" [Catalogue of Electronic Parts, Structural Assemblies, Blocks and Instruments], 1983 through 1984, Part I. Published by Tesla-Eltos sectoral enterprise by authorization by the Federal Ministry of the Electrotechnical Industry, 784 pages, format A4, price Kcs 125]

This catalogue was welcomed not only by laboratory and design personnel in the electrotechnical industry, but also by personnel in purchasing departments of enterprises. It stands to reason that it will also become an excellent aid in schools and libraries and will not be overlooked by serious hobbyists, either. The entire 2 part work is divided into 16 sections. Seven of them are contained in the first part, 9 will be contained in the second part, to be published later.

The introductory section lists a directory of enterprises and research institutes of the Federal Ministry of the Electrotechnical Industry, including their programs. The subsequent sections of the first volume provide a successive listing of active, passive and structural parts, assemblies and materials, connectors and switches, cables and conductors, batteries, storage batteries and power supply sources.

The catalogue provides excellent orientation; each part has a detailed listing of contents. It specifies for each part its type designation, designation in accordance with the uniform classification of products (JKV), its producer, the address of its marketing organization, terms for ordering, etc. Also provided are a diagram, a sketch according to scale, typical application and technical specifications.

The new catalogue will be greatly appreciated by laboratory and design personnel who up to now have had at their disposal only partial catalogues, outlines and tables, usually of older vintage. None of them have as integrated a set as the newly issued catalogue. Everybody, even a technician with limited experience, knows the amount of difficulties that can be caused by the so frequent incorporation into newly developed systems of parts that are no longer produced or the production of which will be suspended in the near future. We all know about these shortcomings. The amount of losses they have caused can be best estimated by logistical personnel. However, there was no help coming from anywhere. Thus, the first volume's supplement, entitled "Prospective Series of Electronic Parts," merits particular appreciation. It contains an outline of semiconductor, passive, structural parts and hybrid circuits. Moreover, it provides an outline of integrated circuits imported from the USSR through the DIZ plant of Tesla-Eltos.

The catalogue is an extensive work offering a tremendous wealth of valuable information. It is a novel undertaking that is without precedent in our country. Thus, there can be no wonder that it also has its unfavorable sides. However, all of these could have been quite easily avoided if the publisher had been more demanding.

Thus, e.g., had the book been subjected to linguistic correction prior to publication, we would not encounter on page 200 (and elsewhere) a term like "generator pulsu..." [pulse generator] (on page 774 the same circuit is called "generator pulzu..."). However, on the adjoining page one can also find a comparable part under the designation "Generator impulsu..." [correct version]. On page 220, but also elsewhere, one can find even the designation "Fetovy pulsni operacni zesilovac..." [operational pulsed field effect amplifier].

According to the technical manual volume 3--Pulse Engineering--terminology and definitions published to meet the needs of light-current engineering, page 5 defines the term 'impuls [pulse]' as "a sudden short-term change in characteristic magnitude (of current, voltage, phase, etc.) with a finite duration. The term 'puls [pulse]' is here defined as a regular series of equal pulses which follow successively at regular intervals in a progression that can be considered steady. Thus, "impulsovy generator" [pulse generator] (p 43) is a generator producing pulses or pulse.

The term "fetovy" is too resemblant of "fetovani"--a malaise leading to increasingly intensive use of drugs. While it is known that attempts had been made at translating the term "fet" as "field transistor," the term generally accepted by now is "field effect transistor."

The best that can be said about the drawing of circuit diagrams in the book is that the number of methods for their depiction considerably exceeds the number of producers of electronic equipment. Comparing, e.g., the diagrams on pages 39, 45, 136 and 450, we can easily see that the concepts regarding depiction of symbols for amplifiers, windings, transistors, diodes, throw-over switches and representation of values show considerable difference. It is but a proof that the obligatory CSN [Czechoslovak State Norms] standards are terra incognita for many producers.

In the introduction to the third section--"Passive Components"--on page 256 it is stated that the CSN 35 8014 applies to the designation of nominal values and their permissible deviations in resistors and condensers. The norm prescribes 1Ω to be the unit of resistance and 1 F of capacitance. In the case of condensers this means that multiples of a farad must be used for the designation of capacitance. The letter code for multipliers is principally a lower-case letter (e.g., 10^{-12} F = p, 10^{-9} F = n, etc.). However, right on the next page, p 267, these data are listed in Table 15 in the column "Capacitance Value (pF)" in the old manner. Thus, e.g., in series E6 the code 76 denotes a capacitance value of "10K," code 83 the value "150K," etc. However, on p 327 in the chapter "Code Number of Ceramic Condensers," in series E6 the code 76 lists in the column "Capacitance (pF)" the value "10n," and code 83 "150n," etc.

In the case of resistors, the designation used in diagrams for resistance in kilo-ohms alternates between k and K, even though the relevant standard calls for using an upper case letter for designating a multiple of a basic unit (R, K, M, T, etc.).

The sketches of mechanical parts show data--be they incomprehensible methods for dimensioning or drawing--that leave the mind numb, if for no other reason than that they recur quite regularly or are modified in original materials--enterprise norms, tables and catalogues. If editing had been more demanding it could not happen, e.g., that the part "Clamp WA 629 01" depicted on p 583 would recur right on the next page under the same designation, but dimensioned in a different manner (different number of reference points and even different dimensions). It is often said that if two are doing the same thing it is not the same thing, but what is demonstrated here is that if one does the same thing it is not the same thing. That is at least what is alleged by the catalogue. Similarly, "Clamp 683 49" on p 580 and "Clamp WA 683 37" on p 575 are drawn in a way that invites gloomy contemplation. They disregard elementary principles of machine drawing and, on the other hand, stand rules about counting to ten on their head. Why is it stated on the same page, 575, that for the relevant connector it is necessary to drill into the plate two openings with a pitch diameter of 3.2 with a tolerance of 10 (ten) millimeters? And why is this requirement stated in the drawing even twice?

The very frequently used manner of designating in writing zero limiting deviations in dimensions--e.g., +0.0 or -0.00--is incorrect, because zero cannot be small or large, positive or negative. That is why CSN 01 3136, Article 14, prescribes the writing of a simple symbol "0" and, moreover, permits leaving out such a symbol entirely. Such apparent chicanery has considerably detrimental effects on legibility and ease of orientation regarding the depicted machine parts.

All these minor shortcomings were selected just as a sample. The enumeration of errors found in the entire book would be very extensive. And so, when we read in the introductory word by the publisher (bottom of page 8): "the catalogue was prepared from materials supplied by production organizations and no errors should occur in the published text. In the adaptation of tables and terminology care was given to uniform rendering of abbreviations, symbols, indices, coefficients, use of Greek alphabet and various types of font, whereby strict application was made of valid technical norms and rules of printing"--end of quote--it seems that some sort of confusion must have developed somewhere.

It is a sad state of affairs if some enterprises interpret CSN standards--which in our country have the nature of law--in several ways simultaneously or simply ignore them, particularly when they make reference to them. However, to allege that valid technical standards were strictly applied is a daring venture.

In conclusion, it can be said that despite its shortcomings this book constitutes a contribution. The blame for the flaws it has accrues primarily to all those who have been very irresponsibly compiling enterprise catalogues and tables and only secondarily to the publisher, who was not adequately demanding and failed to compare the data with valid standards. Thus, the mentioned shortcomings will cause much inconvenience in the compilation of technical documentation.

The catalogue envisions that its useful life will be limited. It is to be wished that the publisher will continue his very meritorious efforts--understandably, while being more demanding--in the coming years as well. After all, it is an aid which technicians have not even dreamt about up to now.

With regard to the book's binding, print and paper, some objections could be voiced to the legibility of several diagrams. The call of some technicians for publishing the catalogue in loose-leaf form would probably be too demanding on maintenance. We shall see how well the present concept fares.

8204
CSO: 8112/1468

NEXT STAGE IN JSEP 3 DEVELOPMENT

Prague VYBER INFORMACI in Czech No 2, 1984 pp 195-196

[Text] JSEP 3--The Next Stage of Development of The Unified System of Electronic Computers

JSEP 3 Systems are being developed on the basis of the project accepted by the council of main JSEP designers and by the intergovernmental commission for computer technology during 1976-1977.

The project aims at further development of JSEP systems in the following areas:

--increase efficiency (specifically, ratio of output to price) of the JSEP 3 computers as compared to JSEP 2,

--increase technical (output, speed of input/output data, memory capacity, number of terminals which can be hooked up, etc) and reliability parameters of these computers,

--increase the contribution of the computers to national economy by use of specialization of technical components, built-in technical components for system management and a network system organization,

--further increase the efficiency of problem solving, particularly in the area of using data banks, such as, for example, through the use of additional problem oriented languages,

--reduce "overhead" in servicing the technical and programming means through high reliability with improved diagnostic methods and redundancy.

The recommendation for further development of JSEP systems presupposes continued, substantial development of the architecture and technical system solutions while the users will be able to use the existing program work and auxiliary components.

Basic systems information processing organization of JSEP 3 leads to:

--widespread use of LSI circuits, which leads to reduction in size of the components, power requirements, reliability and speed,

--widespread use of LSI memory circuits up to 4 Kbits for rapid small capacity processor memories and 64 Kbits (or more) for main, large capacity memories,

--use of new memory elements working on new principles for construction of archival memories with very large capacity memories,

--use of functionally oriented processors and subsystems as basic elements of systems architecture. For increasing the efficiency, also realization of certain system functions (as, for example, data management, input/output organizations) with technological means,

--to increase the performance of the system of using problem oriented processor for efficient solution of partial problems such as symbol processing, matrix calculations, file management, etc.

--use of the components of net architecture of remote data processing for organization of distributed systems and acquisition nets, storage and development of information,

--use of built-in components for databank management and ensuring an effective servicing method of large files (information bases),

--possibility of more flexible changes in configuration of technical and program means and their debugging for a given application area while retaining the compatibility with existing technical components and application programs.

The JSEP 3 system development is assumed to consist of two stages.

The first stage represents current development in the two following directions:

--development and introduction of a new element base; the orientation in this respect is toward microelectronic elements in the I^3L, TTL and ECL technologies.

--development of specialized processors and their method of programming; transfer of some of the operating system functions to areas of technology. The computers under development will be compatible with the JSEP 2 computers with the possibility of linkage of specialized processors (matrix, symbolic, etc), redundancy--creation of multiprocessor systems, ensuring the work in the networks, ensuring certain of multiprocessor systems, ensuring the work in the networks, ensuring certain functions of the operating system by technical resources (?networking). A backup is also necessary for a number of new additional equipment items and items of data teletransfer including, for example, communications processors with the possibility of serving as many as 352 lines (EC 8371), programmable terminals, data preparations equipment, greater quality printers, color displays, disc memories 200 Mbyte and greater capacity, magnetic tape units with a recording density of 246 bits/mm (EC 5027), etc.

The research program also includes [the areas of] laser printers, large capacity magnetic memories (more than 10^9 bits), improved display, etc.

The first stage of JSEP 3 is based on the architecture of the technical resources and operating systems JSEP 2 which are used as a framework for developing improved architecture elements and operating systems.

The OS 7/EC backing all JSEP 3 computers is also created at this stage when each system user has available 16 Mbyte memory (virtual).

The second stage JSEP 3 computers are based on the multiprocessor structure based on functionally oriented processors. The problem oriented processors include various processing processors such as matrix, symbolic and problem oriented language processors ensuring efficient compilation. Functional processors include input/output processors, telecommunication and file processors (which optimize the processing of files in external memories. Individual processors are linked by a very rapid bus.

The structure is based on a main, large capacity memory (potentially up to 100 Mbytes). Based, for example, on integrated circuits (potentially up to 64 Kbit or more). Specialized processors have their own memory (on order of 256 Kbytes). The external memory will be services by an independent control processor and will serve as a virtual memory. Physically it will be accomplished with several 100 Mbyte units on cylindric magnetic layers.

Transition to multiprocessor systems requires new operating systems which ensure compatibility with the existing operating systems.

The above principles will enable us to build systems with broad application possibilities and adaptable in various application areas.

From Vychislityelnaya Technica No 6, 1983 (USSR)

CSO: 2402/10

EC 1027 COMPUTER SYSTEM

Prague VYBER INFORMACI No 2, 1984 pp 197-199

[Article by Josef Cmiral, Kancelarske Stroje, k.u.o. Prague]

[Text] The EC 1027 computer system is being introduced to production during 1984. It can be used for econo-statistical problems solving, for management of information data systems, for mass data processing and for research and development calculations. In addition to these familiar applications, the EC 1027 system can be used for data processing in query or interactive mode. The EC 1027 computer system is part of the JSEP and its compatibility with other JSEP 3 and members of the JSEP 2 systems makes possible formation of computer networks and hierarchic computer systems. The EC 1027 is tied to the EC 1026 system and all EC 1026 peripheral devices can be used with it.

The computer system models produced after 1985 can be designated as EC 1027-4, a dual process complex corresponds to the designation EC 1027-8.

Composition of the EC 1027 Computer System

The computer system EC 1027 consists of the basic EC 2127 unit and a set of peripheral equipment, external memories and terminals. A number of possibilities of linkage of peripheral equipment to the basic unit are available for the EC 1027 configuration.

The Basic EC 2127 Unit

The basic unit of the computer system has a modular structure and ties into the basic unit of the EC 1026 system. It consists of operating process, [program] organizer, main memory of the service module, and from a number of portable modules for attachment of peripherals (see Figure 1). In the configuration of portable modules, it is possible to connect a multiplex or a dual channel interface module, one or two disc modules and also one tape and one communication module.

OP--Operating Processor (OPM Operating Module and [CACHE Memory Module]

The basic purpose of the OP is processing of individual instructions and interrupt handling. With? For? Instructions requiring peripherals, it

transfers the action to the appropriate communication module (PM) of the basic unit for interface with that device.

An 8 Kbyte CACHE memory serves to speed up the interface of the OPM with the main memory (HP) during data transmission or instructions.

OP ensures an operating speed of 400,000 op/sec in the GIBSON III E mix.

ORG--Organizer

Its role is the management of main memory activity and allocation of the system [bus] on basis of priority according to the individual module requirements.

The organizer consists of two parts--allocator and controller of the main memory.

HP--Main Memory

Has an overall capacity of up to 2 MB with fully occupied panel (board), with one-half occupancy, the capacity is 1 MB. It is based on the MHB 4116 16K x 1 bit elements. HP is linked over the ORG--HP (VOHP) and block ORG lines to the common system trunk (bus) SSS as well as to the special data bus SHPD leading to OP.

The width of the data flow is 8 bytes, the data are controlled by an expanded Hamming code (1 error-control byte per 8 bytes of data) which makes possible simple error correction and a detection of a double error. The main memory processing time is 500 ns. Beginning in 1987, computers with memories up to 4 MB are expected.

SRM--Service Module

This module ensures the operator's communication with the system as well as the control and diagnostic of all parts of the system. The following peripherals are linked through an external adaptor and operator's console (PO) with alphanumeric display to the service module:

electronic keyboard EC 0101
dot matrix printer EC 7934-02
a pair of floopy discs EC 5074
table card reader EC 6112

Communication Modules

All communication modules (disk, tape, multiplex and communication) have a similar structure and it is possible to break them down into following elements:

--internal adapter which aids communication with other modules for joint system busses (SSS);

--operating bloc which executes the information processing received from the internal and external adapters;

--external adapter which aids the interface with external components.

The function of the internal adaptor is the same in all communication modules and the function of the operational bloc is similar. These two basic components are arranged jointly and form a so-called transmission processor for all modules.

All modules are run by microprograms. The microprograms in each of the module are stored in the control store of microprograms which enables read and record functions. The microprograms are transferred into the control storage of each module from a floppy disc through the SRM and system bus.

MPX--Multiplex Module

The multiplex module implements the function of the (syllable) byte multiplex channel in the computer system. It can be linked all the way to the control units of the external components through the standard transmission channels (SSK).

Abbreviations:

BL = bloc multiplex channel DKM

M = MPX or any DKM channel

TF = telephone

TF = telephone or direct connection

TG = telegraph communication

SRM = service module

The configurator will be explained in the conjunction with adding to the Nomeclature and Development Plan of JSEP-3.

Table 1

(1) Konfigurátor výpočetního systému EC 1027

(2) Označení	(3) Připojení řídicí jednotka nebo kanál
1. Vnější paměti (4)	
- diskové	
EC 5061 (29 MB)	EC 5561
EC 5066 - M (100 MB)	DSK
EC 5067 - 02 (2 X 100 MB)	DSK
EC 5080; EC 5067 (200 MB)	DSK
EC 5063 (317 MB)	EC 5563
EC 5065 (635 MB)	EC 5563
- ŘJ MD EC 5563	BL
EC 5561	BL
- páskové EC 5004 (2 m/s, NRZI, FM)	PSK
EC 5026, EC 5027 (2 nebo 3 m/s, FM, GK)	EC 5527
- ŘJ MP EC 5527	BL
- disketové EC 5075 (2 X 20 X 250 kB)	M
EC 5074 (250 - 300 kB)	SRM
2. Lokální zařízení (5)	
- klávesnice EC 0101 (abc - č)	SRM
- snímač štítků EC 6016 (1000 št/min)	M
EC 6112 (300 št/min)	SRM
- výstup na mikrofiš EC 7602	M
- tiskárny EC 7039 (řetěz. 1200 ř/min)	M
EC 7045 (bodová sériová, 150 zn/s)	M
EC 7230, EC 7231 (laser, 6000 ř/min)	M
EC 7240 (elstat., 1000 ř/min)	M
EC 7934 - 02 (bodová sériová, 150 zn/s)	SRM
- děrná páska EC 7902 (in 1500 zn/s, out 100 zn/s)	M
- displeje abc - č EC 7920 - 01 (EC 7922, EC 7927, EC 7934), EC 7910	M
- displeje grafické EC 7067, EC 7068, EC 7901, EC 7980	M
- grafické komplexy EC 7907, EC 7942, EC 7941, EC 7943	M
3. Vzdálená zařízení (6)	
- displeje abc - č EC 7920 - 11 (EC 7921, EC 7927, EC 7934), EC 7920 - 21 (EC 7925, EC 7934)	TF
- sběr dat EC 8540	TF
- terminál EC 8576	TF
- skupinový terminál EC 8534, EC 8542, EC 8577, EC 8579	TF
- dálnopis EC 8591, EC 8593	TG
- příprava dat EC 9053 (Consul 9114)	TF
- počítače JSEP (EC 1025, EC 1027)	TF
SMEP (SM 4)	TF
ADT 4500	TF
- inteligentní terminál IT 20	TF

Key:

1. Configurator of the EC 1027 computer system
2. Designation
3. Linkage control unit or channel

Key continued on following page.

4. 1. External Memories

--disc

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--tape EC 5004 (2m/s, NRZI, FM)
EC 5026, EC 5027 (2 or 3 m/s, FM, GK)

.

--floppy disc EC 5075 (2x20x250 kB)
EC 5074 (250 - 300 kB)

5. 2. Local peripherals

--keyboard EC 0101 (abc - c)
--card reader EC 6016 (1000 st/min)
EC 6112 (300 st/min)
--output to microfiche EC 7602
--printers EC 7039 (chain 1200 r/min)
EC 7045 (point serial, 150 zn/s)
EC 7230, EC 7231 (laser, 6000 r/min)
EC 7240 (electrostatic 1000 r/min)
EC 7934 - 02 (point serial, 150 zn/s)
--punch card EC 7902
(in 1500 zn/s, out 100 zn/s)
--abc displays - No EC 7920 - 01 (EC 7922, EC 7927,
EC 7934), EC 7910
--graphic displays EC 7067, EC 7068, EC 7901,
EC 7980
--graphic displays EC 7907, EC 7942, EC 7941,
EC 7943

6. 3. Remote equipment

--abc display No EC 7920 - 11 (EC 7921, EC 7927,
EC 7934), EC 7920 - 21 (EC 7925, EC 7934)
--data collection EC 8540
--terminal EC 8576
--group terminal EC 8534, EC 8542, EC 8577, EC 8579
--teletype EC 8591, EC 8593
--data preparation EC 9053 (Consul 9114)
--JSEP computers (EC 1025, EC 1027)
SMEP (SM 4)
ADT 4500
--intelligent terminal IT 20

CSO: 2402/10

TELEVISION VIEWER, RADIO LISTENER STATISTICS GIVEN

East Berlin RADIO FERNSEHEN ELEKTRONIK in German Vol 33 No 3, 1984 p 140

[Text] Statistics of Radio and Television Subscribers in the GDR

Status as of September 1983

District administration of the German Post Office	Subscribers total[1])	Portion who are TV viewers[1])	Portion who are TV viewers of channels I and II[1])
Rostock	327.7	295.1	251.0
Schwerin	212.1	199.1	181.7
Neubrandenburg	211.2	196.5	169.4
Potsdam	420.6	391.6	340.2
Frankfurt/Oder	269.4	242.2	201.3
Cottbus	325.8	292.5	177.7
Magdeburg	483.6	456.7	424.1
Halle	707.3	663.2	557.8
Erfurt	474.0	436.2	310.5
Gera	285.8	258.8	174.9
Suhl	198.1	182.1	125.4
Dresden	704.1	623.0	411.7
Leipzig	559.4	513.2	382.1
Karl-Marx-Stadt	788.1	710.4	458.7
Berlin	505.6	447.8	405.2
	6,472.8	5,908.4	4,571.7

Slight differences arise from rounding up or down of decimal places

[1])in thousands

12114
CSO: 2302/59

MICROELECTRONICS RESEARCH COORDINATION VIEWED AS INADEQUATE

East Berlin RADIO FERNSEHEN ELEKTRONIK in German Vol 32 No 4, 1983 pp 264-265

[Article by Dr. Hans Steinhagen]

[Excerpt] The authors of [1] elaborate three "essential aspects of microelectronics." However, I doubt whether the demand for "a unified and proportionate development of all elements of microelectronics," which deserves to be rated as important, should be put on a par with the organizational aspect of "providing electronic components" and with the applications aspect. Undoubtedly these aspects are of great importance for the development engineer working in the field. When they are discussed even in a practically oriented periodical such as RADIO FERNSEHEN ELEKTRONIK, then it seems important to explain the problem and possible solutions in the future.

The providing of electronic components is a problem of production and organization which surely exists also in other fields. Therefore as a theoretician one is unlikely to suspect any connections between the question "What Does Microelectronics Mean" and the providing of components. The engineer who is doing practical work in research and development already has a great deal of trouble with this problem. He cannot make a designed system a reality if he does not have on hand all the electronic components. Thus an idea for the application of a new circuit in an innovation may not be put into effect until months later. This often involves the loss of valuable time. In my opinion, the cause of such delays lies in the fact that in providing electronic components, research and development sectors with their small unit-number requirements are put on an equal footing with production sectors which require large numbers of units. A small development operation which orders five circuits of a certain type, for example, is put on a par with a production sector which needs 5,000 circuits for the production of its devices. A drawing up of material balance sheets which is requisite even for minimal numbers of units often leads to further time delays. It seems to me that solving the problem of providing electronic components by way of preferential deliveries of small numbers of units at short notice for research and development sectors is an important way to raise efficiency in such areas.

Reference [1] believes that a second important aspect of microelectronics lies in the "preparedness and ability of the user to introduce components, equipment, and systems of industrial electronics very rapidly and effectively." Every engineer who at any time starts on an application must overcome a multitude of barriers. To give oneself up to the new technology means to follow arduous and difficult paths. On this subject it is said in [3]: "Whoever still wants to make a contribution the day after tomorrow must begin today at the latest to intensively prepare himself for this. In electronics this realization is of imperative importance, and to offend against it is very expensive." But this is not the only problem in connection with the application of microelectronics. Thus in [4] mention is already made of the importance of applications preparation. There it is said that "the duty of applications preparation which the component manufacturers have..." is "not as yet being fulfilled to a sufficient degree." Generally speaking this preparation for applications is a prerequisite for the introduction of a new component to the user.

Between this and the development of specific circuit implementations by the user lies the field of variant applications of a component--a field which is especially important to applications in microelectronics. The range of variant applications reflects know-how in the use of a component. Unfortunately, the elaboration of such variant applications in the GDR is not being coordinated, so that each user must work out the know-how for himself or has to "ask around." Even the "Central Reference Register for Microelectronics Applications (ZNAM)" [5] remedies this situation only to a limited extent.

1. "The unselfish helpfulness of all enterprises and institutions" [5] is assumed. But it is not mandatory.

2. It is not possible to include current application investigations before their completion, so that due to 1. as well parallel investigations cannot be ruled out, despite the conclusion reached in [6].

3. Valuable time elapses before an effected component application is used (preparation of the user report, filing in the ZNAM, information search, organizational clarification of second-time use opportunities, second-time use [5]).

4. Many of the "little wiring tricks" in the application of a new component are not included at all in the ZNAM.

Therefore it seems appropriate to have a requirement that the R & D centers of the specialized component-using combines develop their existing application departments into central offices for coordinated circuitry groups in accordance with their production specialization. Then users with fewer opportunities could also rapidly get access to the know-how of a specialized user. Duplication of work arising from the parallel conducting of application investigations at different enterprises would be eliminated. It seems particularly important to me that there be an association of central application offices with the R & D centers, through which a multitude of specific practical applications is largely given in advance.

An application without such a specific association is not without problems, because orientation to field conditions must be the decisive criterion of the application. An application without orientation to field conditions is not an "aggressive, progressive application" [6]. If this is not consistently observed, phenomena can appear like those described in the leading article on the Leipzig Spring Fair of 1981 [7]: "Many new IC's for consumer-goods electronics suggest that the development of new devices in home electronics has gotten under way. Unfortunately, at this fair not much of such a development was in evidence as yet." In view of the introduction of a chess computer and a microcomputer-controlled rotisserie as instances of applications for microelectronics, in [7] as well the author expresses "uncertainties as to whether there could not be more important areas of application for these IC's." All of this demonstrates the importance of an orientation to field conditions for an application, and forces us to give thought to the objectives of specific applications.

With microelectronics, opportunities are put into our hands to tread new paths in the synthesis of systems. Today the development engineer designs systems having a capability which a classical electronic technician did not dare to dream about 20 years ago. The mastery of complex systems of microelectronics from research and development up to conversion and production requires engineers with extensive technical knowledge as well as a constant readiness to undergo further training and to take risks, to think through and to materialize new things.

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[6] Dunkel, J.: "The Objectives of the Berlin Electronics Application Center VEB" RADIO FERNSEHEN ELEKTRONIK, Berlin 31 (1982) 5, p 279-281.

[7] Schlegel, W. E.: "Leipzig Spring Fair of 1981, Microelectronics," RADIO FERNSEHEN ELEKTRONIK, Berlin 30 (1981) 6, p 343.

12114
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NEW ELECTRONICS STANDARDS ANNOUNCED

East Berlin RADIO FERNSEHEN ELEKTRONIK in German Vol 33 No 4, 1984 p 270

[Text]

TGL [GDR norms]/ issue	Title	Binding from	Replacement for TGL/issue
36823/01 February 1983	Electronic teletype terminal unit; with 5-unit code; Technical Requirements	June 1, 1984	36823/01 October 1980
GDR 37837 October 1982 1st Aebl. [expansion unknown]	Environmental effects on electrical and electronic products; testing for strength of component connections: Methods 1051 to 1055 (continuity test)	June 1, 1984	--
38470 July 1983	Semiconductor components; light-emitting diode series VQF 10-1; Technical Conditions	June 1, 1984	--
38908 June 1983	Fixed capacitors; aluminum-electrolyte capacitors with axial connecting wires, low voltage; Technical Conditions	June 1, 1984	37225 December 1979
25076/03 February 1983	Electrical engineering; electronics; uniform container system EGS; mounting frame, style C	July 1, 1984	25076/03 December 1974

TGL/issue	Title	Binding from	Replacement for TGL/issue
39336 April 1983 (CEMA standard 3185-81)	Computers and data processing systems; equipment for electronic computers; General Technical Requirements, Testing	July 1, 1984	39336 November 1981 39337 February 1982
39799 September 1983	Integrated semiconductor circuits; bipolar 4-bit latch circuits D 175 D and E 175 D; Technical Conditions	July 1, 1984	--
39800 September 1983	Integrated semiconductor circuits; bipolar monostable multivibrator circuits D 121 D and E 121 D; Technical Conditions	July 1, 1984	--
14283/11 November 1983	Electronic measuring instruments; color styling, legend, markings	Aug 1, 1984	14283/11 December 1977
28200/06 December 1976 First Aebl.	Electronic household devices; package labeling and package inscription	Aug 1, 1984	--
37270 August 1983	Electrical engineering, electronics; uniform container system EGS 834; system properties; system configuration, system dimensions	Aug 1, 1984	--

12114
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ROSTOCK EDP COOPERATIVE OUTLINED

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 21 No 5, 1984 p 2

[Article signed 'Br.']

[Text] The EDP cooperative (KG EDV) of the Rostock district, in concert with the working group for the territorial coordination of EDP attached to the District Planning Commission, is gearing up for the requirements of the coming years. Some 22 EDP operators in the Rostock district belong to the KG EDV, with the head enterprise being the Rostock DVZ [expansion unknown] VEB [state enterprise]. An organizing agreement is the binding basis for the joint work. The organ of the KG EDV is the council which was selected by the general assembly. Its members are the heads of the ORZ [organization and computer centers] of the leading combines, enterprises, and scientific institutions, such as the Shipbuilding Combine, the Maritime Shipping and Port Management Combine, the Fishery and Agriculture/ Foodstuffs Industry VEB, the Data Processing Center VEB, Robotron Sales, Wilhelm Pieck University, and the Regional Planning Commission.

In connection with the objectives for 1984 and the following years, the emphasis is on pooling the data processing work in the territory and improving that data processing which is oriented to process control. This results in focuses such as the following:

- helping the District Planning Commission to ensure the optimal site distribution and maximal utilization of the territory's EDP capacities for completely meeting all needs in this district,

- a coordinated manner of proceeding in the territory's use of minicomputer technology with ESER-EDVA [uniform electronic data processing systems--data-processing equipment] in the form of EDP use lines of a nature which is oriented to process control.

- coordination in planning/programming in terms of the requirements on software production,

- further developing the construction of means of rationalization of EDP.

- a step-by-step buildup of a data processing network for pooled processing,

- creation of foundations for the technical maintenance of ESER technology including rationalization measures,

- supervising and influencing the training of technicians for data processing.

For the purpose of jointly solving these tasks, which are of a subject-specific nature, the council calls together standing or temporary working groups, of which the following exist at present:

WG [working group] Microcomputing/Remote Data Processing

WG Territorial Coordinating of ESER Capacities and Breakdown Safeguards

WG Rationalization of Planning and Programming

WG Mechanical Breakdowns and Spare Parts Considerations

WG Training and Advanced Training

WG Minicomputers, with about 40 members (all of them operators of minicomputers in the district).

A sharing of information and a certain amount of concerted action among the working groups have proved successful. The WG leaders report regularly on the status or results achieved in their work before the council of the KG EDV. Twice a year a general assembly of the KG takes place, at which an account is rendered by the chairman of the council, proposals and commitments are made on the joint realization of actions, and measures for further cooperation (working plans) are decided on.

12114
CSO: 2302/59

CURRENT CONCERNS IN FIELDS OF HYDROLOGY, METEOROLOGY

Bucharest STIINTA SI TEHNICA in Romanian Jun 84 pp 13-18

[Article by Engineer C. Diaconu, director of Institute of Meteorology and Hydrology: "Centennial of Romanian Meteorology and Hydrology"]

[Excerpts] The creation of the Romanian Meteorological Service one hundred years ago marks the beginning of a systematic, unitary activity in this field, at the national level. The act itself has a higher significance reflecting the new conditions of economic-social development created after the Unification of the Principalities, after independence and the emergence of the first modern Romanian state, one of the many steps taken to develop the economy, education, science and culture. The formation of the meteorological service crowned the efforts of some enthusiastic, learned and impassioned men who understood the importance of this activity for the economic life of the country and who, through personal effort and pioneering work, initiated the first meteorological and hydrological observations on the territory of the Romanian principalities. The most enthusiastic and perseverent of all, the one who devoted his life to this scientific discipline and to the organization of the meteorological network, who combined, in his time, meteorological and hydrological observations--Stefan Hepites--also became the first leader of the new institution created a century ago and led it for close to 20 years.

The development of navigation on the Danube made it necessary to set up a system for monitoring water levels. The first hydrometric stations appeared at the beginning of the last century and the first regular service for measuring the Danube levels started in 1879. On interior rivers, the first stations for continuous measurements were organized toward the middle of the last century in Transylvania and in Banat; in the other provinces they started to appear toward the end of the century.

The decisive moment in the development of Romanian hydrology came between 1948-1950 and in 1951 with the organization of the General Hydrometeorological Directorate and demands connected, especially with the plans for hydropower installations on interior rivers boosted the expansion of the hydrometric network.

In 1970, the unified institute for meteorology and hydrology was formed, a fact which benefited both sectors and reflected world trends in organizing these activities.

The development experienced in the past two decades by Romanian meteorology and hydrology is demonstrated by the expansion of the national territorial network of observation and measurement stations and posts and also by the extension of areas of research, of techniques and methods assimilated and promoted by the Institute.

The centennial of Romanian meteorology and hydrology marks a moment of professional and scientific maturity, of efficient integration of the Institute of Meteorology and Hydrology in the general activity of the Romanian economy, science and technology. The experience accumulated by this institute, the material and human resources which are today at the disposal of the Institute of Meteorology and Hydrology as well as the state territorial hydrometric network are a guarantee for the future development of Romanian meteorology and hydrology, for improving the scientific levels and efficiency of its work.

The Complex Aspect of Meteorological and Hydrological Observations in Romania

In our country, the meteorological network consists of 184 stations located in a grid which can define most accurately, in area and time, the dimensions and variations of meteorological data. This network carries out programs of synoptic measurements and observations, at one hour intervals, of the parameters which define the properties of air masses, such as temperature, relative and absolute humidity, air pressure, direction and intensity of winds, duration of sunshine, the degree of overcasting, the character of clouds, precipitations, atmospheric visibility. Four times a day measurements are taken of the quantity of precipitation falling during six-hour intervals. Observations are also being carried out concerning electrical discharges (lightning, thunder, thunderclaps) as well as other atmospheric phenomena (hoarfrost, fog, white frost, hail, dust storms, etc.).

In addition to synoptic observations and measurements, the meteorological stations carry out programs of a climatological nature, considering the above mentioned parameters four times a day (at 0100, 0700, 1300 and 1900 hours). There are also over 1500 pluviometric stations located in the most diverse geographical zones of the country which measure the amount of precipitations.

In some mountain areas which are quite inaccessible but representative with regard to meteorological parameters (the Pietros, Rodna, Paring, Cozia) automatic stations have been installed, equipped with extremely complex apparatus which record and transmit to the meteorological collection stations much of the data which defines weather conditions.

The network of meteorological stations at ground level is being supplemented by the aerological stations at Bucharest-Mogosoaia, Cluj-Napoca, and Constanta, which carry out, four times a day at climatological intervals, measurements of meteorological parameters such as temperature, pressure, humidity, velocity and direction of winds, up to a height of 30 Km. An important part in the study of the lower layers of the atmosphere is played by the pilot samplings carried out four times a day, measuring the direction and velocity of winds between ground level and 500 m altitude at 20 meteorological stations. The data thus obtained helps to detect the possibilities of pollutants spreading and their dilution through diffusion and also the pollution potential in various geographic areas of the country.

The Institute for Meteorology and Hydrology (IMH) has, at present, the necessary equipment to receive the meteorological data transmitted by the orbiting meteorological satellites which travel on polar orbits at heights of 700-800 Km, as well as data from the geo-stationary satellites placed at an altitude of about 30,000 Km which move synchronous with the earth and which investigate the atmosphere above some specified geographical areas. The photographs obtained by the meteorological satellites offer us a complex image of the degree of nebulosity and its characteristics and makes it possible to obtain some vertical profiles of temperature and humidity up to the highest layers of the air mass.

This meteorological activity carried out in our country has also revealed other properties of the air mass. It is worth mentioning here the actinometric network consisting of eight stations which measure the amount of solar radiation (diffuse and reflected), as well as the measurements carried out at the Observatory for Atmospheric Physics (at Afumati) on electrical conditions in the atmosphere, which have proven many times to have a special influence on the human body. The aerological observatory at Mogosoaia also measures the total concentration of ozone in the atmosphere so as to follow the changes in the thickness of this element which protects the earth from ultra-violet radiation.

In order to characterize air quality the IMH units carry out measurements of the concentration of sulfur dioxide, dusts, and other chemical components. These measurements are carried out in highly industrialized or urban areas. Other measurements are made in areas far from pollutants, by the remote network, in order to follow the evolution of air quality. These measurements are part of a vast program elaborated by the OMM [World Meteorological Organization] and the PNUE [Ecological Program of the United Nations], which are trying to establish the extent to which mankind takes care to preserve the ecological balance of the planet.

The hydrological network in our country consists of about 1000 hydrometric river stations spread over 25 representative hdyrographic basins, each one grouping between five and ten run-off areas. These hydrometric stations measure twice a day the level of rivers at 0700 and 1700 hours; at high water times the intervals between measurements are reduced to 4, 3, or 2 hours, or sometimes even one hour, according to the rate of increase and to the agreement on announcing hydrological data in order to compile forecasts. In addition, the water flows are calculated and during the cold season the ice condition on rivers and on the Danube is recorded. The results of observations and recordings made by hydrometric stations are used to draw diagrams showing the variation of water levels (monthly, yearly, and for several years) and forms the national data bank which helps draw conclusions concerning the water levels.

To this network are added the 50 hydrometric stations located near the most important lakes in our country, where water levels are measured daily, and also about 5000 hydrometric stations for underground waters.

The Flow of Information and the National Reservoir of Meteorological and Hydrological Data--In the Service of the National Economy

The entire flow of information and the national reservoir of data, stored by classical means or by modern ones, are the basis for meteorological and

hydrological forecasting and for research in these closely related fields. The goal is to study physical processes in the atmosphere and in the hydrosphere, respectively, in order to gain a true understanding of the laws which govern the two media of our planet.

The wealth of data accumulated is subject to detailed statistical processing and to a process of standardization, synthesis and generalization, in order to find out the dynamic laws (those causing the actual meteorological and hydrological phenomena) and the statistical laws (which generate the totality of phenomena) and thus be able to explain the territorial distribution of characteristic element of the climate and hydrological system. These very laws are the ones which determine the parameters of climate and hydrological resources which actually describe the evolution of the natural surroundings and which ultimately determine many aspects of economic-social activity. These activities include water management, energy production (including non-conventional sources), irrigations, drainage, the supply of industrial and drinking water, civil and industrial works, hydrotechnical and water improvement works, air and water navigation, road and rail transportation, public health, sports, tourism and leisure, etc. They are the practical and operational activities in the service of society in which meteorology and hydrology are directly involved.

We should also mention here that, in addition to its current operation, the IMH provides a large variety of climate and hydrological parameters to the national economy, for every point and area of the country. Therefore, parameters have been developed to characterize the main climate and hydrological elements such as solar radiation, air, water, and soil temperature; precipitation and snow cover, atmospheric pressure and winds, evapo-transpiration, surface of meteorological and hydrological phenomena (fog, snow storms, white frost, hoar frost, freezes, floods, pollution of air, water and soil, and erosion of soil and of river beds). The most common parameters known for these elements and phenomena consisted of average or extreme values, frequencies and durations, variability and probability values.

The current knowledge of the laws governing the air and water media and the parameters which define the climate and the waters must be continually exceeded so as to permit the constant overall monitoring of these two media. As a result, the applicability of the dynamic laws will be extended and they will be able to express more adequately the space-time evolution of natural phenomena. Also, the simulations carried out on high performance computers will make it possible, in the near future, to make a quantitative evaluation of the effectiveness of the deliberate attempts to modify the weather, the climate, and the circuit of water in nature.

The year 1952 saw the creation of the service of hydrological forecasting within the framework of the General Hydrometeorological Directorate. The information on the condition of rivers was transmitted in the classical Morse Code and processed by this service which compiled, daily, a bulletin of hydrologocal forecasts. Later on, the activity of the forecasting service was based in increasingly wider information sources and on ever improving methods for hydrological calculations. The means of receiving the information changed from

telegrams to telephone and then to radio-telephone. Processed information on weather forecasts which determine the condition of waters is also being used.

Since 1970, as a result of increased demand for rational management of water in the accumulation lakes, long range hdyrological forecasts have been compiled in order to provide the water users with the data concerning quantities of water run-off over longer periods of time--one month, a season, and even one year.

The development of modern technical means for automated processing of information and the strides made by hydrology as a science have caused an important qualitative leap in hydrological forecasting.

At present, the Institute of Meteorology and Hydrology receives, during periods of normal waters, daily information from over 400 hydrometric stations on the territory of the country and during run-off periods this information is received every hour or every three hours, and includes data on water levels and flows, on precipitation and ice conditions on the rivers and on the Danube. The installation of a system for automatic measurement and transmission of data is presently being completed in stations located in mountain areas, at high altitude. The modern stations are equipped with automatic sensors which transform the hdyrometeorological data (water level, flow, air temperature, precipitation) into coded electrical signals which are then sent by advanced radio means to relays for collection and retransmission. From here, the data travels radially to collection centers equipped with independent type - 100 electronic computers, and then to the national center at the Institute of Meteorology and Hydrology where the information is being transmitted by means of operational programs, on media compatible with the computer.

The hydrological and meteorological information from the modern automated stations is then blended with the information which arrives by the conventional means of radio and telex. To this is added the information obtained by modern global means--data from meteorological radars, concerning the quantity of precipitation, and photogrammetric data from the orbiting satellites (LANDSAT), and also the latest "news" concerning weather forecasts compiled by the synoptic meteorologists.

In this manner a whole set of information is prepared for a given time; this is recorded on magnetic tapes and discs and can be processed by means of a high-power electronic computer (Felix C-1024). The automated data system of hydrological forecasting is harmoniously integrated with the conventional one, the two complementing each other.

The data is processed using modern calculating methods and mathematical models, based on solving mathematical physics equations and on the laws of hydrology which connect the forecasted hydrological elements to the meteorological and hydrological phenomena which already occurred.

The results of this data processing are shown on displays or as computer printouts and as forecast bulletins which are transmitted to the consumers. At the present time, the short range hydrological forecasts (2-3 days in advance) and

those of medium and long range (ten days, one month, a season) are increasingly more in demand by the national economy. They are becoming extremely useful for the rational management of water resources in accumulation lakes, for their complex utilization--drinking and industrial water supply, hydro-power, irrigation, pisciculture, leisure - for planning river navigation and for taking preventive steps against flooding and ice and thus reducing the damage caused by overflowing rivers. The economic effectiveness of hydrological forecasting is extremely significant. In the 1980s, flooding has caused damages in the range of 20 billion lei in our country. If we accept that, in general, hydrological forecasts along with efficient protective steps can reduce these damages by 25 to 30 percent, we can immediately see the resulting benefits.

1632
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