JPRS L/9551

17 February 1981

USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

(FOUO 7/81)

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SM 2103, SM 2104 PROCESSORS OF SM-3 AND SM-4 CONTROL COMPUTER COMPLEXES

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The processors are the heart of the SM-3, SM-4 control computer complexes (UVK) (see Figures 1, 2) and are intended for executing program instructions, servicing requests of external systems and providing the operator with operational communications with the control complex. With the processor the operator can stop a program, load in instructions and data, check the content of the registers of external systems, memory cells and universal registers, initiate any program in memory, implement step-by-step execution of a program, generate the initial loader of the perforated tape operations system from the internal permanent memory of the microprogram control processor (for SM-3 only).

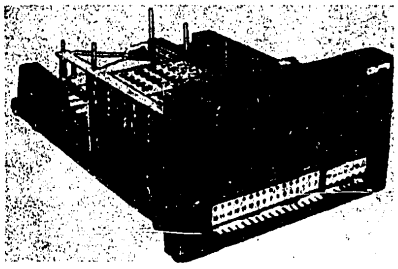

Figure 1. SM 2103 processor of SM-3 UVK.

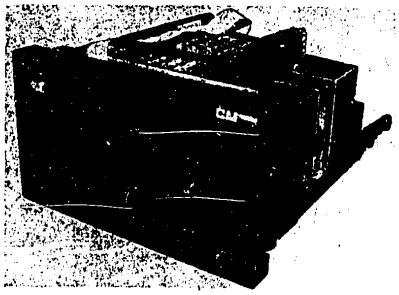

Figure 2. SM 2104 processor of SM-4 UVK.

Another function of the processor is to detect errors in instructions, related to the unlawful utilization of reserve instructions or improper addressing of registers (with a nonexisting address or address with the improper whole number boundary). Any detected error is accompanied by a change to its corresponding service program. The processor likewise automatically monitors stack overflow and power failure and switches to the corresponding service programs in bad situations.

For operation in real time the processor has a system that receives and processes time marks from an external source (timer).

The SM 2104 processor is different from the SM 2103 in that it has higher speed and an arithmetic expander, which multiplies and divides with a floating decimal and performs arithmetic operations with a floating decimal, which makes the overall program run speed even faster. The existence of a memory dispatcher provides an opportunity to expand the memory zone to 124K words.

The processor has 8 general purpose registers (UR), which can be used as stores (including when the results of an operation are left in a register), index registers (including the case when the content of a register is combined with the content of a memory cell), address indexes (here the content is the address of the operand), table indexes, lists, etc., memory region indexes for temporary storage of data (stack). The specific utilization of UR depends on the selected addressing mode.

SM-3, SM-4 UVK utilize the multilevel stack interrupt principle. The number of interrupt levels is limited only by the depth of the stack in memory and can be practically as large as desired.

To each peripheral system (PU), connected to the "Common line" (OSh), is assigned a certain priority. There are five priority levels: one out-of-processor; four program (each with four interrogation lines ZP4-ZP7), and each of which has its own interrupt request line (from all the systems of that level) and its own interrupt enabling line.

On one higher priority interrupt level there is a system that is physically connected closer to the processor.

The processor is designed as a self-contained building block (AKB) based on a typical frame, which is assembled from special aluminum profiles. On the frame is fastened a face panel, operator panel (PO), cassette interface unit (BKI), cassette processor unit (BPR), power and ventilator units.

The processor is installed in a rack on guides, which make it easy to pull out for preventive maintenance and repairs.

The operator panel is a printed circuit board with switches, light-emitting diodes and logic elements, covered with a decorative panel. The keys protrude through holes in the face plate. Also installed on PO is a switch for turning on and off the power and for locking the functional keyboard of PO.

Specifications of SM 2103, SM 2104 Processors

	SM 2103	SM 2104
Type of processor	parallel	
Control	microprogrammed	
Representation of arithmetic operands	with fixed decimal in auxiliary code	with fixed decimal in auxiliary code, with floating decimal

	SM 2103	SM 2104
Word length of arithmetic operands, bits:		
with ordinary precision	16	
with double precision	32	
Range of representation of numbers with ordinary precision:		
with character	from -32768 to +32767	
without character	from 0 to 65535	
Word length of logic operands, bits	1, 8, 16	
Instruction execution time, μs, not more than:		
"register-register" format	5.0	1.2
"register-memory" format	7.0	2.5
"memory-memory" format	9.3	3.9
multiplication (with fixed decimal)	programmable	10.2
division (with fixed decimal)	programmable	13.0
addition (with floating decimal)	programmable	22.0
multiplication (with floating decimal)	programmable	35.0
Addressing system	12 types (direct, indirect, relative, index, with automatic increase, etc.)	
Instruction format	zero-, one- and two-address instructions	
Interrupt system	priority	multilevel
Number of general purpose registers	8	
Power from AC line:		
voltage, V	220 + 10% - 15%	
frequency, Hz	50 ± 1	
Input power, V·A, not more than	400	500
General dimensions of processor, mm	482.6 × 785 × 265.9	483 × 620 × 267
Weight of system, kg, not more than	40	

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SM-4 (SM-1401) CONTROL COMPUTER COMPLEXES

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 5 pp

[Text] The SM-4 control computer complex (UVK) (Figure 1) is in the hardware nomenclature of small computer systems.

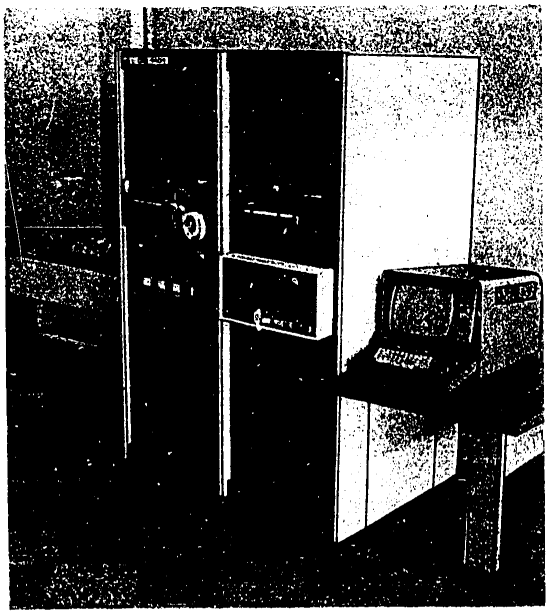

Figure 1.

By virtue of its well developed architecture, extensive selection of peripheral systems and systems for communicating with a facility, developed within the

framework of SM EVM, the orientation of the software toward the solution of problems in real time, the UVK SM-4 can be used for building systems for automating scientific research and experiments, for controlling technological processes, for the collection, preparation and processing of data and for controlling batch technological processes, for automating planning and design operations; information-metering systems, for carrying out scientific-technical and complicated engineering calculations; satellite subsystems in multicomputer hierarchical systems, operating under the control of highly productive UVK of the M-4030, M-4030-1 types or YeS EVM; channel and message switching systems; service and transportation systems, etc.

The range of application of UVK can be expanded by matching the UVK SM-4 interface with interfaces of the YeS EVM, 2K, KAMAK and other types.

The SM-4 complex is built on the basis of the SM-2104 processor with up to 124K word memory and peripheral systems. A sample structural diagram of UVK SM-4 is shown in Figure 2.

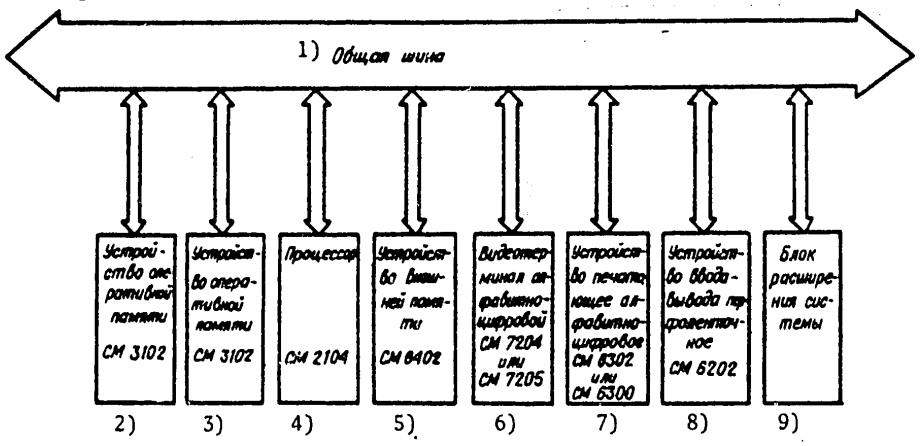

Figure 2.

KEY:
1. Common line
2. Operational memory system SM 3102
3. Operational memory system SM 3102
4. Processor SM 2104
5. External memory system SM 6402
6. SM 7204 or SM 7205 alphanumeric video terminal
7. SM 6302 or SM 6300 alphanumeric printer
8. Perforated tape input-output system SM 6202
9. Systems expansion unit

UVK SM-4 exhibits all the architectural features of UVK SM-3, and furthermore it has a number of additional capabilities.

UVK SM-3 and SM-4 share a common nomenclature of peripheral systems and are compatible in terms of software with UVK M-400, i.e., all the programs, developed for UVK M-400, can be used in SM-3, SM-4.

The architecture of SM-4 complexes is determined by the selected instruction and interrupt system, by the organization of interaction between the systems in the complex. The structure of the SM-2104 central processor provides high speed.

UVK SM-4 is a complex with a single-line input-output interface system, i.e., all systems (processor, operational memory and peripheral systems) are connected to the same data transmission line, called "Common line" (OSh). The use of a single asynchronous OSh channel makes it possible to use a communications algorithm and unified interface equipment for all systems.

The processor uses the established set of interface signals both for communications with memory and for communications with peripheral systems, which use the same set of signals when communications is established with the processor, memory or other peripheral systems, connected to OSh.

The interfaces of the peripheral systems include registers -- sources and (or) receivers of information. The single-line interface structure provides a common peripheral systems register addressing system and operational memory cells.

In accordance with the architecture of the complex, to each register is assigned an address, which distinguishes it from other registers of peripheral systems, connected to OSh. This address is analogous to the address of a memory cell. The structure of the OSh system enables the processor to examine the registers of the peripheral systems as active operational memory cells and to gain access to them with the aid of address instructions, and therefore there is no need for special input-output instructions. 4K words are allocated for addressing the registers of external systems.

The advantage of this peripheral systems accessing system is the fact that the processor can work with data in the registers of these systems directly, without having first to refer them to memory or to its own registers, using for this purpose the entire list of instructions and all capabilities of the addressing modes. Data can also be transmitted from one buffer register to another through OSh, bypassing the central processor (its registers) altogether. Therefore numerous interrupts do not occur and the overall productivity of the processor increases.

OSh is used by the processor and by all peripheral systems in the time-sharing mode in accordance with the system of priorities. ARBITR of the processor (the priority interrupt control system) decides which of the systems will occupy OSh at a given moment of time.

Information is exchanged between systems through OSh on the asynchronous principle. Two systems, connected together, for example a transducer and the executor, take part in any OSh operation. The transducer controls the line during the exchange of data with the other system, called the executor. The process whereby systems interact on the "transducer-executor" system is flexible (the line can switch dynamically to other transducers connected to it). Each system of the complex, with the exception of OZU [Direct access memory], can become a line tasker. The connection between systems through OSh is mutually closed. Every control request signal, sent by the tasker, should get a response from the executor, after which the exchange ends.

If the tasker answers the request of a system with an enabling signal, but the system does not send a confirmation signal, permission is revoked. If the tasker does not receive a reply it registers an OSh error.

The OSh interface is designed on the basis of a multiwire high-frequency data transmission trunk, consisting of a collection of wire lines. The heart of the interface is made up of 56 signal lines.

The common line can connect up to 20 systems to the interface, and the total length of the line should not exceed 15 m. When more than 20 systems are connected or the tolerable OSh length is exceeded it is necessary to use an additional system, called an interface expander (RIF), which is intended for amplifying OSh signals. In this case the number of systems that can be connected to OSh is not limited.

The SM-4 complex uses the same structural elements, for example racks, self-contained building blocks, cassette units and components.

In the racks are installed building blocks for accommodating components of the power system. The building blocks can be of desk-top, floor and built-in design. The built-in building blocks can be removed from a rack on guides.

The cassette units are used for installing components and are located in the building blocks.

The component units are TEZ [not further identified] with microcircuits and digital components.

The component base of the complex is based on TTL -- microcircuits of the expanded K155 series. IMS of the K131, K599 series, which are electrically, logically and structurally compatible with the K155 series, are also used for making high-speed logic circuits and for saving hardware expenses.

Microcircuits of the K559 series are used as main line elements.

The systems that are connected to the complex can be divided conditionally into three groups. The first group includes SM EVM systems, designed as structurally complete units. They are installed in available places in the racks of the complex or in an additional rack and are connected by cables. The second group includes systems, the controller of which is designed as two components, developed for connecting the cassette interface unit (BKI) of the processor or systems expansion unit (BRS) to standard circuitry. The systems expansion unit is used when there is a need to connect more than three systems and contains 1-2 BKI units. The third group includes systems which utilize, for communications with the OSh interface, more than two components, and they have individual wiring and are not of structurally complete execution. Additional systems can be installed in BRS.

The systems expansion unit is intended for connecting additional systems to the SM-4 terminals. It is designed in three modifications:

self-contained component unit (AKB) with a power source and fans for connecting systems of the third group;

AKB with a power source and with fans and BKS for connecting up to six systems of the second group. Systems of the third group can be connected to available places in this modification of BRS;

AKB with a power source, fans and two BKI for connecting up to 12 systems of the second group.

The grounding system should be a ground circuit with not more than 1 Ω impedance.

The software of UVK SM-4 has systems for preparing, debugging and developing program software; running of programs in the time-sharing mode and in real time; data teleprocessing; organization and management of data bases.

The software consists of operations systems, applied programs packages for various purposes, systems for programming from machine and task-oriented input languages, including FORTRAN-IV, BASIC, COBOL, etc., and also test programs for checking the performance of systems included in the complex.

The operations systems, depending on the systems carrier utilized, are divided into perforated tape and disk systems, and in terms of purpose into general purpose, real-time and time-sharing systems.

The software nomenclature includes a general purpose perforated tape operations system (PLOS SM), perforated tape dialogue programming system (DS SM) and general purpose disk operations system (DOS SM).

The dialogue programming system consists of a dialogue language and program interpreter in that language, intended for the development, debugging and running of client programs, written in input dialogue language. DS SM is used for automating scientific experiments, scientific-technical and economic calculations and in education.

DS SM prepares client programs in the DS SM input language; debugs client programs; loads client programs into OZU from perforated tape: reads out onto perforated tape or prints out the text of client programs entirely or in parts; enables a client to operate in the dialogue and program modes.

PLOS SM is a package of programs on perforated tape, which prepare client programs and systems programs in assembler language; edits input text, revises and supplements it; prints out in edited form the entire text of programs or parts of it on perforated tape; debugs computer programs by running certain parts of them and checking them at different points; loads from perforated tape into memory programs in the format for initial loading; provides an octal output onto perforated tape or to a printer of the content of all or of indicated parts of memory in symbolic code; reads out onto perforated tape in absolute binary format the content of all or of a specified part of memory; provides asynchronous input-output service.

Systems programs were developed for performing these functions: a translator from mnemonic assembler language (AS SM), "Initial loader" programs (NZAGR-SM), "Absolute loader" (AZAGR-SM), "Text editor" (RT SM), "Debugger" (OTL-SM), "Input-output dispatcher" (DVV-SM), standard programs that perform operations with a floating decimal, computation of transcendental functions, operations on double length words and conversion of lines to KOI-7 code and reconversion.

DOS SM is a further development of PLOS SM and is oriented toward the single client operating mode. DOS SM is designed on the modular principle and contains a large collection of systems programs and several service programs.

The heart of DOS SM is the "Monitor" program, which provides access to the systems programs and client programs, transmits data for input-output and external memory control operations; corrects mistakes, etc.

The "Macroassembler" language translator translates programs in "Macroassembler" language; performs translation on condition; provides program sectioning capability; expands the set of assembler directives. The FORTRAN-IV language translator performs translation of programs in FORTRAN-IV language; provides direct access input-output; performs mixed operations; pinpoints errors and establishes feedback with the main program; permits the processing of characters using 1 byte long logic variables.

The "Composer" program is intended for shifting each computer module and for assigning absolute addresses; for developing a loader card and module. The "Librarian" program develops, alters, erases and prints out the content of the library. The "Debugger" program helps to smooth out programs that are composed. The "Editor" program edits text. The file operations program performs operations on files.

The development of operations systems is proposed in the future for expansion of the software: OS RV SM -- general purpose operations system for operation in real time; FOBOS SM -- background operational base operations system for operating in real time; DIAMS SM -- disk dialogue multiconsole system for solving information problems and for managing data bases; PPP -- applied programs packages.

Specifications

Control of complex	microprogrammable
Number of general purpose registers	8
Input-output system:	
type of interface	"common line"
interface transmission capacity in direct access mode, thousands of words/s	700
interrupt system	priority, five-level, with unlimited number of sub-levels on each level, using systems stacks and interrupt vector mechanism
Direct access memory capacity, kbytes	248

Cycle time, μs	1.2
Organization of memory	page
Addressing system	direct, indirect, relative, index with self-expansion, etc. (12 types in all)
Dispatcher memory capacity, kbytes	248
Operating mode	systems, client
Size of page, words	32-4096
Number of active pages	16 (8 systems and 8 client)
Memory protection	by write, by write and read
Type of processor	parallel
Representation of arithmetic operands	with fixed decimal in auxiliary code, with floating decimal
Word length of arithmetic operands, bits:	
with ordinary precision	16
with double precision and floating decimal	32
Word length of logic operands, bits	1, 8, 16
Range of representation of numbers with ordinary precision:	
with symbol	from -32,768 to +32,767
without symbol	0-65,535
Instruction execution time, μs, not longer than:	
in "register-register" format	1.2
in "register-memory" format	2.5
in "memory-memory" format	3.9
multiplication time (with fixed decimal)	10.2
division time (with fixed decimal)	13.0
addition time (with floating decimal)	22.0
multiplication time (with floating decimal)	35.0
processor switching time	5.0

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SM-3 (SM 1301) CONTROL COMPUTER COMPLEXES

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 4 pp

[Text] The SM-3 control computer complexes (Figure 1) are included in the hardware nomenclature of the small computer system. The developed architecture of the complexes, the extensive collection of peripheral systems and industrial communications systems, developed within the framework of SM EVM, and the orientation of the software toward the solution of problems in real time enable UVK [Control computer complex] SM-3 to be used for the development of:

scientific research and experimental automation systems;

technological process control systems;

data acquisition, preparation and processing and technological batch process control systems;

planning and design work automation systems;

information-metering systems;

systems for doing applied scientific and complicated engineering calculations;

satellite subsystems in multicomputer hierarchical systems, operating under the control of highly productive UVK of the M-4030, M-4030-1 or YeS EVM type;

channel and message switching systems;

systems for service, transportation, etc.

The ranges of application can be expanded by using the existing capabilities of the UVK SM-3 matching interface with YeS EVM 2K, KAMAK and other interfaces.

UVK SM-3 complexes are built on the basis of SM 2103 processors with up to 28K word memory and peripheral systems.

All the architectural features of UVK SM-3 are inherent to UVK SM-4, while the latter has a number of additional capabilities. UVK SM-3 and SM-4 have the

common peripheral nomenclature and are compatible in terms of software with UVK M-400, i.e., all programs developed for UVK M-400 can be used in SM-3, SM-4.

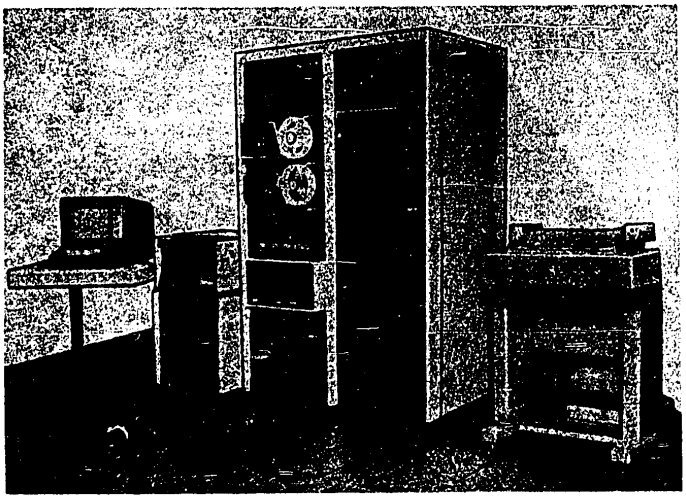

Figure 1. SM-3 (SM 1301) control computer complex.

The architecture of the SM-3 complexes is determined by the selected system of instructions, interrupt system and organization of interaction between systems in a complex.

UVK SM-3 complexes have a systems input-output interface with a single-line structure, in which all systems (processor, direct access memory systems and peripheral systems) are connected to the same data transmission line, called "Common line" (OSh). The use of one asynchronous OSh channel makes it common to use a communications algorithm and unified interface equipment that is common for all systems.

The processor utilizes the established set of interface signals both for access to memory and for communications with peripheral systems. The latter also utilizes the same set of signals when communications is established with the processor, memory or other peripheral systems, connected to the "Common line."

The interfaces of peripheral systems include registers -- sources and (or) receivers of information.

The single-line interface structure provides a common addressing system for the peripheral systems registers and direct access memory cells.

In accordance with the architecture of the complex, each register of a system has its own address, distinguishing it from other registers of peripheral systems, connected to the "Common line." This address is analogous to the address of a memory cell.

The structure of a system with a "Common line" enables the registers of peripheral systems to be viewed as active operational memory cells and enables the processor to access them through address instructions, for which reason no special input-output instructions are needed. 4K words are reserved for addressing registers of external systems.

The advantage of the described system for accessing peripheral systems is the fact that the processor can operate with data in the registers of these systems directly, without having to reference them beforehand to memory or to its own registers, using for this purpose the entire list of instructions and all capabilities of the addressing modes. Data can also be transmitted from one buffer register to another through the "Common line," bypassing entirely the central processor (its registers). In view of this numerous interruptions do not occur and the overall productivity of the processor increases.

The "Common line" is used by the processor and by all peripheral systems on a time-sharing basis in accordance with the systems priorities. The ARBITR of the processor (the priority interrupt control system) decides which of the systems will occupy the "Common line" at the current time.

Information is exchanged between systems through the "Common line" on the asynchronous principle. All systems connected to each other as a tasker and executor take part in any OSh operation. The tasker controls the operation of OSh during exchange of data with the other system, called the executor. The process whereby systems interact by the "tasker-executor" model is flexible: the OSh can switch dynamically to other taskers, connected to it.

In principle each system of the complex, with the exception of OZU [Direct access memory], can become a tasker of the line. A connection between systems through OSh is mutually closed. Each control request signal, sent by the tasker, receives an answer from the executor, after which exchange ends. If the tasker answers a request of a system with an enabling signal, the system does not send a confirmation signal, permission is revoked. If a response signal is not received from the executor the tasker registers an OSh error.

The OSh interface is designed on the basis of a multiwire HF data transmission trunk, consisting of a collection of wire lines; 56 lines of the group are signal lines and make up the heart of the interface. Different information of the system: data, address, instructions, information about the state of central and peripheral systems and control signals, are transmitted directly by these 56 functional lines of the "Common line."

The following base UVK SM-3 complexes are built on the basis of the existing hardware and software: SM 1301.03; SM 1301.04; SM 1301.05; SM 1302; SM 1303.

A structural diagram of a complex for the SM 1301.05 version is shown in Figure 2.

The complexes described above can be expanded.

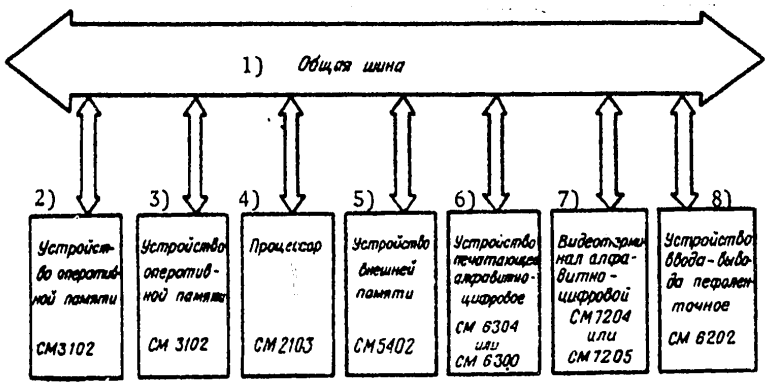

Figure 2. Structural diagram of UVK SM-3 (SM 1301).

KEY:
1. Common line
2. Direct access memory SM 3102
3. Director access memory SM 3102
4. Processor SM 2103
5. External memory system SM 5402
6. SM 6304 or SM 6300 alphanumeric printer system
7. SM 7204 or SM 7205 alphanumeric video terminal
8. Perforated tape input-output system SM 6202

To the "Common line" interface may be connected up to 20 systems, and total line length should not exceed 15 m. When more than 20 systems are connected or the tolerable OSh length is exceeded it is necessary to use an additional system -- an interface expander (RIF), which is intended for amplifying OSh signals. When RIF is used the number of systems that can be connected to OSh is architecturally unlimited.

Systems connected to the complex can be conditionally broken down into three groups.

The first group includes SM EVM systems of finished design execution. Systems of this group are installed in open places of racks of the complex or in an extra stand and are connected to the complex by a cable of the necessary length.

The second group includes systems, whose controller is designed as two components, developed for connecting the cassette interface (BKI) of the processor or system expansion unit (BRS) to standard wiring.

In the BKI of the SM-3 processor there are open places for connecting up to three such systems. If more than three systems must be connected it is necessary to use a system expansion unit (BRS), containing one or two BKI units.

The third group includes systems that utilize more than two components for connection to the OSh interface, and which are not of the structurally finished design execution. Such systems can be installed in BRS.

BRS is intended for connecting extra systems to the SM-3 terminals. This unit has three modifications. BRS consisting of an autonomous building block (AKB) with a power source and ventilating fans, is intended for connecting systems of the third group. BRS consisting of an AKB with a power source and ventilating fans and a cassette interface unit is intended for connecting up to six systems of the second group. Systems of the third group can be connected to an open place in the given BRS. BRS consisting of an AKB with a power source, ventilating fans and two BKI is intended for connecting up to 12 systems of the second group.

The following structural elements are used in SM-3 complexes: racks, autonomous building blocks, cassette units and components. Racks are intended for installing building blocks for the installation of elements of the electrical power system. Building blocks can be table-top, floor and built-in units. The built-in building blocks can be removed from a rack on guides. Cassette units are for installing components and are installed in building blocks. The components are TEZ with microcircuits and digital components.

The heart of the component base of the complex is comprised of TTL -- microcircuits of the expanded K155 series. IMS of the K131 and K599 series, which are electrically, logically and structurally compatible with the K155 series, are also used in order to take full advantage of the high-speed logic circuits and to save on hardware expenses. Microcircuits of the K559 series are used as trunk line elements.

The grounding system should be a ground circuit with not more than 1 Ω impedance.

The program software of UVK SM-3 contains systems for preparing, debugging and developing program software; execution of programs in the time-sharing mode, in real-time scale; data teleprocessing; organization and management of data bases.

The program software consists of operations systems, applied programs packages for various purposes, system for programming from input machine and problem-oriented languages, including FORTRAN-IV, BASIC, COBOL, etc., and also test programs for checking the performance of systems that are included in the complexes.

The operations systems, depending on the systems carrier that is utilized, are subdivided into perforated tape and disk systems. The operations systems are subdivided into general purpose, real-time and time-sharing systems, depending on their function.

The nomenclature of program software includes a general purpose perforated tape operations system (PLOS SM) and general purpose disk operations system (DOS SM).

PLOS SM is a package of programs on perforated tape, which perform preparation of client programs and systems programs in assembler language; editing of original text, revision and supplementing of text; readout in edited form of all the text of programs or of parts of it onto perforated tape; debugging of computer programs by

running certain portions of them and by checking the anticipated results at certain points; loading of programs from perforated tape into memory in the format for initial loading; octal readout of the content of all or of specified parts of memory onto perforated tape or to a printer in symbolic code; readout in absolute binary format of the content of all or of a specified part of memory onto perforated tape; asynchronous input-output service.

The following systems programs were developed for implementing these functions:

mnemonic assembler language translator (AS SM);

"Initial loader" program (NZAGR-SM);

"Absolute loader" program (AZAGR-SM);

"Text editor" program (RT-SM);

"Debugger" program (OTL-SM);

"Input-output dispatcher" program (DVV-SM);

standard programs that perform operations with a floating decimal, computation of transcendental functions, operations on double-length words and conversion of lines to KOI-7 code and reconversion.

DOS SM is a further development of PLOS SM and is oriented toward the single client operating mode; it is designed on the modular principle and contains a large selection of systems programs. In addition to the standard package of systems programs there are several service programs.

The nucleus of DOS SM is the "Monitor" program, which serves the following functions: access to systems programs and client programs; data transmission during input-output operations and external memory control; correction of mistakes, etc. DOS SM also includes:

a Macroassembler language translator, which translates programs in Macroassembler language, performs translation by condition, provides the capability of program sectioning and expansion of the assembler directive package;

a FORTRAN-IV language translator, which translates programs in FORTRAN-IV language, provides direct access input-output, performs mixed operations, pinpoints errors and establishes feedback with the main program, processes characters utilizing 1 byte long logic variables;

"Composer" program, which shifts each computer module and assigns absolute addresses, develops a load card module;

"Librarian" program, which develops, modifies, erases and prints out the content of the library;

"Debugger" program, which helps to debug composed programs;

"Editor" program, which edits text;

file operations program, which performs operations on the files.

Specifications

Type of processor	parallel
Number system	binary
Structure of communications	single-line, asynchronous with one system for addressing direct access memory cells and registers of peripheral systems
Representation of arithmetic operands	with fixed decimal, in auxiliary code with symbol
Range of representation of arithmetic operands	from -32,768 to +32,767
Word length of arithmetic operands, bits:	
with fixed decimal	8, 16 (in-system processing)
with floating decimal	32, 48 (programmed processing)
Word length of logic operands, bits	1, 8, 16
Addressing system	direct, indirect, relative, absolute, immediate, index, with automatic expansion and automatic reduction (12 kinds in all)
Instruction format	nil-, one- and two-address instructions
Instruction system	includes 65 instructions, which in accordance with the kinds of addressing perform more than 400 different types of commands on words, bytes and bits
Number of general purpose registers	8
Interrupt system	priority, five-level, with an unlimited number of sublevels on each level; controls the order of utilization of the processor by all systems of the complex and enables it to operate in real time in the multiprogram mode with many external interrupts
Interrupt processing system	automatic, content of command counter and state of processor in systems stack

Execution time, μs, not more than:	
"register-register" format	5.0
"register-memory" format	7.0
"memory-memory" format	10.0
switching time	4.0
subroutine callout and return from subroutine	10.0
Direct access memory volume, kwords	28
Organization of direct access memory	pageless
Addressable unit of direct access memory	byte, word
Direct access memory access time, μs/word	1.2
Sampling time, μs/word	0.65
OSh cycle duration, μs	0.75 (OSh cycle -- interval of time during which master system generates "Busy" signal for OSh to transmit (receive) byte to (from) buffer register or executor system)
Time of reaction to external interrupts, μs, not longer than:	
on direct access channel	6.0
on program channel, including time for conserving content of instruction counter, word of state register and for starting new program	10.0 plus instruction execution time

Maximum number of systems connected to "Common line" interface, 20, and with additional systems for expanding the interface -- architecturally unlimited.

Minimum transmission capacity of interface:	
on out-of-processor channel, thousands of words/s	not less than 700
on program channels, thousands of words/s	not less than 30
AC main power:	
voltage, V	$220/380 \begin{smallmatrix} +10\% \\ -15\% \end{smallmatrix}$
frequency, Hz	50 ± 1
Input power, kV·A	2.9
Area occupied by complex, m^2	not less than 15
Area occupied by auxiliary equipment, m^2	not less than 10

SM-3 complexes operate at an ambient temperature of 20 ± 5°C; relative humidity 65 ± 15%, atmospheric pressure from 630 to 800 mm Hg st.

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EPG-SM GRAPHIC SCREEN CONSOLE

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The system (Figure 1) is intended for operational interaction between a client and computer complexes, built on the basis of SM-4P processors. Information is represented on the screen of the cathode-ray tube in graphic and symbolic forms. The distinguishing feature of the console is the use of part of the volume of the direct access memory of UVK [Control computer complex] SM-4 for generating an image. The system functionally consists of the following components: display processor, graphic monitor, alphanumeric and functional keyboards.

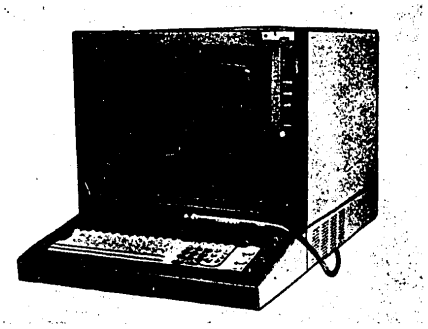

Figure 1. EPG-SM screen console.

The developed system of display processor instructions, which takes into consideration the architectural features of UVK SM-4, permits in-system solution of various graphic functions. The display processor sends instructions and data to direct access memory through the high-speed direct access channel, processes them and generates the corresponding signals for the monitor. The display processor instruction system takes the greatest possible load off the computer complex, reduces the volume of graphic arrays in OZU [Direct access memory] and simplifies programming.

The operator interacts with the SM-4 complex with a light pen and through alphanumeric and functional keyboards.

The extensive logic capabilities of the SM-4P processor, the flexibility of speed of the "Common line" interface, the well developed interrupt system, etc., guarantee high productivity and make the graphic systems, based on the utilization of EPG-SM systems, very efficient. These systems can be used as an independent computer system with graphic representation of results (Figure 2) and as a one- or multiconsole graphic subsystem, connected to the main computer through a processor to processor connecting unit or an adapter (Figure 3).

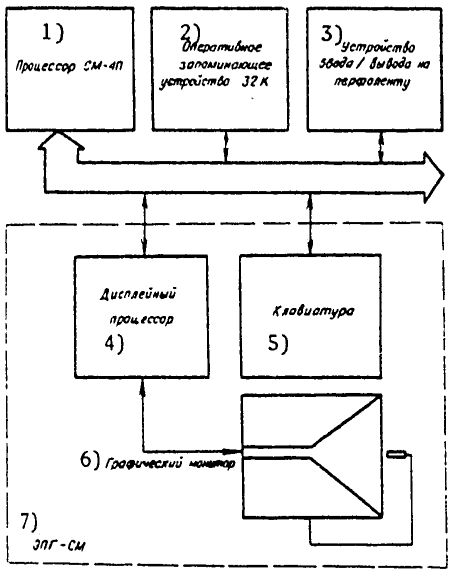

Figure 2. Base graphic SM EVM.

KEY: 1. SM-4P processor
2. 32K direct access memory system
3. Perforated tape input-output system
4. Display processor
5. Keyboard
6. Graphic monitor
7. EPG-SM

The described configurations of the graphic systems have extensive functional capabilities, which are attributed both to the parameters of the hardware and to the general purpose and special software; capability of preprocessing graphic information and performing operations on an image for the purpose of taking the load off the main computer; capability of easily changing the architecture of systems by adapting them to different ranges of application.

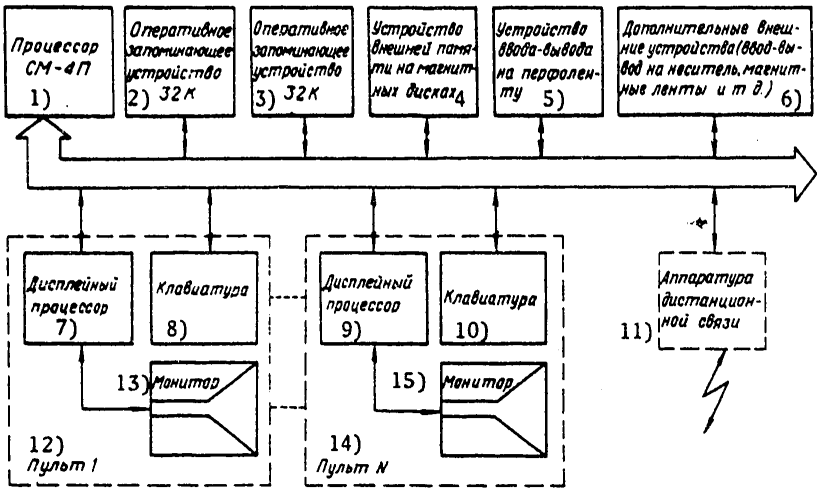

Figure 3. Multiconsole graphic subsystem.

KEY:
1. SM-4P processor
2. 32K direct access memory system
3. 32K direct access memory system
4. External magnetic disk memory
5. Perforated tape input-output system
6. Additional external systems (input-output onto carrier, magnetic tapes, etc.)
7. Display processor
8. Keyboard
9. Display processor
10. Keyboard
11. Long-distance communications equipment
12. Console 1
13. Monitor
14. Console N
15. Monitor

The systems engineering characteristics of a graphic complex based on SM-4 and EPG-SM permitted to be used as the heart of a variety of systems for automating design work, scientific experiments, etc.

Specifications

Effective screen dimensions, mm	240 × 240
Number of addressable points	1,024 × 1,024
Light spot diameter, mm	not more than 0.3
Time for plotting vectors of maximum length, ms	not more than 30
Time necessary for moving beam to arbitrary point, ms	not more than 15
Total line length in frame at 50 Hz, m	not less than 120
Maximum symbol plotting time, μs	8.5
Number of symbol sizes	2
Symbols can be oriented on coordinate axes.	
Number of types of lines	4

Number of brightness gradations	8
Playback error, %	not more than 0.5

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SM-1800 MICROCOMPUTER

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The SM-1800 is an aggregated built-in microcomputer, built on the basis of large integrated circuits, manufactured by n-channel MOS [Metal oxide semiconductor] technology. It is used in central monitor systems, branched automated terminal stations, multimicroprocessor data control and processing systems, as controllers of conveyors, automatic assembly lines, loading and transport machinery and systems, and as continuous process controllers (for direct digital process control).

The design of the SM-1800 microcomputer is based on the aggregate-module design principle. Its makeup includes the following modules:

central processor;

direct access memory;

permanent memory;

timer;

module for mating the SM-1800 with analog-digital video terminals with outputs to a radial parallel interface (IRPR);

module for mating with perforated tape input and output systems and with a line printing system with outputs to the IRPR interface;

module for mating with a radial series interface (IRPS);

module for mating with a "common line" interface;

for mating with a modem;

for mating with a floppy disk storage;

for mating with the SM-1800 operator console;

OZU [direct access memory] monitor;

analog input;

analog output;

level comparator;

16- and 32-channel digital inputs;

digital output;

number-pulse signal output;

output signal amplifier;

microprocessor controller;

floppy disk storage with two 256K byte disks;

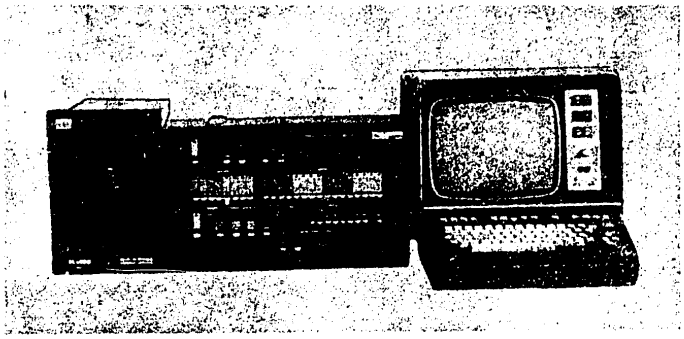
perforated tape input-output;

DZM-180 line printer;

VT-340 alphanumeric display;

ATsV-MIKRO alphanumeric video terminal;

ATsV-SM video terminal.



Each functionally complete system (module) is assembled on a 240 × 280 mm printed circuit board. The modules are installed in a self-contained unit, representing a frame with circuitry elements and power sources. The dimensions of the unit are 280 × 490 × 800 mm. The self-contained units can be installed in

a 600 × 850 × 1,800 mm rack or may be used as a desk computer in a protective case. The maximum communications line length is 3 km.

Specifications

Central processor module

Word length, bits	8
Maximum addressable memory volume, kbytes	64
Maximum number of addressable external registers:	
input	256
output	256
Capacity of OZU in central processor module, kbytes	1
Capacity of PZU [Permanent memory] in central processor module, kbytes	2
Instruction completion time, μs	2-8.5

Direct access memory module

Capacity, kbytes	16
Word length, bits	8
Cycle time, ns:	
record	800
read	650
generation	650

Permanent memory module

Capacity, kbytes	4
Word length, bits	8
Read cycle time, ns	200

Analog input module

Number of input channels	16
Input signal conversion range, V	±5
Resolving power, bits	12
Value of lower-order digit, mV	1
Basic error, %	not more than ±0.2
Active input impedance, MΩ	not less than 1
Maximum conversion time, ms	60
Suppressible interference on standard alternating current, dB:	
on 1 kHz	not less than 34
on 50 Hz ± 2%	not less than 60
on direct current	not less than 80

Analog output module

Number of output channels	4

Resolving power, bits	
Output signal at up to 400 Ω load impedance:	
by voltage (modification I), V	10, 24
by current (modification II), mA	20, 48
Basic error, %:	
for voltage	not more than 0.2
for current	not more than 0.3

Digital input module

Number of input channels	16 and 32
Input signal level, V:	
logic "0"	0...±2.4
	0...±4.8
	0...±9.6
logic "1"	±9.6...±14.4
	±19.2...±28.8
	±38.4...±57.6
Input current for each channel, mA	not more than 20
Maximum tolerable interference amplitude:	
general interference, V	100
normal interference	not more than 0.1 of logic "0" level

Digital output module

Number of output channels	16
Maximum switchable current, A	0.2
Working frequency, kHz	10
Switchable voltage	±4.8...±7.2
	±9.6...±14.4
	±38.4...±57.6

Numerical pulse signal output module

Number of input channels	4
Capacity of each counter, bits	8
Maximum counting frequency, kHz	20
Output signal level:	
logic "0"	0...±2.4; 0...±4.8;
	0...±9.6
logic "1"	±9.6...±14.4;
	±19.2...±28.8;
	±38.4...±57.6

The SM-1800 software is intended for debugging and running programs in the automatic mode in SM-1800 and in the cross mode in the M-4030 computer under the control of the DOS-2 ASVT operations system.

In the automatic mode the programming systems perform programming on the assembler language level, programming with the aid of an "ANS-minimal BASIC" language interpreter, programming in a high-level language, containing

computer-oriented structures (PL/M language subset), handling of the text file library and of arbitrary format files on floppy disk, input-output programming for switched external systems on the driver level, starting and monitor running of applied and systems programs.

In the cross mode the programming systems can be used for debugging programs of the entire capability of the DOS-2 ASVT operations system, supplemented with a cross-translator and SM-1800 microcomputer simulator.

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LINE SWITCH

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The line switch is intended for the construction of SM EVM multiprocessor complexes of different makeup and capacity with the "Common line" (OSh) interface.

The line switch (PSh) performs the following functions: connects an auxiliary line (DSh) to peripheral equipment, shared by two processors; improves the reliability of complexes due to the inclusion of a processor, kept in "warm backup" and switched on automatically in place of the disabled processor.

The system includes 22 insertable units of elements (B7) and an autonomous frame unit (KBA).

The line switch is designed as an autonomous unit, built into a rack. There is an operator's panel.

The component base consists of microcircuits of the K131, K155, K559, K599 series.

Specifications

Delay of signal transmission cycle through switch, ns	not more than 500
Time of connection of PSh in neutral position to "common line" by processor inquiry, μs	not more than 1
Internal timer available	
Control modes -- programmable, manual local, manual remote.	
Load capacity of each section, SEN [Standard load]	
through input	2
through output	18
AC input power:	
voltage, V	220 $^{+ 10\%}_{- 15\%}$
frequency, Hz	50 ± 1
Input power, V·A	500
Accrued operating time per failure of electronic part, hr	not less than 2,200
Average repair time, min	not more than 40

The line switch operates at an ambient temperature of 5-50°C and relative humidity of up to 90% at 30°C; atmospheric pressure of 630-800 mm Hg st. and vibration frequency up to 25 Hz with an amplitude of not more than 0.1 mm.

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SEMICONDUCTOR MEMORY MODULES (2b3.089.480 AND 2b3.089.481 COMPONENTS)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 3 pp

[Text] The modules are intended for operation in direct access storage systems of the SM-3, SM-4 complexes.

Specifications

	2b3.089.480	2b3.089.481
Capacity, words	12K	16K
Word length, bits	16 + 2	16 + 5
Access time, μs	0.8	0.8
Sampling time, μs	0.4	0.35
Input-output interface	common line	special
Memory elements	series K565 RU1 microcircuit	
Single failure correction capability	not provided	provided
Input power, V·A		14.5
Dimensions, mm		251 × 425 × 20

SM-5301 Magnetic Tape External Memory System

The system is intended for storing large arrays of information, for accumulating, sorting, revising and composing data arrays, for developing an information library and for exchanging information by means of magnetic tapes with the analogous systems of ASVT-M and YeS EVM.

The system includes an UVPML controller of the SM-5002 type (KUVPML SM-5002), installed in an UVK rack; one-four magnetic tape storages (NML) of the A3112 or SM-5300 type (IZOT 5004E); an SM rack for installing NML (two NML of the A3112 type or four NML of the SM-5300 type may be installed in one rack).

Specifications

Maximum number of program-accessible NML	4
Data exchange speed, kbytes/s:	
with NML A3112	24
with NML SM-5300	10
Interface	common line

Single cassette capacity, bits	
NML A3112	$20 \cdot 10^6$
NML SM-5300	$10 \cdot 10^6$
Reliability of reproduced information, bits/error	$1 \cdot 10^8$
Single-phase AC main power:	
voltage, V	$220 \begin{smallmatrix} + 22 \\ - 33 \end{smallmatrix}$
frequency, Hz	50 ± 1
Input power, kV·A, not more than:	
with one NML A3112	1.0
with one NML SM-5300	0.6
General dimensions of controller, mm	482.6 × 176 × 772
Weight, kg, not more than:	
with one NML A3112	270
with one NML SM-5300	55
with two NML SM-5300	210

SM-5603 Floppy Disk External Memory System

The system is intended for expanding the external memory of UVK [Control computer complex] SM-3, SM-4, for fast information input-output, for the development of a data library, and also for exchanging information by means of flexible magnetic disks, which are an effective and compact data carrier, which differ favorably from any tape carrier in that they have a short access time.

The system includes a control system (controller); PLX 45D2 floppy disk storage; power units.

Specifications

Number of program access disks	2
Interface	common line
Information exchange speed, kbytes/s	35
Storage capacity, Mbytes	0.5
Average access time, ms	400
Maximum recording density, bits/mm	128
Reliability of reproduced information, bits/error	$1 \cdot 10^9$
Input power, kV·A	0.5
General dimensions, mm	480 × 354.5 × 765
Weight, kg	40

A3112 Magnetic Tape Storage

The storage is intended for recording, storing and reproducing digital information.

Specifications

Type of carrier	12.7 mm wide magnetic tape
Reel diameter, mm	up to 267
Type of transport	single-capstan with lever idler
Recording method	BVN-1

Recording density, bits/mm	32
Recording format	ISO MS 1863
Tape transport speed, m/s	0.75
Rewind speed, s	not more than 500
Reel capacity, Mbytes	20
Input power, kV·A	not more than 0.54
Reliability of reproduced information, bits/error:	
installed in ASVT-M rack	$1 \cdot 10^8$
installed in SM EVM rack	not less than $1 \cdot 10^8$ (BVN-1), $1 \cdot 10^9$ (FK)
General dimensions, mm:	
installed in ASVT-M rack	680 × 480 × 480
installed in SM EVM rack	483 × 621 × 600
Weight, kg:	
installed in ASVT-M rack	130
installed in SM EVM rack	not more than 80

SM-5300 (IZOT 5004E) Magnetic Tape Storage

The magnetic tape storage system is intended for operation as an external storage system in small computers. It receives, stores and plays back digital information.

Specifications

Data exchange speed, kbytes/s	10
Recording density, bits/mm	32
Recording method	BVN-1
Type of head	double-gap
Gap distance, mm	3.81 ± 0.1
Maximum effective cassette diameter, mm	216
Unit cassette capacity, bits	$10 \cdot 10^6$
Tape transport speed, cm/s	31.75 ± 5%
Start-stop time, ms	25 ± 3
Rewind time, s	not more than 300
Reliability of reproduced information, bits/error	$1 \cdot 10^8$
Single-phase AC main power:	
voltage, V	220^{+22}_{-33}
frequency, Hz	50/60 ± 1
Input power, V·A	not more than 350
General dimensions, mm	310.5 × 482.5 × 440
Weight, kg	not more than 35

SM-6305 Printout System

The system is intended for printing out alphanumeric and special symbols in computers and computer complexes. It has a "common line" interface and can be connected to UVK SM-3, SM-4 (under the control of any SM EVM operations system). It is available in four modifications: SM-6305.01, SM-6305.03, SM-6305.02 and SM-6305.04 (the last two models are equipped with a programmable carrier format control unit).

The system includes ATsPU of the SM-6315 type and a controller (in the form of two TEZ [not further identified] installed in UVK).

Specifications

Printing speed, lines/min:	
SM-6305.01 and SM-6305.02	500
SM-6305.03 and SM-6305.04	700
Symbol field:	
SM-6305.01 and SM-6305.02	96
SM-6305.03 and SM-6305.04	64
Number of digits in line	up to 132
Buffer storage capacity, 8-digit words	up to 132
Paper tape width, mm	up to 420
Number of printed copies	original and up to 5 copies
Single-phase AC main power:	
voltage, V	220^{+22}_{-33}
frequency, Hz	50
Input power, V·A	up to 600
General dimensions of ATsPU, mm	not more than 830 × 650 × 1,140
Weight of ATsPU, kg	not more than 220

SM-6315 Parallel Alphanumeric Printing System (ATsPU)

The system is intended for printing out alphanumeric and special symbols from computers and complexes. It has a radial hookup interface for parallel information transmissions (IRPR). It can be connected directly to a computer with IRPR.

There are four models: SM-6315.01, SM-6315.03, SM-6315.02 and SM-6315.04 (the last two models are equipped with a programmable carrier format control unit).

Specifications

Printing speed, lines/min:	
SM-6315.01 and SM-6315.02	500
SM-6315.03 and SM-6315.04	700
Symbol field:	
SM-6315.01 and SM-6315.02	96
SM-6315.03 and SM-6315.04	64
Number of digits in line	up to 132
Buffer storage capacity, 8-digit words	up to 132
Paper tape width, mm	up to 420
Number of printed copies	original and up to 5 copies
Single-phase AC main power:	
voltage, V	$220^{+22+10\%}_{-33-15\%}$
frequency, Hz	50

Input power, V·A	up to 600
General dimensions, mm	not more than 830 × 650 × 1,140
Weight, kg	not more than 220

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LONG-DISTANCE COMMUNICATIONS ADAPTERS

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The adapters are intended for mating data transmission channels with small computers (SM EVM) for exchanging data between several interacting SM EVM complexes, and also between SM EVM complexes and terminal installations on multiplex and switched telephone, industrial, municipal and long-distance communications channels and on special (wire) communications lines.

Several models of long-distance communications adapters mate SM EVM complexes of the SM-3 and SM-4 types with data transmission channels, equipped with YeS8001, YeS8002, YeS8005, YeS8006 asynchronous modems or YeS8027, YeS8028, YeS8030, YeS8033 signal converter systems, and also with remote terminals of the "Displey VT-340" type and T-63 teletype on wire communications lines.

Three modifications of the long-distance communications adapters have been developed, depending on the types of connecting equipment (see the table). All adapters provide output to two data transmission channels.

The long-distance communications adapters provide a "Common line" interface with computers; establish communications with switched equipment; convert information from parallel code to serial code and back; monitor transmitted information in terms of parity, format and overflow; assign a given speed and format of transmitted and received data; convert TTL signal levels to the signal levels of S2 connecting circuits or to bipolar current pulses at a nominal current of 20 mA, or to unipolar current pulses with a nominal current of 40 mA and reconvert the current signals of S2 interface signals to TTL levels.

The format of the received and transmitted data is variable.

The data transmission speed, number of information and stop bits, selection of parity or nonparity tests, and exclusion of the tests are selected with patch cords in the units and can be set at the client's option.

Each communications adapter is built on unified SM EVM components in the form of a six-row cassette unit with a collection of components. A cassette unit is installed in a building block of an expanded SM-3 or SM-4 complex. The adapters

Adapter code	Number of channels	Type of interface	Electrical parameters of interface signals	Type of communications line	Maximum distance from BS ADS to connecting equipment
BS ADS-1	1 channel	S2 interface	According to S2 interface	Telephone channel	15 m
	2 channels	"--"	"--"	Same	15 m
BS ADS-2	1 channel	"--"	"--"	"--"	15 m
	2 channels	Bipolar current pulse with nominal current of 20 mA	Transmitter output voltage ±60 V ± 10% Receiver input voltage from ±1 to ±5 V	Special 4-wire communications line	10 km for line with parameters R = 48 Ω/km; C = 0.046 μF/km
BS ADS-3	1 channel	S2 interface	According to S2 interface	Telephone channel	15 m
	2 channels	Unipolar current pulses with nominal current of 40 mA	Transmitter output voltage 60 V ± 10%	Special 2-wire communications line	10 km for line with parameters R = 48 Ω/km; C = 0.046 μF/km

are powered by a BP113 power unit, installed in the same building block. The power voltage is +5 ± 5% and 60 V (20 kHz).

The adapters are connected to the SM-3 or SM-4 complex by a common line cable, and to modems by a cable that comes with the delivery set.

The performance of the adapters is checked with the aid of a test program. The test is used for checking out the logic part of the adapter without turning off connected equipment or to test the performance of the entire adapter with the equipment disconnected from the output and a panel with a special patch cord switch inserted.

The developed data teleprocessing software system (STOD) permits the use of all modifications of the adapters.

Specifications

Operating modes	duplex, half-duplex
Communications method	start-stop
Operating speeds, bauds	50, 100, 200, 600, 1,200, 2,400, 4,800, 9,600
Symbol format	variable, 1 bit "Start" 5, 7, 8 bits information; 1 bit "Test" (may be omitted); 1, 2 bits "Stop"
Power voltage	+5 V ± 5%; 60 V (20 kHz)
Dimensions, mm	446 × 250 × 100
Weight, kg	5
Average accrued operating time per failure, hr	4,000

The ADS [Long-distance communications adapter] operate at an ambient temperature of 5-55°C and up to 90% relative humidity at 30°C; at atmospheric pressure from 630 to 800 mm Hg st; tolerable vibrations on 25 Hz with an amplitude of 0.1 mm.

7872
CSO: 1863

UDC 681.14

IVK-2 TEST-COMPUTER COMPLEX

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The task-oriented complex, based on modern small computer hardware (SM EVM) and experiment interface systems in a standard KAMAK, is intended for building different systems for automating general physical experiments.

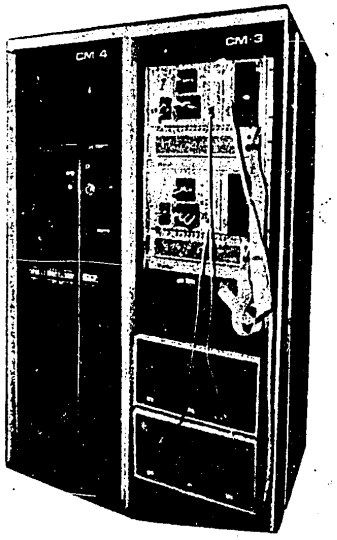

Figure 1. IVK-2 information-computer complex.

The IVK-2 (Figure 1) performs input of analog, pulse and code signals from an experimental setup, and also information from teletype; processes input information and solves a wide range of scientific-technical problems; reads out analog, code signals and information to teletype.

By virtue of a well developed multilevel interrupt system, real-time disk operation system and programming systems for operation with the KAMAK system the client can build multiprogram real-time systems for conducting experiments.

The modular design principle of IVK-2 makes it easy to restructure and expand the complex with new SM EVM systems and KAMAK modules.

The IVK-2 hardware includes:

SM-4 control computer complex (SM-4P 16-digit parallel processor, speed 700,000 register operations per second; floating decimal arithmetic expander; unit of control and expansion of direct access memory to 124K words; 64K word direct access memory; perforated tape input-output system; magnetic disk external memory with floating heads with capacity of 2.4M words; magnetic tape external memory system; alphanumeric terminal based on cathode-ray tubes; compact wide printer, speed 500 lines/min; systems expansion unit);

KAMAK systems (two KAMAK crates, input and output modules, crate monitor and control modules, a group of monitor and test modules and crate controller).

The number of crates can be increased to four with up to 23 positions for modules in each crate.

The KAMAK module set provides in each crate:

32 analog input channels (analog-code converter word length is 9 bits; analog-code conversion speed is 80 kHz);

four input and four output registers, each with a capacity of 24 bits;

two analog output channels (code-analog converter word length is 10 bits; code-analog conversion speed is 100 kHz);

24 initiative inputs;

four 16-bit pulse counters.

The IVK-2 base software consists of:

DOS SM disk operation system with macroassembler and FORTRAN-IV languages;

DOS RV SM real-time multiprogram disk system;

program systems for KAMAK operation in FORTRAN-IV language; test software.

The client, if he so desires, can expand the IVK-2 base software with program systems and apply program packages in the SM EVM software nomenclature.

A structural diagram of IVK-2 is presented in Figure 2.

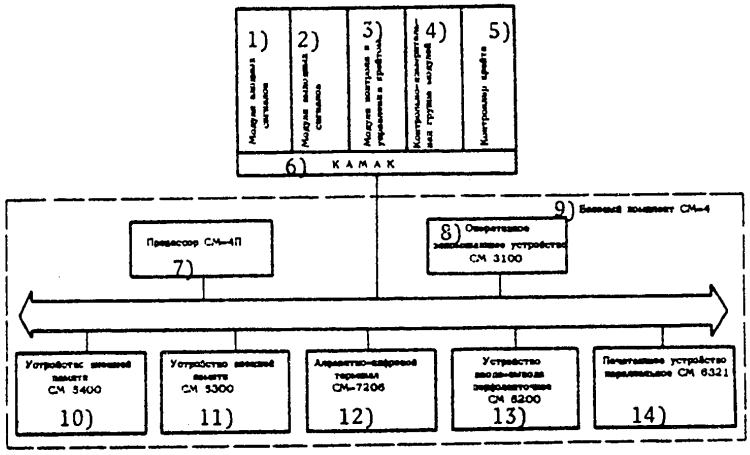

Figure 2. Structural diagram of IVK-2.

KEY:
1. Input modules
2. Output modules
3. Crate monitor and control modules
4. Monitor-test module group
5. Crate controller
6. KAMAK
7. SM-4P processor
8. SM 3100 direct access memory
9. SM-4 base set
10. SM 5400 external memory
11. SM 5300 external memory
12. SM-7206 alphanumeric terminal
13. SM 6200 perforated tape input-output system
14. SM 6321 parallel printer

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CSO: 1863

UDC 681.14

IVK-3 TEST-COMPUTER COMPLEX

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application], in Russian 1979, 2 pp

[Text] The IVK-3 complex is intended for automating research conducted with the aid of optical spectral instruments and is used in physics, chemistry, biology, medicine, metallurgy, light and food industries, etc.

The aggregate modular structure of the complex, built on the basis of modern SM EVM hardware and industrial communications systems by KAMAK standards, and also the developed software offer the client broad capabilities for automating specific processes and facilities.

The makeup of IVK-3 includes the following: base composition of the SM-3 control computer complex (UVK), KAMAK crate No. 2 with a set of functional and service modules, F-30 digital ampere-volt meter, N-306 two-coordinate template plotter and assembly kit.

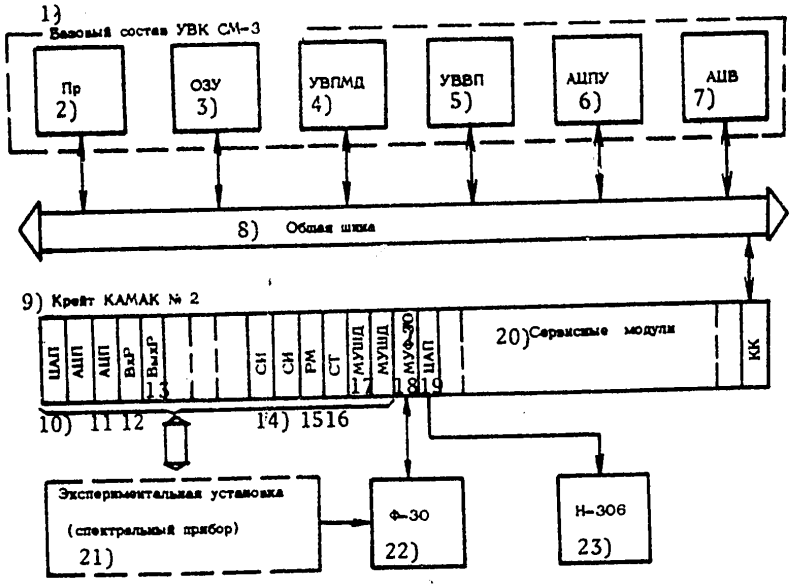
The base composition of UVK SM-3 includes a processor (Pr), direct access storage (OZU), alphanumerical video terminal (ATsV), alphanumerical printer (ATsPU), perforated tape input-output system (UVVP), external memory on magnetic disks (UVPMD).

KAMAK crate No. 2 contains the following modules:

functional -- crate controller KK, two two-channel digital-analog converters TsAP, input register VkhR, two pulse counters with digital indication SI, two analog-digital converters ATsP, two step motor control modules MUShD, three output registers VykhR, relay multiplexer RM, synchronizer-timer ST, digital ampere-volt meter control module MUF-30;

service -- voltage converter, inquiry register, word generator, trunk indicator, word generator-register, repair module, manual controller, two mockup modules.

IVK-3 can perform all basic functions associated with the conduct of automated experiments: data input-output through standard peripheral systems included in the UVK SM-3 composition, data input-output through industrial communications systems in the KAMAK standard; data input through an F-30 ampere-volt meter; graphic data output to an N-306 plotter; data storage on paper and magnetic carriers; data processing in accordance with prescribed programs in the package mode and real-time mode.



Structural diagram of IVK-3.

KEY:
1. Base composition of UVK SM-3
2. Pr
3. OZU
4. UVPMD
5. UVVP
6. ATsPU
7. ATsV
8. Common line
9. KAMAK crate No. 2
10. TsAP
11. ATsP
12. VkhR
13. VykhR
14. SI
15. RM
16. ST
17. MUShD
18. MUF-30
19. TsAP
20. Service modules
21. Experimental setup (spectral instrument)
22. F-30
23. N-306

The IVK-3 software is general and task-oriented.

The general software includes: disk operations system (DOS SM); real-time disk operations system (DOS RV); background operational real-time base operations system (FOBOS); KAMAK program monitor for organizing operations of exchange between UVK SM-3 systems and KAMAK modules using FORTRAN-IV language; tests for checking functional elements of the complex.

The task-oriented software is available as program modules, which perform standard operations encountered in the automation of spectral research. These operations include the following:

control of spectral instrument in "point storage" and synchronous scanning modes;

spectral data input in analog and pulse form;

operational statistical averaging of raw spectral information and evaluation of measurement precision;

input and operational correction of experimental parameters in dialogue mode;

output of spectra to ATsPU and plotter;

generation of messages to ATsPU and ATsV;

generation of base spectra;

scaling of spectra;

interpolation of spectra;

arithmetic operations on spectra;

integration and differentiation of spectra;

reduction to ideal instrument.

Specifications
UVK SM-3

Word length, bits	16
Register-register operation completion time, μs	not more than 5
OZU capacity, K words	32
UVPNMD capacity, Mbytes	4.8
Perforated tape input-output speed, char/s	300; 50
Output speed to ATsPU, char/s	180
Number of characters in ATsPU line	132
Input-output speed for ATsV, char/s	1,000
ATsV screen size, mm	200 × 140
Number of characters in ATsV line	80
Number of ATsV lines	16

KAMAK equipment

Number of switchable RM channels	16
RM switching frequency, Hz	not more than 100
ATsP word length (first, second), bits	9; 14
ATsP conversion frequency (first, second), kHz	not more than 80; 0.5
TsAP word length, bits	10
TsAP code replacement frequency, kHz	not more than 100
SI counting frequency, MHz	not more than 20
SI capacity and indication, decimal digits	6
Word length and number of input VkhR, bits	24 × 2

Word length and number of VykhR outputs, bits	24 × 2
Word length and number of VykhR power outputs with manual code selection, bits	16 × 2

F-30 digital ampere-volt meter

Word length, decimal digits	5
Conversion frequency, Hz	not more than 5

N-306 plotter

Precision, %	0.5
Stylus speed, cm/s	not more than 75

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CSO: 1863

IVK-2 TEST-COMPUTER COMPLEX

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 3 pp

[Text] The IVK-2 test-computer complex is intended for automating laboratory scientific experiments, conducted by general physical methods.

The IVK-2, developed on the basis of UVK [Control computer complex] SM-4 and KAMAK systems, is used for monitoring and controlling various processes in real time.

The complex features stack memory, byte processing, "extracode" instructions and operations on numbers with a floating decimal of the developed addressing system, developed interrupt system and 8 general purpose registers in the central processor, and the capability of expanding memory to 124K words provides high effective speed during the solution of various problems.

By using additional systems of the "Trunk channel switch," "Trunk channel adapter" and other types it is possible to develop on the basis of the IVK-2 multicomputer and multiprocessor systems with common memory field and external systems.

Makeup of IVK-2 Systems

The technical systems of IVK-2 include the UVK SM-4 base set and 2 KAMAK crates with the identical set of functional modules.

The makeup of the UVK SM-4 complex is:

SM-4P processor;

64K word direct access memory (OZU);

symbolic information input and display system based on "Videoton-340" (UVOSI);

SM-6321 or VT-25150 wide parallel printer;

SPTP-3 perforated tape input-output system (UVVPL);

external storage based on SM-5300 or A-3112 magnetic tape storage;

external memory based on "IZOT-1370" (UVP-I) magnetic disk.

The KAMAK crate makeup (with power source, active and passive ventilation panels) is:

crate monitor;

relay multiplexer;

analog-digital converter;

digital-analog converter;

interrogation register;

4 input registers;

clock pulse generator;

4 input pulse counter;

teletype interface;

24/12V converter;

word generator;

trunk indicator.

The user, at his own discretion, can expand the functional capabilities of IVK-2 both by increasing the number of connected KAMAK crates, and by filling in available vacant places in the crates with the functional modules necessary for a given experiment.

The basic specifications of IVK-2 are:

weight -- not more than 1,400 kg;

input power -- not more than 6 kVA;

register-register operation performance time -- not more than 1.4 μs;

OZU capacity -- 28-124K words;

UVP-I capacity -- 4.8M bytes;

input speed from perforated tape -- 300 characters/s;

input speed onto perforated tape -- 50 characters/s;

maximum printing speed -- 500 lines/min;

line width -- 132 characters;

number of analog inputs -- up to 64;

ATsP [analog-digital converter] bit configuration -- 9 bits;

ATsP conversion frequency -- 80 kHz;

analog input signal level -- up to 10 V;

analog outputs -- 2;

TsAP [digital-analog converter] bit configuration -- 10 bits;

TsAP conversion frequency -- 100 kHz;

TsAP output signal level -- 0 to ±5 V;

number of parallel 24-bit digital inputs -- 8;

number of parallel 24-bit digital outputs -- 8;

number of initiative "yes-no" inputs -- up to 48;

number of numerical pulse input counters -- 8;

counter capacity -- 16 bits;

maximum counter operating frequency -- 50 MHz;

internal crystal clock pulse generator frequency -- 1 MHz;

clock pulse period -- 1 μs, 10 μs, 100 μs, 1 s;

output clock pulse duration -- 500 ms;

capability of transmitting and receiving information using "teletype interface" module;

transmission speed controllable within wide range;

teletype word length -- 8 bits;

signal level -- 20 mA or 60 mA.

IVK-2 Software

The IVK-2 base software includes an operational perforated tape system (PLOS SM), disk operations system (DOS SM) and real-time disk operations system (DOS RV), KAMAK program monitor and test set.

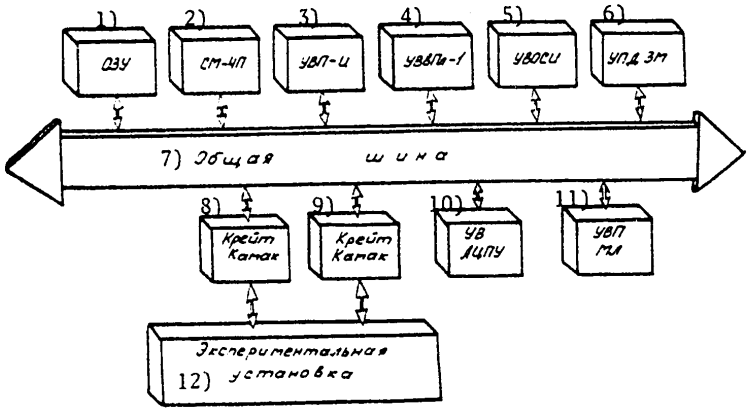
PLOS SM is a set of programs intended for preparing, debugging and running user programs in Assembler language in the single-program mode.

DOS is a set of systems programs intended for the preparation, debugging and testing of programs in single-program dialogue and in package modes in Macro-assembler and Fortran-IV languages.

DOS RV is a real-time control system, resident in direct access memory. The system performs planning of the computer process in the multitask mode and development of user programs in the background mode. The system performs processing of direct access files in memory and represents systems for constructing structures with imposition (sverleyn structures). The system contains means for developing and including communications systems service programs.

The KAMAK program monitor (KAMAK monitor) is a collection of subroutines for organizing exchange operations between SM-4 computer complex control systems and KAMAK crate modules under DOS, DOS RV control. The KAMAK monitor enables the user to work with KAMAK modules in Fortran-IV high-level language.

IVK-2 tests are intended for checking the performance both of the IVK-2 set itself and of individual elements that are included in the set.



TsVK-2 test-computer complex for automating scientific research based on SM-4.

1. OZU [RAM]
2. SM-4P
3. UVP-Ts
4. UVVP1-1
5. UVOSI
6. UPD ZM
7. Common bus
8. KAMAK crate
9. KAMAK crate
10. UV ATsPU
11. UVP ML
12. Experimental setup

Mail inquiries to:

Exporter: V/O "Elektronorgtekhnika"
Address: 121200 Moscow G-200
Telegraph address: ELORG Moscow 200
Telephone: 251-39-46
Telex: 7586

Deliverer: V/O "Soyuzzagranpribor"
Address: 103918 Moscow K-9, ul. Ogareva, 5
Telegraph address: Moscow K-9
Soyuzzagranpribor
Telephone: 229-61-10
Telex: Moscow K-9 7937 -- GRAND

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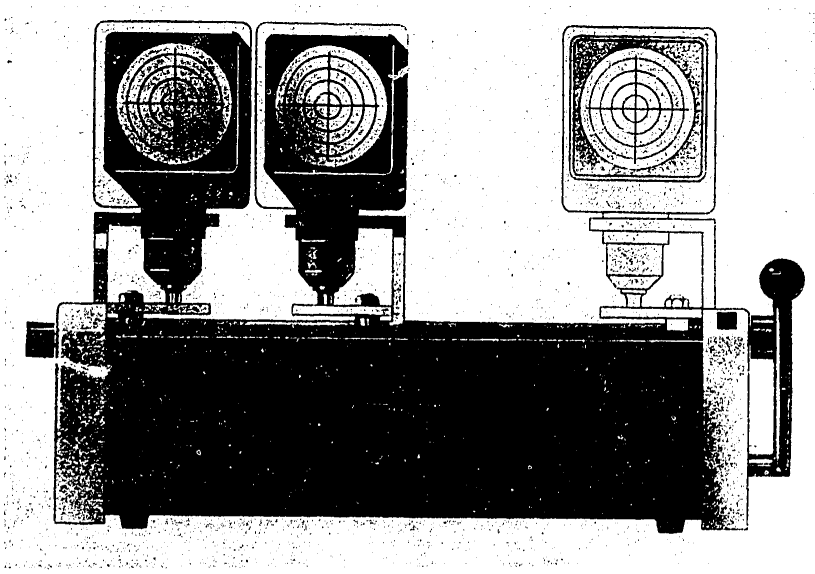
CSO: 1863

UDC 621.3.049.75

UPBO-PF SYSTEM FOR PUNCHING BASE HOLES IN PHOTOGRAPHIC FILM TEMPLATES

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The system is intended for punching technological base holes in photographic film templates for making printed circuit boards.



Reference symbols, inscribed a certain distance from the image on the photographic template, are used for alignment during perforation.

Specifications

Center distances, mm	135-470
Maximum template width, mm	500
Precision, mm	±0.05
Luminosity of projector screens, lx	50
Magnification of optical system, power	35
Resolving power, lines/mm	70
Screen diameter, mm	110
Reference character diameter, mm	0.3-2.5
Input power, W	100
General dimensions, mm	700 × 270 × 400
Weight, kg	50

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CSO: 1863

UDC 621.3.049.75

UPFO FIXING HOLE PUNCHING SYSTEM

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for punching technological holes in photographic film templates of printed circuit boards and for visual monitoring of the precision with which circuit elements are positioned on photographic templates.

The system consists of a template with a coordinate grid, microscope on a moving carriage, manipulator with three degrees of freedom and nine in-line punches. The template table is equipped with a lamp.

The photographic template is placed on the tape, held in place by the glass of the manipulator and aligned relative to the punches (the centers of the contact surfaces are aligned with the nodes of the coordinate grid of the template) and is perforated. The perforations are aligned with one of the sides of the circuit board.

The performance precision and stability of the system is assured by rigidly fastening the punches and template grid to a polished granite slab. The relative position of the punches is dictated by the requirement to achieve the maximum possible number of different center distances.

Specifications

Hole diameter, mm	$3^{+0,28}$
Maximum circuit board dimensions, mm	410 × 400
Maximum distance between hole and edge of photographic template	30
Center distances, mm	120; 132.25; 142.5; 150; 157.5; 165; 175; 182.5; 195; 205; 215; 227.5; 235; 250; 262.5; 277.5; 290; 307.5; 325; 347.5; 370; 410
Template coordinate grid space, mm	2.5
Microscope power	20
Hole punching error relative to contact surfaces, mm	±0.05
Input voltage, V	220

Overall dimensions, mm	550 × 590 × 350
Weight, kg	100

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CSO: 1863

UDC 621.317.7

AMTs 1416 RECORDER-INDICATOR-GENERATOR (RIF)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The device is intended for debugging of radio electronic components, assembled on digital integrated microcircuits of the 155, K155, 133, K133 and other series, which are analogous in terms of electrical parameters. The situations and operating modes to be monitored are indicated by three light-emitting diodes. The instrument is recommended for application at enterprises of the Ministry of Communications and in the instrument-making, electronic and radio industries.

RIF performs the following functions in the monitoring of electrical signals at the outputs of microcircuits and test signal generation functions: recording of single pulses of both polarities, not less than 100 ms in duration; recording of single positive pulses on external sync signal (external sync signal parameters: 10 Hz $\leq$ $\leq$ F $\leq$ 5 MHz and t not less than 100 ns); monitor of logic 0 and logic 1; monitor of periodic pulse signal of any on-off ratio at signal frequency not lower than 10 Hz and not higher than 5 MHz; generation of test signal in the form of a series or of individual heteropolar pulses (series frequency from 120 Hz to 100 kHz and individual pulse duration from 200 ms to 2 ms); monitor of "Broken circuit" situation at tested output of microcircuit.

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CSO: 1863

GIS AMTs 155 TESTER FOR TUNING AND REPAIRING TRANSISTOR EQUIPMENT AND FOR TESTING ASSEMBLY

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The instrument is intended for determining the performance of transistors on the basis of forward and backward junction currents and resistances directly in a working circuit without unsoldering.

A needle dial indicates the measured currents and resistances. The tester is connected to a tested circuit with three feelers.

Specifications

Current measurement range	0-3 μA; 0-3; μA; 0-300 μA; 0-3 mA
Resistance measurement range	0-100 Ω; 0-1 kΩ; 0-10 kΩ; 0-100 kΩ; 0-1 MΩ
Measurement error, %:	
of transistor currents in circuit	not more than 15
of resistances in circuit	not more than 10

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CSO: 1863

UDC 681.14

INDUSTRIAL COMMUNICATIONS COMPLEX (USO)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 4 pp

[Text] By virtue of the existence in the UVK SM-3, SM-4 nomenclature of the matching system of the "Common bar" [OSh] interface and "rank 2K USS OSh/2K" interface it is possible to use as industrial communications systems the entire nomenclature of ASVT-M (M-400, M-6000, M-7000) and SM-1, SM-2 modules, which have a rank 2K output. Depending on the requirements on the control system, any collection and combination of communications systems can be utilized within the existing rank 2K channels in communications units of the USS OSh/2K system.

A structural diagram of the industrial communications complex is shown in the figure.

M-400 computerized industrial communications system:

high-speed low- and middle-level analog signal input system (UVAS-1);

noise-immune low- and middle-level analog signal system (UVAS-2);

digital signal input and output system (UVVDS);

relay output system (URV);

A651-1 crossbar section (SKR).

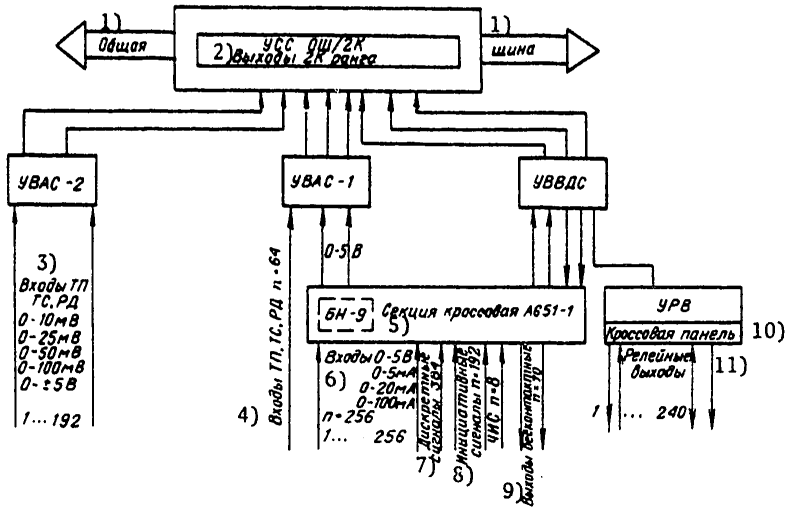
UVAS-1 A61113 High-Speed Low- and Middle-Level Analog Signal Input System

The system receives from a facility, switches, amplifies and converts to digital code analog signals of the following types:

current signals of instruments in the State system of industrial instruments and automation systems (GSP), 0-5, 0-20, 0-100 mA;

0 to 5 V voltage signals;

signals of thermionic converters (TP), resistive thermometers (TS) and slide wire transducers (RD).



KEY: 1. Common line
2. USS OSh/2K
2K rank outputs
3. Inputs TP, TS, RD [B=V]
4. Inputs TP, TS, RD
5. Crossbar section
6. Inputs
7. Digital signals
8. Initiative signals
9. Contactless outputs
10. Crossbar panel
11. Relay outputs

[UBAC=UVAS; YBBДC=UVVDS; БН=BN; UPB=URV]

Number of inputs:

for middle-level signals -- up to 256 channels;

for low-level signals -- up to 64 channels.

The precision class of a middle-level signal converter is 0.3/0.2.

Speed is 30,000 conversions per second.

The precision class of the low-level signal amplifier is 0.2.

The amplifier time constant is not more than 150 μs.

Low-level switching time is less than 2 ms.

Relay type switchboard. Programmable interrogation of all input channels.

The normalizer and amplifier units perform reception, normalization and amplification of up to 5 V of signals from TP, TS and RD of the following types and gradations:

from thermionic converters -- of the PP-1, KhA, KhK type;

from resistive thermometers -- of the 21, 22, 23, 24 gradations;

from slide wire transducers 0-120, 0-150, 0-300 Ω.

The system is connected to the OSh/2K unit through three rank 2K interface channels.

The system is designed as a typical UTK rack.

UVAS-2 A61114 Noise-Immune Low- and Middle-Level Analog Signal Input System

The system performs reception from a facility, normalization, amplification and conversion to digital code of signals from thermionic converters of the PP-1, KhA, KhK types; from resistive thermometers of the 21, 22, 23 and 24 gradations; from slide wire transducers with impedances of 0-120, 0-150, 0-300 Ω; from transducers with 0-50 V emf; from 0...±5 or 0...±10 V voltage transducers.

Low-level signals are connected to the inputs of the normalization units that correct the cold solder temperatures for thermionic converters and normalization of signals to the 0-50 mV level, for resistive thermometers and slide wire transducers. Signals are amplified to 0-5 V by a low-level signal amplifier. The precision class of the amplifier is 0.2.

Low-level signals are switched by a relay switchboard with RES-44 relays.

The total error of the normalization and switching system does not exceed 0.3%.

Signals of 0...5 V are switched to the analog-digital converter input without amplification. The system utilizes the A611-4 integrating analog-digital converter.

Integration time (10 or 40 ms) is set by the operator in accordance with the necessary amount of smoothing of the signal. The conversion speed accordingly is 100 or 25 conversions per second.

The precision class of the converter is 0.2/0.15.

The system is connected to the OSh/2K matching system through two rank 2K interface channels.

Transducer interrogation is programmable.

The system is designed as a typical UTK rack, measuring 60 × 1,600 × 650 mm.

UVVDS A6227 Digital Signal Input and Output System

The system is intended for receiving signals from digital transducers of a facility of the following types:

two-position passive, interrogated signals by program from a computer (a total of 384 channels by groups of 16 transducers);

two-position initiative (emergency), a change of the state of any causes interrogation of the computer to interrupt (a total of 192 channels by groups of 8 transducers);

numerical pulse signals -- pulse counting (or voltage drops) on 8 channels with a capacity of up to 4,096 pulses each. The maximum pulse frequency is 200 kHz.

Input signals for all types of transducers:

voltage ±6, ±12, ±24 V;

"Logika-2" IMS signals;

signals of the "Dry contact" type -- contacts are closed to ground (R < 100 Ω) or interrupt (R > 6,000 Ω).

The system transmits contactless control signals by two-position final control elements (A641-2 module) on 160 channels (by groups of 10 digits).

Input signal parameters:

power voltage up to -40 V; load current up to 150 mA.

The output signals perform control of indication and signal systems and relays; of digital-analog converters, instruments built on the basis of "Spektr" elements, ASVT-D, etc. When there is a need to use signals with positive polarity any A641-2 module can be replaced with an A641-1 module. The system also has two A641-6 position control (contact) modules. These modules, being relay decoders with 16 outputs, transmit group control addresses to the relay output system (URV).

Each module has two decoders, which send all 64 addresses for entering control information in URV relay registers.

One A641-2 output module is used for controlling the A641-6 modules.

The system is designed as a typical UTK rack, measuring 600 × 1,600 × 650 mm.

Three rank 2K interface channels are used for connection to USS OSh/2K.

URV A64114 Relay Output System

The system performs the transmission of control signals to the final automation controls of a facility through relay contacts on 240 channels -- 24 groups with 10 relays per group. Each channel is a group of contacts on RES-26 or RES-22 relays.

Relay groups are controlled from contactless outputs of the A641-2 module of the UVVDS system and information from the A641-2 module passes simultaneously through six relay groups. A group address is selected with the aid of A641-6 position

control module or A641-2 contactless module, located in UVVDS. For especially important controls, requiring monitoring by the operator, signals about transmitted information and address can be diverted to the operator's console and disconnected only after the operator confirms the necessary action.

Outputs are switched to a facility and operator's console through the crossbar panels of the units to which all relay contacts lead. This arrangement does away with a special crossbar rack and intermediate cables for the indicated purposes. The maximum number of systems is practically unlimited by virtue of the utilization of the relay outputs themselves for group addressing for transmitting output information.

Organization of Switching and Cross Connection of Signals from Facility Transducers and Control Signaling

For purposes of switching and cross connection the USO system includes an SKRA651-1 cross section. The cross section includes 12 cross panels, in each of which there are 12 24-terminal blocks for connecting the corresponding cables from USO systems and facility transducers and for organizing the corresponding switching between them. The cross panels, in addition to terminal blocks, can include type BN-9 load units for 0-5, 0-20, 0-100 A current signals and for generating the corresponding 0-5 V signal for transmission to the switchboard and converter input. Each 16-channel load unit occupies the place of two terminal blocks. The maximum number of BN-9 units in the USOM-400 is 16.

A61111 High-Speed Analog Signal Input System

The system performs conversion to digital code and input into UVK of wide-band middle-level voltage signals. The number of analog inputs is 64, including 4 monitor inputs.

The input signal ranges are: main -10...0...+10 V; -5...0...+5 V; auxiliary -1.25...0...+1.25.

The precision class in the main ranges is c/d = 0.3/0.2 and in the auxiliary it is 0.5/0.3.

The active input impedance is not less than 2 MΩ.

Code word length is 11 bits plus 1 character.

The positive input signals are converted to normal binary code and negative to auxiliary.

The 2K interface is used.

The system has a speed of up to 100,000 conversions per second at an analog information coding time of 5 μs.

The system is connected to SM-3, SM-4 complexes through units of the USS OSh/2K system and its speed is determined by the service program.

The system may be installed at a distance of up to 500 m and information can be transmitted on two-wire coaxial communications line.

The system is designed as a typical UTK SVT rack with a cross panel.

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ARM-R AND ARM-M AUTOMATED DESIGNER WORK PLACES BASED ON UVK SM-3

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The work places are intended for providing a modern level of design, enabling the designer to operate in the computer dialogue mode. The designer can control the design process, evaluate intermediate results on an operational basis and guide the programs along one path or another to achieve the desired results.

The ARM complexes which are being manufactured at the present time are oriented chiefly toward two broad ranges of application -- radio electronics (ARM-R) and mechanical engineering (ARM-M). These complexes differ in the types of graphical information coding systems utilized in them and graphical displays and plotters (EM-709, EPG-400 and AP-7252 in ARM-R, PKGIO, UPGI and AP-7251 in ARM-M).

The software of the automated work places consists of the base software and packages of applied programs. The base software, shared in common by ARM-R and ARM-M, is necessary to each client, irrespective of the nature of the tasks that it must solve. The applied programs packages are oriented toward the solution of several specific problems, encountered by a client, and they are developed as a rule, by the client himself.

The ARM complex with the base software only enables the client to perform the following tasks:

input of graphical information with the aid of a semiautomatic coder, from perforated tape in coder format, from perforated tape in a special manual coding format;

input of text information from the coder, from perforated tape, directly from the alphanumeric display;

callout of graphic information to the plotter, graphic display screen or (in symbolic form) to a printer, or onto perforated tape. During input the scale and orientation of a drawing can be changed, a rectangular "window" of arbitrary size can be cut out in any place on a drawing and it can be displayed in magnified scale on the graphic display screen;

callout of text information to the screen of the alphanumeric display, printer or onto perforated tape;

correction of previously inserted graphic information with the aid of the coder or light buttons and pens on the graphic display screen, in particular correction of the image in a "window";

correction of text on the alphanumeric display screen;

development of a design and production technology and punching of control perforated tape for milling machines with ChPU.

The base software is delivered along with ARM complexes. It consists of the following basic parts: DOS-400 [Operational disk system], DOS-ARM, test system and auxiliary programs.

DOS-400 is a general purpose operational disk system, enabling the complex to operate in the single-program mode. It is oriented toward dialogue operation and contains assembler language and FORTRAN-IV language translators, a file operations system and program correction and debugging systems. It is used primarily for the development of new programs.

DOS-ARM is an operational disk system, permitting multiprogram operation. It permits the simultaneous solution of up to four independent problems, solved in special memory banks. It performs combined input-output operations with processor operation both within a specific problem and between different problems.

The test system is intended for semiautomatic performance testing of all technical systems in the ARM complex and contains a large set of tests and special monitor for combining separate tests into sequential chains.

The auxiliary programs are intended for facilitating data exchange between different external systems and permit simultaneous transmission of information and completion of all necessary format changes.

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AUTOMATED GROUP WORK PLACES BASED ON UVK SM-4

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The group ARM [Automated work place] complexes have broader capabilities and service more clients than the ARM-R and ARM-M complexes.

A group ARM is a central computer complex based on UVK SM-4, connected to a series (up to several dozens) of terminal stations, in which the UVK SM-3 computer is utilized. Some of the operations can be done at terminal stations in the autonomous mode, i.e., without utilization of the central complex.

The central complex contains large-volume external memory systems, coordinate graphs and high-speed printer. Its functions include processing of the data base of the entire ARM complex, solution of computation tasks on inquiry from terminal stations, production of final planning results (drawings, photographic templates, text materials).

Many communications lines can be connected to the central processor to provide communications with external terminal stations.

The terminal stations of the group ARM should be capable of performing the basic volume of tasks that require much dialogue with the operator. Among such tasks are the generation and editing of images, input and editing of text information, preparation and correction of programs for ChPU milling machines, development and debugging of client programs, etc.

A terminal station consists, as a rule, of a general purpose mini- or microcomputer, a few simple and reliable external systems, graphic display (for instance, the EPG SM display); it can be connected to a small-scale plotter and plotting table for coding information.

The operational disk system of the central complex (DOS RV [operational real-time disk system] performs multitask and multiprogram completion of tasks in real time, distribution of systems resources on the basis of priorities and dynamic distribution of memory.

The parallel completion of many tasks in the real-time mode is possible by virtue of priority dispatching, separation of memory into divisions, temporary loading of

tasks onto disks, operational intervention by the clients from their terminals in the problem solving process.

The DOS RV system includes the following components: set of control programs, operator communications program, nonresident task loader, DOS RV file system, set of service programs, macroassembler language translator, FORTRAN language translator and task builder.

The operational system of terminal stations should be combined with DOS RV and is a trimmed-down version of that system. The software of group ARM and ARM-R (ARM-M) can be made compatible.

The auxiliary group ARM programs perform recoding of information into formats of all newly developed external systems, utilized in a group ARM.

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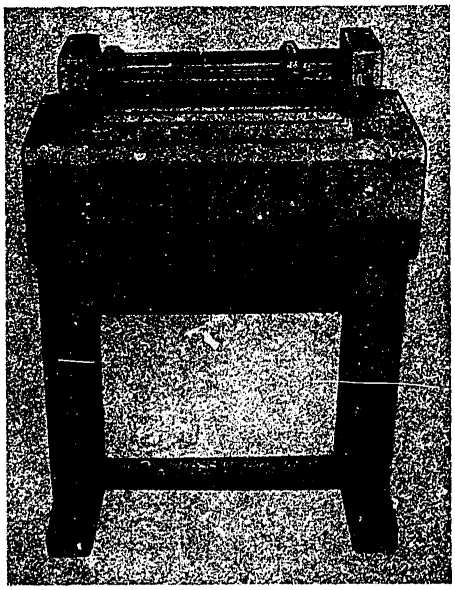
SM-6300 ALPHANUMERIC PRINTER SYSTEM

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The system is intended for printing out alphanumeric information during operation in SM complexes with a "Common line" interface.



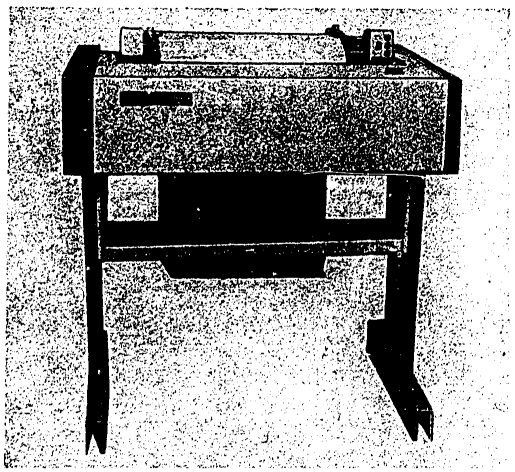
The system consists of a DZM-180 serial action printer (manufactured in Poland) and a controller.

Specifications

Maximum printing speed, char/s	180
Number of characters per line	not more than 132
Coding of characters	binary 7-bit code in accordance with GOST 13052-74
Buffer memory capacity, symbols	256
Character construction	7 × 7 dot mosaic matrix
Paper width, mm	420
Number of copies	1 original and 2 copies
Maximum distance from computer, m	5
DZM-180 input power from AC main:	
voltage, V	220 + 10% - 15%
frequency, Hz	50 ± 1
Controller power from DC voltage source, V	5 ± 5%
Input power:	
DZM-180, V·A	260
controller, W	7.5
General dimensions, mm	700 × 440 × 940
Weight, kg	not more than 70

SM-6304 Alphanumeric Printer

The system is intended for printing out alphanumeric information during operation in SM EVM complexes with a "Common line" interface. The system is of the serial type based on the DARO 1156 machine.



The system consists of a serial action DARO 1156 alphanumeric printer, a set of interface units (KBES) and interface cable.

Specifications

Nominal printing speed, char/s	100
Number of characters per line	not less than 132
Character coding	7-bit code in accordance with GOST 13052-74 ($KOI\text{-}7N_0$ and $KOI\text{-}7N_1$ combined code tables)
Character construction	5 × 7 dot mosaic matrix
Paper width, mm	420
Computer interface	through "Common line" interface program channel
Distance from computer, m	up to 7

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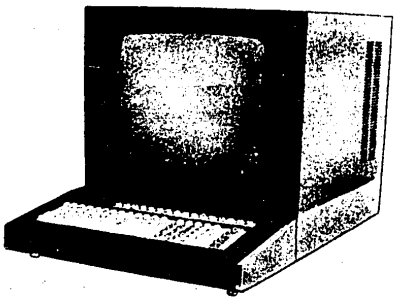
SM-7204 ALPHANUMERIC VIDEO TERMINAL

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The SM-7204 alphanumeric video terminal is assembled on the basis of the VTA 2000 = 2 system and is intended for keyboard input and screen display of symbolic information and performs operational exchange between the operator and data processing center in SM EVM complexes as a programmer's and operator's console.

The system consists of control, indication, power and circuitry units.



The video terminal performs the following functions: information display; acquisition and editing of information by keyboard; transmission of information to one local system (printer); byte-wise exchange of information with a processor (the "Duplex" mode -- information typed by the operator on the keyboard is transmitted to the processor), or transmission of data arrays (in this case the processor receives information from the memory of the system).

Information is displayed on a 40LK 3B cathode-ray tube.

Input and editing of data and control of the system are accomplished from keyboards. Symbol keys (there are 48 of them) are intended for callout of digital

and symbolic characters to the screen. Technological keys (there are 16 of them) are intended for transmission to the processor of technical service requests. The function of the keys is determined by the client.

Specifications

Image field size, mm	180 × 250
Numbers:	
of characters on screen	1,920
of characters in line	80
of lines	24
Generation principle:	
image	TV scanning
characters	5 × 7 dot raster
Indexable characters:	
Cyrillic alphabet	32
Roman alphabet	26
numerals	10
special symbols	28
additional symbols	8
Size of indexable characters, mm	4 × 2
Frame frequency, Hz	not less than 50
Maximum tolerable illumination of screen plane, lx	300
Code word length during information exchange with processor, bits	8
Data transmission distance, m	not more than 15
AC main power:	
voltage, V	220
frequency, Hz	50 ± 1
Input power, V·A	not more than 450
General dimensions, mm	720 × 455 × 500
Weight, kg	not more than 55

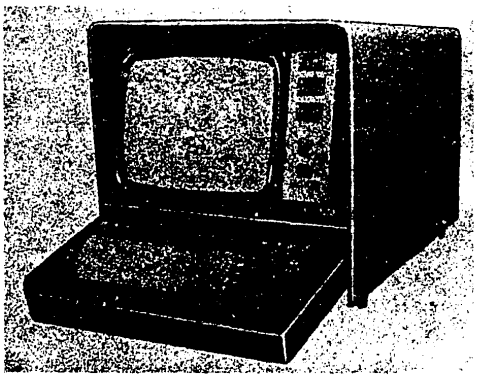
SM-7205 Alphanumeric Video Terminal

The terminal is intended for keyboard input and display of symbolic information on a screen in the autonomous mode and during operation in SM EVM complexes with "Common line" interface.

The system consists of a "Videoton-340" alphanumeric display (manufactured in Hungary), connected to the controller by interface cable.

The video terminal operates in the following modes: "autonomous" -- the input and output lines do not function and information from the keyboard is displayed on the screen; "complex" -- information from the keyboard goes into a computer (input) and information from the computer is displayed on the screen (output); message transmission -- information from the display memory, composed beforehand on the screen, is transmitted to the computer.

The alphanumeric field consists of 28 control keys, controls operating modes and provides editing capability.



During text editing the system can clear the screen, place a mark in the first position of the first line; place a mark in the first position of the next line; move a mark in four directions; tabulate; substitute, insert and erase a letter; protect memory; underscore; raise a frame one line to fill in the next line, erase and insert a line.

Specifications

Data exchange capacity, char/s	1,000
Buffer memory capacity	1,280 8-digit symbols
Numbers:	
of symbols displayed on the screen	1,280
of symbols per line	80
of lines on screen	16
Code system	binary 7-digit code in accordance with GOST 13052-74 ($KOI\text{-}7N_{(0)}$ and $KOI\text{-}7N_{(1)}$ combined code tables
Computer interface	through program channel of "Common line" interface
AC main power:	
voltage, V	$220^{+10\%}_{-15\%}$
frequency, Hz	50 ± 1
Input power, W:	
"Videoton-340" system	150
controller	7.5
General dimensions, mm	711 × 352 × 390
Weight, kg	not more than 45

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SM 4101 INTERFACE EXPANDER (RIF SM)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The interface expander is intended for use in SM-3, SM-4 computer complexes and other systems based on them. It is necessary for building sophisticated complexes with a number of interface systems that exceeds the capabilities of the main interface segment in terms of load and/or length.

RIF SM expands the functional capabilities of SM EVM complexes by expanding the input-output interface functions at a slight reduction of productivity. It lengthens the complex trunk by the length of the main interface segment (by 15 m) and controls an additional 19 standard loads (SEN). Further expansion of interface capabilities can be accomplished by means of series or parallel connection of expanders.

Software is not necessary for controlling the performance of RIF SM in complexes.

The RIF SM interface expander consists of insertable units (BE9402 -- 2 each) and a wiring cassette unit.

RIF SM is an SM EVM cassette unit -- a structurally independent unit, designed for installation in AKB, BAM and BRS units of SM-3, SM-4 complexes. It has four rows of terminals. The component base consists of microcircuits of the K131, K155, K559, K599 series.

Specifications

Type of connection interface	OSh [Common line] SM EVM series, parallel, parallel-series
Connection methods	
Output load capacity, SEN	19
Intrinsic input/output load capacity, SEN	1/1
Geometric length of interface trunk lines after expander, m	not more than 15.0
Additional transmission cycle delay during access to system, installed after expander, μs, not more than:	
during completion of READ operation	0.35
during completion of WRITE operation	0.25

Power from DC source, V	5 ± 0.25
Input power, W	not more than 9.0
Operating mode	continuous
Accrued operating time to failure (calculated), hr	9,000
Average repair time, min	60
Service life, years	not less than 6
General dimensions, mm	267 × 456 × 68
Weight of system, kg	not more 3.0

RIF SM operates at an ambient temperature of 5-40°C at 30-80% relative humidity.

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KAMAK CRATE. FUNCTIONAL CHARACTERISTICS

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 3 pp

[Text] The KAMAK crate is intended for utilization in IVK-1 [Test-computer complex] based on SM-3 and IVK-2 based on SM-4.

The crate is the foundation for the construction by clients of various general purpose automation systems, primarily for general physical experiments in the leading fields of physics. The crate is task-oriented by virtue of an interface system with scientific equipment and IVK software, which permits work in low- and middle-level languages in the real-time mode.

The KAMAK crate is built on the base KAMAK crate and includes the following additional modules: KAMAK crate controller for UVK [Control computer complex] SM-3, SM-4; 2TsAP10 digital-analog converter.

The crate controller permits exchange of information with UVK SM-3, SM-4 on a programmed channel. The controller occupies the two right positions (stations) of KAMAK.

The KAMAK crate contains the following subsystems: analog input; digital input; digital output; initiative signal input and counting; communications; analog medium-speed output; clock pulse and constant generator; word generator. The crate can also accommodate other different modules, designed in accordance with KAMAK standards, including the general purpose modules of the base KAMAK crate, for expanding functional capabilities.

The analog input subsystem is intended for switching and converting analog signals to digital form and contains an analog-digital converter (ATsP) of the 712 (711) type, intended for converting spectrometric analog signals to digital signals; a switchboard (type 750 relay multiplexer), intended for switching analog signals by relays to gercons; a type 058 24/12 V transformer (converter).

Specifications of Type 750 Switchboard

Number of switched channels:	
during one-wire switching	32
during two-wire switching	16
Channel switching time, ms	not more than 5

Input voltage:	
maximum, V	10
minimum, mV	100
Input impedance:	
"closed channel," Ω	0.3
"open channel," MΩ	100

Signals are supplied through two type "ITT Cannon DC 37P" connectors.

The output signals pass to four parallel-connected LEMO connectors.

Specifications of Type 712 ATsP

Word length, bits	10
Maximum conversion time, ms	not more than 25

Operating mode: analysis of pulses not longer than 1 μs in duration and/or of slowly changing or constant voltages.

Differential nonlinearity, %	not more than 1
Integral nonlinearity, %	not more than 0.2
Input signal range	from 100 mV to 10 V

The operating modes of the 712 module are selected with keys on the front panel. Also installed in the front panel are 8 LEMO connectors for supplying analog signals and mode control signals. External memory for storage is connected by means of a "Cannon" 15-contact connector.

The corresponding signal levels are controlled and selected with two compact five-position switches.

The digital data input system is intended for the input of digital signals from an external source and contains two type 305 modules (input registers), intended for receiving two 24-digit words from a source to buffer registers. The registers can be controlled with connectors, installed in the front panel.

The input register operates in the following modes:

executer in relation to an external system;

controller in relation to an external system;

synchronous register, controlled by two sync pulses;

asynchronous;

unit in the retransmission mode.

The input and output signals are TTL.

The input load capacity is 1; the output load capacity is 10.

Input signals are supplied through two 37-contact "ITT Cannon DC 37" connectors, and control signals are supplied through two EMO connectors.

The subsystem performs input and storage of 96 TTL input signals from external systems operating in a variety of modes.

The digital output subsystem is intended for the output of digital signals to external systems and contains two type 350 modules. Each module has two registers, which transmit two 24-bit words to external systems. Each register is controlled by special signals, supplied through LEMO connectors, installed in the front panel.

The operating modes are analogous to those of the 305 module.

Signals are supplied through two 37-contact "Cannon DC 37" connectors.

In the normal mode: the input and output signal levels are TTL and the load capacity is 10.

The data outputs can be loaded to 40 mA at a logic zero of up to 30 V (when switching is done inside the unit).

The total capacity of the subsystem in terms of the output is: 96 output signals of a given TTL level (or up to 30 V); 6 output control signals.

The input and initiative signal counting subsystem is intended for counting pulses and for the input of interrogation signals when the counter overflows and turns on a type 303 interrupt register and a type 401 quadruple counter.

The type 303 interrupt register receives and masks initiative signals on any of 24 inputs of a "Cannon DC 37P" connector and sends an interrogation signal to the crate trunk. Here the first two inputs are parallel-connected to a type LEMO coaxial connector, also installed in the front panel. The minimum initiative signal width for the first two inputs is 50 ns, and for the other inputs the integration time constant is 50 μs. The input signal levels are TTL.

The type 401 module contains four 16-digit counters, which count pulses with TTL levels, and it also reads the state of a counter to the crate trunk, including without clearing the content. When a counter overflows an interrupt signal is generated, which can be masked. The input of each of the four counters can be gated with an external signal, supplied to the gating input through LEMO coaxial connectors. The state of each of the four interrogation flip-flops can be checked by program.

Counter capacity is 4 × 16.

The maximum operating frequency is 15 MHz.

Controls and indication instruments, which indicate the working state of the counters and the initial zero setting of the counters, are mounted in the front panel.

The counters can be series-connected (by resoldering on the printed circuit board).

Locking of the counter inputs can be defeated during the reading time.

The communications subsystem is intended for two-way exchange of data with external systems and contains a type 500 teletype module. The type 500 module performs two-way data exchange with an external system in serial code and transmits compositions with the following word length: 8 digits, 7 digits with a parity position, 4 digits.

By means of internal switching it is possible to operate in the following transmission modes: with and without a parity check; with and without blocking of interrogation signals; simplex, in both directions on the same wire; duplex, in each direction on a separate wire. The input and output registers enable the module to operate in the duplex mode with two different systems.

The 500 module can be used for connection to an analog module, to alphanumeric displays and to computer teletype channels.

The transmission speed in the teletype mode is 110 bits/s.

The transmission speed can be increased to 40 kHz (by resoldering inside the module).

The transmission line current is 20 mA.

A "Cannon DE-9P" and an interrogation signal indicator are mounted in the front panel.

The medium-speed analog output subsystem is a module that contains a 2TsAP10 digital-analog converter and two 10-digit converters of digital codes that go into the registers from the crate trunk to positive voltage. The output voltages of the converters are proportional to the codes that are stored at a given time in the registers. A "1" can be added to each register.

Specifications of Converter

Maximum code changing frequency, kHz	100
Converter code word length, digits	10
Output voltage amplitude, V	from 0 to 5
Input power, V·A	3.5
Width	1 M (M = 17.2 mm)

Five LEMO connectors, to which are connected the outputs of the first and second converters, are located on the front panel, and to each converter are supplied add "1" signals and an interrogation input signal from an external source.

The type 730A clock pulse and constant generator is a 1M-wide module, intended for generating high-precision pulses for controlling the automation subsystems. It generates 0.5 μs pulses in the 1 μs to 1 s range with frequency division (by decades). The highly stable crystal oscillator is an internal oscillator, operating on 1 MHz.

It may be used as an external clock frequency divider to 10 MHz.

The output pulses can be gated by an external signal, supplied to the band input.

The periods of the output frequencies when the internal crystal oscillator is used are: 1, 10, 100 μs, 1, 10, 100 ms and 1 s.

The external frequency divisors are 10^1-10^7.

The input load capacity is 1 and the output load capacity is 10.

Two input connectors and 7 output connectors (of the LEMO type) and one clock pulse source switch (internal/external) are mounted in the front panel of the module.

The type 233 word generator is a 1M-wide module, intended for setting constants and for transmitting control code combinations, which the operator does by selecting a code with the aid of 24 switches, mounted in the front panel. A code is read out on a read command, addressed to a given module.

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KAMAK CRATE. SERVICE AND AUXILIARY MODULES

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The service modules are intended for checking the modules in the manual control and control signal and data indication mode in the crate trunk. They contain a type 081 trunk indicator; a type 140 manual control module; a type 232A word generation module; a type 061 repair module.

The type 081 trunk indicator indicates data and command signals, transmitted through the trunk lines, and it operates in the following indication modes: dynamic, in which the signals of the last operation are stored; static, in which the existing state of the signals is stored. The module indicates inquiries from modules, which arrive through a 25-contact connector on the rear panel. Trunk signal indicators and an indication mode switch are mounted in the front panel.

The type 140 manual control module is intended for manual checking of the performance of individual modules and of the entire system and is used for typing any single KAMAK command on a keyboard, for executing it and for indicating trunk control signals, and also (if need be) for automatically stopping a command.

It operates in the automatic, single-cycle and step-by-step modes.

The input signals, which arrive through connectors on the front panel, control the module operating modes. The module is 4 M wide.

The type 232A word generation module is intended for generating and indicating 24-digit words on the crate trunk, operates under the control of a type 140 module and loads data from the trunk read lines for indication; it clears the indication register; transmits a 24-digit word to the trunk write bars. It is 3 M wide.

The type 061 repair module with a rigid extension, used for connecting the modules to the crate during repair or adjustment. It can be used with units that have one output to the trunk. The width of the module is 1-12 M and its weight does not exceed 5 kg.

The auxiliary modules include: 021 and 022 units without printed circuit boards; 091 and 092 units with circuit boards.

The 021 and 022 units are intended for building functional KAMAK units with widths of 1 M and 2 M, which meet the requirements of the ergonomics of the KAMAK base crate, and are used by manufacturers of auxiliary modules and by the users of KAMAK base crates.

The 091 and 092 units utilize 021 and 022 units (respectively) and general purpose 090 mockup boards, intended for the installation (by the client) of single-use functional KAMAK units, when it is not economical to manufacture special printed circuit boards.

The type 090 printed circuit board permits the installation and connection of integrated circuits of different configurations. The circuit board ends with a printed connector with gold-plated contacts. The printed circuitry and holes are made with high precision.

Circuit board dimensions are 304 × 182.9 mm; the surface utilized for the circuitry is 283 × 168 mm; the printed connector (gold-plated) has 2 × 43 contacts; the printed circuit space is 2.54 mm; the holes are unmetallized; hole diameter is 0.8 mm.

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KAMAK CRATE. GENERAL INFORMATION

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The crate is powered from the standard 220 V single-phase industrial AC main.

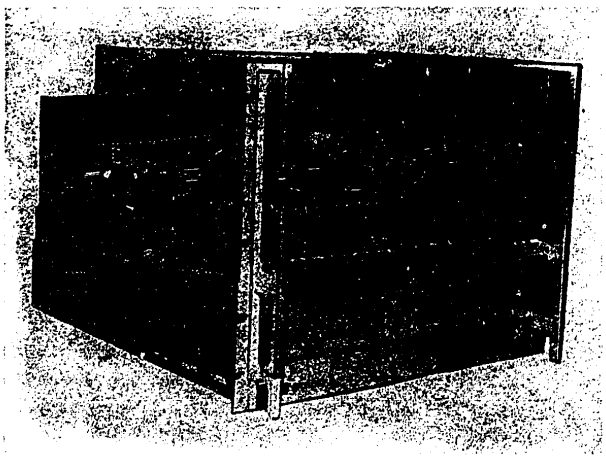
The ZC-400 power source has the following output voltage parameters, in accordance with the KAMAK standard:

+6 V ± 0.25% with maximum current not more than 25 A;

-6 V ± 0.25% with maximum current not more than 25 A;

+24 V ± 0.05% with maximum current not more than 6 A;

-24 V ± 0.05% with maximum current not more than 6 A.



Weight of power source not more than 50 kg.

The power source is intended for joint operation with a 077 panel, to which it is connected by a multicontact connector.

The power source control system provides protection against overloading and overheating. In joint operation with 077 panel the control system automatically regulates the cooling rate as a function of the actual load on the power unit.

The KAMAK crate power system includes a 24/12 V transformer (converter) of 058 type. The converter is intended for producing the following voltages, necessary for ATsP [Analog-digital converter] and other modules: +12 V ± 0.2% with maximum current not more than 2 A; -12 V ± 0.2% with maximum current not more than 2 A. Regulation accuracy is not less than 0.05%. The output load does not exceed 0.3 Ω in the 20 Hz to 100 kHz range.

The 058 converter provides protection against current overloads and overvoltages and undervoltages and also indicates the output voltage by means of light-emitting diodes.

The ventilation system is intended for cooling the modules in the KAMAK crate. The ventilation system of the base crate contains a 077 panel, which provides forced ventilation, and a 076 panel, which provides free ventilation.

The 077 panel contains fans, which provide forced cooling of the KAMAK modules housed in the crate, and power source. It is a bearing structure, by which the 002 crate can be connected to a ZC-400 power source. Air is drawn in through an external filter on the front panel.

The 077 panel provides additional cooling of the top crate. On the front side of the panel are indicator lights, which signal the condition of the power source, and a line voltage switch.

The 076 panel is used for improving heat exchange between crates, located one over the other, installed in 19-inch SM EVM racks. The top crate is cooled with outside air, and air entering from the bottom crate or another EVM unit is diverted to the sides.

The KAMAK base crate is intended for the construction and utilization of KAMAK crates of modifications 1 and 2 in IVK-1, IVK-2 [Test-computer complex].

In conjunction with UVK SM-3 or SM-4 and additional functional modules the KAMAK base crate can be used in systems for automating experimental setups in various national economic fields.

The KAMAK base crate utilizes basically equipment manufactured by the "POLON" company of Poland and fully meets KAMAK standards in terms of logic, electrical, design and technological requirements; in relation to the use of an extensive nomenclature of modern components, including integrated microcircuits of an intermediate degree of integration, compact and reliable connectors, switches and various types of controls; in relation to the use of modern design-technological

decisions relative to ergonomics, unification, mechanical manufacture precision and printed circuit boards; with high reliability and a long service life due to the use of connectors and printed circuit boards with gold-plated contacts.

The KAMAK base crate contains the following components, necessary for general purpose automation systems: crate with a power and ventilation system; digital input subsystem; digital output subsystem; analog output subsystem; initiative signal input and counting subsystem; clock pulse and constant generator; communications subsystem; service module; general purpose module.

7872
CSO: 1863

KAMAK CRATE. DESIGN EXECUTION

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The type 2004 KAMAK crate includes a type 002 crate cassette; a type ZC-400 power source; a type 077 panel with ventilators; a type 076 passive ventilation panel.

The dimensions and weight of the crate and of individual components are indicated in the table.

1) Параметры	Крейт КАМАК типа 2004 2)	Кассета типа 002 3)	Источник питания типа ЗС-400 4)	5) Панель типа 077	6) Панель типа 076
7) Высота, мм	355	221,5	180	89	44,5
8) Длина, мм	482	430	427	430	430
9) Ширина, мм	525	360	176	525	525
10) Масса, кг	35,8	5,8	19,8	6	4,2

1. Parameters
2. Type 2004 KAMAK crate
3. Type 002 cassette
4. Type ZC-400 power source
5. Type 077 panel
6. Type 076 panel
7. Height, mm
8. Length, mm
9. Width, mm
10. Weight, kg

The heart of the crate is a type 002 cassette, consisting of two side plates, connected together by transverse connecting elements. In the top of the cassette are installed top and bottom guide assemblies, made of plastic and intended for installation of the units. The overall width of the units is 25 M (M = 17.2 mm). In the middle of the cassette is a metal frame, to which are fastened 25 connectors, forming a so-called crate trunk. The trunk provides electrical connection for the units (modules) through an 86-contact connector with gilded contacts. The contacts of all connectors are connected by wiring, made by twisting, in accordance with KAMAK standard EUR 4100 on single-crate systems. In the back of the cassette, in the form of a separate detachable unit, is installed a ZC-400 power source, the parameters of which meet the KAMAK standard.

The power source outputs are connected through a standard 50-contact connector to the crate trunk.

The cassette is adaptable for operation in 19-inch racks and has convenient handles, which are also used for fastening the 077 panel.

The crate operates in the 5-40°C temperature range at up to 90% relative humidity at 30°C; atmospheric pressure of from 630 to 800 mm Hg st. It can tolerate extended exposure to mechanical vibrations on up to 25 Hz with an amplitude of not more than 0.1 mm.

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CSO: 1863

UDC 681.14

KAMAK CRATE CONTROLLER FOR UVK SM-3, SM-4

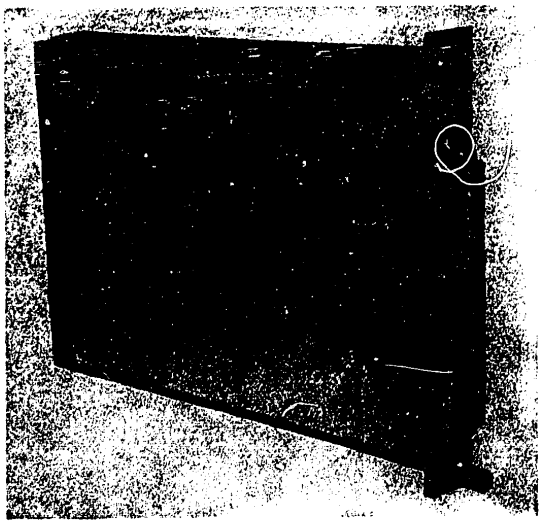
Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The KAMAK crate controller is intended for controlling equipment installed in a single KAMAK crate through the program channel of the machine.

The system includes a crate controller, connection cable to the "Common line" of the machine, a connection cable to another controller and dead end of the "Common line."

The controller operates on interrupts and readiness inquiry.

Exchange with KAMAK modules takes place in 16- and 24-digit words.



The addressable registers are: control and state; mask and inquiry; higher-order data byte. The KAMAK module registers are addressed directly from the address lines of the "Common line."

The interrupt system is single-line priority with 8 sublevels. Eight interrupt vectors are generated on requests from the modules and in accordance with the index of the result of the completion of an instruction.

Up to four controllers can be connected to the computer.

Sixteen-digit data are transmitted on the main KAMAK channels by one computer instruction. Twenty-four-digit data are transmitted by main KAMAK instructions after two computer instructions, and after three instructions for other exchange instructions. If only one address part changes in the KAMAK instruction sequence and the operation code remains the same, access to a module is gained through one computer instruction. Data can be transmitted between KAMAK modules by one computer instruction.

The controller is designed as a 2M (M = 17.2 mm) wide module on two 180 × 280 mm circuit boards. The data circuitry is mounted on one board and the control circuitry on the other. The boards are connected to each other and to connectors on the front panel to provide easy access to the circuit boards and to facilitate operation. Two 96-contact connectors are installed on the front panel for connection to the "Common line," in addition to B.D.1 signal indication elements.

The controller is built on IMS [not further identified] of the K155, K559 series.

Input power does not exceed 18 V·A.

Accrued operating time per failure is not less than 24,000 hours.

Repair time does not exceed 40 min.

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CSO: 1863

UDC 681.14

A71118 COMPUTER INTERFACE SYSTEM USVM

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The interface system is intended for organizing multicomputer hierarchical complexes based on the M-4030 (M-4030-1) module as a central computer and of one SM-3 (SM-4) complex as a peripheral computer.

The system performs the following functions: connection of the central computer to a multiplex or selector channel; systems processing of an algorithm of communication with the central computer in accordance with the YeS EVM [Unified series computer] interface requirements; transmission of data in monopole, multibyte (in portions of 8 bytes) or multiplex mode with the central computer connected to a multiplex channel; indication and termination of data exchange between computers at the initiative of either of them; communications with the peripheral computer in the programmable (on inquiry of readiness), programmed interrupt or direct (out of processor) access to memory; byte-by-byte data exchange in the programmed peripheral computer interrupt mode and word-by-word exchange (two bytes at a time) in the direct access mode; data exchange with the memory of the peripheral computer in the direct access mode under the control of just the program of the central computer and without any intervention by the programs of the peripheral computer; program compatibility with the A7119 USVM computer interface, assuring connection of the central computers with UVK [Control computer complex] M400; connection of SM-3, SM-4 with electronic computers of the YeS EVM series; check of the interaction of the system with the central computer from the control console in the internal mode.

Interaction of the system with the peripheral computer is organized through a data register, command and state register, address register and array length register.

Specifications

Data transmission speed in programmed interrupt mode, thousands of bytes/s	not exceeding 40
Maximum data transmission speed in direct memory access mode, thousands of bytes/s	800
AC main power: voltage, V	380 $^{+\ 10\%}_{-\ 15\%}$
frequency, Hz	50 ± 1

Input power, kV·A	not more than 0.5
Distance between mated computers, m	not more than 50

USS OSh/2K Interface Matching System

The interface matching system is intended for organizing operation of the SM-3 and SM-4 control computer complexes, using the OSh [common line] interface together with external systems and computers that utilize the 2K interface.

The USS OSh/2K system allows SM-3, SM-4 external systems and industrial communications systems of the UVK M-6000, M-7000, SM-1, SM-2 nomenclature to be connected to UVK SM-3, SM-4. It may also be used in multicomputer control complexes for organizing data exchange between SM-3 or SM-4 computers, on the one hand, and SM-1, SM-2, M-6000 or M-7000 through data transmission modules and systems on the other hand.

The system consists of a control unit (BU), intended for running OSh and 2K interface matching algorithms, and an interface unit (BI), intended for the installation of interface units of the 2K elements and modules, for receiving and transmitting to the BU unit 2K interface signals, and it permits monopole operation, corresponding to a busy "Common line" during the time of transmission of an entire data array, and multiplex operation, corresponding to a busy "Common line" during the time of transmission of one information word. The 2K interface has its own interrupt vector address. The system also permits operation in the interrupt and individual vector mode, in which each external 2K system has its own interrupt vector address, and in the common vector mode, when all 2K systems have the same common interrupt vector address.

Up to 16 external 2K systems can be connected to UVK SM-3 and SM-4 through USS OSh/2K, and program access to them is gained the same way as to independent systems, connected directly to the common line.

Each 2K system has two program access registers: data register (RD) and command and state register (RKS).

The processor can work with data in the registers of external 2K systems directly, without having to be referred to memory or to their own registers.

The system provides an opportunity to connect up to 8 expanders for 15 external 2K systems, i.e., up to 120 external 2K systems can be connected to USS OSh/2K.

USS OSh/2K, in terms of load capacity on the "Common line," physically does not exceed the load corresponding to two peripheral OSh systems.

The system is designed as two self-contained building blocks -- control unit and interface unit, installed in an SM-3 or SM-4 rack and connected together by two cables.

Specifications

Number of program channels	1

Number of 2K systems connected to program channel	up to 16
Number of direct access channels	2
Number of 2K systems program-connected to each direct access channel	up to 8
Maximum internal speed of direct access channels, 16-bit words/s	up to 700,000
AC main power: voltage, V	220 + 10% - 15%
frequency, Hz	50
Input power, W	not more than 800
General dimensions, mm: control unit	482.6 × 176 × 772
interface unit	482.6 × 265.9 × 772
Weight, kg	not more than 40

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CSO: 1863

UDC 681.14

MODULES AND SELF-CONTAINED USO BUILDING BLOCKS OF SM-1 (SM-2) NOMENCLATURE FOR APPLICATION IN SM-3, SM-4

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 8 pp

[Text] A611-15 Module for Connecting Digital Test Instruments

The module is intended for connection to UVK [Control computer complex] of serial digital test instruments with an output to a digital recorder, two inputs into the computer complex of parallel code and information from two-position contactless transducers.

The module consists of an interface unit and a connecting wire to the instrument. The maximum distance between the module and instrument is 10 m.

The module is manufactured in different modifications, depending on the input signal level.

1) Исполнение модуля	2) Уровень входных сигналов, В	
	3) «Логическая «1»	4) «Логический «0»
А611-15.1	2,0 — 5,25	0 — 0,8
А611-15.2	6 ± 1,2	0 — 1,2
А611-15.3	12 ± 2,4	0 — 2,4
А611-15.4	24 ± 4,8	0 — 4,8
А611-15.5	−6 ± 1,2	0...— 1,2
А611-15.6	−12 ± 24	0...— 2,4
А611-15.7	−24 ± 4,8	0...— 4,8
А611-15.8	−5 ± 1,0	0...— 0,8
А611-15.9	0 — 5,25	0 — 0,8

KEY: 1. Module model
2. Input signal level, V
3. Logic "1"
4. Logic "0"

The module performs the following connections: Sh1413, V7-16 digital volt meters; Ch3-36, Ch3-38 frequency meters; R385 volt-faradometer; F4893 analog-digital converter; digital general purpose test instrument (TsUIP).

There are 32 input information lines.

A611-19 Analog-Digital Converter Module

The module is intended for converting analog signals to binary code and for input into a computer complex. Analog signals are received from a switchboard or directly from a transducer.

The module occupies three outputs to the 2K interface, but it uses only one sampling code.

Specifications

Input signal range, V:	
for model A611-19/1	-5...0...+5
for model A611-19/2	-10...0...+10
Conversion time, μs	30
Basic error, %	0.1
Tolerable general interference voltage, V	50
General interference suppression, dB	60
Input impedance, MΩ	1
Output code word length, bits	11
General dimensions, mm	235 × 140 × 37

A611-20 Analog-Digital Comparator Module

The module is intended for comparing an analog signal from the switchboard (from a transducer or 2K interface) with the code received from the processor (through the 2K interface), and for converting analog signals to code (in accordance with the processor microprogram).

It occupies one 2K interface output.

Specifications

Number of analog inputs	1
Analog signal range, V:	
for model A611-20/1	-5...0...+5
for model A611-20/2	-10...0...+10
Digital signal range	0-2,047 (11 bits)
Basic error, %	0.2
Comparison time, μs	2
Transient time at analog input for jump of 0 to +10 V, μs	10
General dimensions, mm	235 × 144 × 17

A612-11 Contactless Switchboard

The switchboard is intended for switching DC voltage signals for subsequent conversion with the aid of A611-19, A611-20 modules.

The switchboard takes one output to the 2K interface.

Specifications

Number of input channels:	
bipolar	16
unipolar	32
Number of output channels	1
Switched voltage range, V	-10...0...+10
Basic error, %	0.05
Switching time, μs	4
Input power, W	not more than 2
General dimensions, mm	235 × 144 × 20

A612-15 External Current and Voltage Signal Switchboard

The switchboard is intended for multiplexing (by switching in accordance with the VK [Computer complex] program) communications lines to middle-level analog signal transducers, installed at a distance of up to 1 km from the data acquisition and processing center. The module also performs normalization of current signals.

The switchboard is available in two models: A612-15/1 and A612-15/2.

The switchboard is controlled from A641-9, A641-12, A641-3 modules or from other dry contacts by 8-bit code, the four high-order digits of which are the switchboard address code, and the four low-order digits are the channel address code.

It is designed as a typical case for wall installation.

Specifications

Number of channels:	
input	16
output	1
Number of switching poles	3
Input signal range:	
AC, A	-5...0...+5
DC, V:	
A612-15/1	-5...0...+5
A612-15/2	-10...0...+10
Tolerable general interference, V	not more than 120
Channel to channel switching time, ms	not more than 5
General dimensions, mm	300 × 240 × 240

A613-3 Sampling and Storage Module

The module is intended for registering (storing) current values of DC voltage signals. The A611-11, A611-10 modules perform analogous functions.

The module comes in two models: A613-3/1 and A613-3/2, which have different power sources.

Specifications

Number of channels in module	4
Input and output signal range, V	-5...0...+5
Basic reduced error for 10 ms storage time, t° = = -20°C at 30-80% humidity, %	not more than 0.1
Output signal transient time for input jump of 5 ± 5 V, μs	not more than 5
Input current, μA	not more than 10
Output impedance, kΩ	not more than 10
Switching time, μs	not more than 5
Interface	rank 2K

A613-11 Normalization and Filter Module

The module is intended for converting DC analog signals to voltage signals and (or) for filtering signals from normal interference.

The outputs of A613-11 are connected to A611-19, A611-20, A612-11, A613-3 modules.

The module is available in eight models: A613-11/1-A613-11/8.

Specifications

Number of channels	8-16 (8 inputs for two-pole circuits, 16 inputs for unipolar circuits)
Input signal, mA	-5...0...+5
Input signal, V	-10...0...+10
Output signal, V	-2.5...0...+2.5
	-10...0...+10
Normal noise suppression on 50 Hz, dB	20; 40
General dimensions, mm	240 × 133 × 36

A614-1 Group Test Converter

The converter is intended for converting thermionic converter (TP), resistive thermometer (TS) and rheocord transducer signals to a standard analog signal.

The converter has class I/4T5 spark-safe inputs.

The 8-bit code is controlled with an A641-9 or A641-12 code control module.

Specifications

Number of transducers that can be connected in arbitrary combination	32
Types of connectable transducers:	
thermionic converters	of scale divisions PP-1, KhA, KhK

resistive thermometers	of scale divisions 20, 21, 22, 23, 24
rheocords with impedance, Ω	0-100, 0-120, 0-300
Output signal, mA	0-5
Basic conversion error, %	0.5-1.0
Maximum conversion time, ms	50
Maximum distance between converter and VK, km	up to 1
General dimensions, mm	600 × 700 × 455

A614-2 AC Group Test Converter

The converter is intended for collecting and for proportional conversion of DC electrical signals (mutual inductance, voltage) to a standard signal.

The 8-digit binary code is controlled by an A641-9 or A641-12 code control module.

Specifications

Number of switched transducers	16
Mutual inductance input signal range, mH	-5...0...+5
	-10...0...+10
Voltage, V	0.2
Output signal range, V	-5...0...+5
Basic conversion error, %	not more than 0.5
Conversion time, ms	not more than 150
Maximum distance from VK, km	1
General dimensions, mm	600 × 490 × 305

A614-3 Group Test Converter

The converter is intended for converting to a standard signal DC signals of resistive thermometers and rheocords, insulated from the ground. The instrument is connected to a sensor by a four-wire line. The impedance of each wire of the line does not exceed 100 Ω.

The converter is controlled by A641-1, A641-3, A641-9 contactless modules or from "dry contacts."

The instrument may be placed in a case for wall mounting.

Specifications

Tolerable distance from VK, km	up to 1
Number of switched transducers	16
Type of transducers:	
resistive thermometers	of scale divisions 20, 21, 22, 23, 24
rheocords with impedance, Ω	0-100; 0-120; 0-300
Output Signal range, V	0-5; 0-10
Amplification characteristic	linear

Converter precision class, %	0.4
Conversion time, ms	1
General dimensions, mm	540 × 240 × 240

A614-4 Group Test Converter

The instrument is intended for converting to a standard DC signal signals from thermometers, thermionic DC transducers and rheocords.

Connection to TP is accomplished with thermionic wires, to rheocords with a four-wire line and to DC transducers with a two-wire line.

The module contains circuits for automatically correcting the error of the end temperature for thermionic converters.

Specifications

General interference, V	up to 100
Distance from VK, km	up to 1
Number of connected transducers	16
Types of transducers:	
thermionic converters	of scale divisions TPP, TKhA, TKhK
rheocords with impedance, Ω	0-100; 0-120; 0-300
DC transducers, mV	0-10; 0-20; 0-50; 0-100
Output signal range, V	0-5; 0-10
Precision class, %	
Response of input and output	linear
Input impedance, kΩ	100
Connecting wire impedance, Ω	not more than 100
Conversion time, ms	not more than 2.5

A621-1 Normalizing Module

The module is intended for converting input signals of various levels from contact or contactless two-position transducers and "dry contact" transducers to standard output signals. The A622-9 module performs analogous functions.

The module is used in conjunction with A611-12 digital signal input-output modules and A622-8 initiative signal input module. It is installed in a cross AKB.

The module comes in eight modifications, depending on input signal parameters, A621-1/1-A621-1/8.

Specifications

Number of channels:	
input	16
output	16

Output signal parameters, V:	
logic "0"	0-1.2
logic "1"	4.8-7.2
Input signal levels, V:	
logic "0"	0-1.2; 0-2.4; 0-4.8
logic "1"	12-1.2; 24 ± 2.4; 48 ± 4.8
Input current, A	2.0-3.5; 2.0-5.0; 3.5-6.0

A621-2 Electrical Isolating Module (MGR)

The module is intended for galvanic separation of electrical circuits, connecting input modules and contact and contactless transducers.

The module has six models: A621-2/1-A621-2/6.

Specifications

Number of channels:		
input		8
output		8
Input signal levels, V:		
logic "0"		0-1.2; 0-2.4; 0-4.8
logic "1"		4.8-7.2; 9.6-14.4; 19.2-28.8
Input current of each channel, mA		10-25
Input signal frequency (with an on-off ratio of 2):		
from contact transducers, Hz		not more than 25
from contactless transducers, kHz		not more than 20
Output signal levels, V:		
	logic "0"	logic "1"
at power source voltage of 5 ± 0.25 V	0-0.4	2.4-5.25
at power source voltage of 24 ± 1.2 V	0-2.4	19.2-25.2
Load current of each channel, mA		not more than 1.7
Galvanic isolation parameters:		
impedance on each channel, M		not less than 20
through-put capacity between input and output circuits, pF		not more than 50
interference voltage applied between input and output, V		not more than 100
General dimensions, mm		230 × 126 × 38

A621-3 Electrical Isolation Module

The module is intended for electrical separation of electrical circuits of contact and contactless transducers from UVK circuits.

The module is used in conjunction with digital signal input modules and with the A622-10 (A622-8) switchboard.

It is installed in the cross AKB [Self-contained building block].

It has two models, A621-3/1 and A621-3/2, depending on input signal levels.

Specifications

Number of channels:		
input	8	
output	8	
Input signal levels, V:	for A621-3/1	for A621-3/2
logic "1"	9.6-14.4	4.8-7.2
logic "0"	0-2.4	0-1.2
Input current of each channel, mA	3	5
Signal frequency, kHz, not more than	10	

1) Исполнение модуля	Напряжение питания выходных ключей, В 2)	3) Параметры выходных сигналов: 4) ток нагрузки, мА	5) напряжение, В: 6) логического „0"	7) логической „1"
A621-3/1	5	1,7	0—0,4	2,4—5,25
	24		0—4,8	19,2—25,5
A621-3/2	5	30	0—0,4	2,4—5,25
	24	60	0—4,8	19,2—25,5

KEY: 1. Model
2. Power voltage of input keys, V
3. Output signal parameters
4. load current, mA
5. Voltage, V
6. logic "0"
7. logic "1"

General dimensions, mm 230 × 126 × 38

A622-8 Initiative Signal Input Module

The module is intended for input into UVK of information from positional, pulse and initiative contactless transducers.

The module comes in three models: A622-8/1, A622-8/2, A622-8/3.

Specifications

Number of input channels 16

1) Исполнение модуля	2) Параметры входных сигналов: 3) напряжение, В: 4) логического „0"	5) логической „1"	6) длительность, мкс	7) ток, мА
A622-8/1	0—1,2	6±1,2	5	0,4—0,9
A622-8/2	0—2,4	12±1,4		0,25—0,5
A622-8/3	0—4,8	24±4,8		0,18—0,32

KEY: 1. Model
2. Input signal parameters
3. Voltage, V
4. logic "0"
5. logic "1"
6. duration, μs
7. current, mA

General dimensions, mm	235 × 140 × 15

A622-10 Digital Signal Switch

The switch is intended for multiplexing (by switching in accordance with the VK program) channels from contact transducers of the "dry contact" type.

It is connected to VK through the A641-9 contactless code control module. It is designed as an external instrument for wall mounting.

Specifications

Number of groups	16
Number of channels per group	16
Number of output channels	16
Input signal levels, kΩ:	
logic "1" (contact closed)	1-0.2
logic "0" (contact open)	more than 10
Distance from VK, km	up to 1
General dimensions, mm	540 × 305 × 250

A623-2 Number-Pulse Signal Input Module

The module is intended for receiving, storing and feeding into UVK pulse signals from contact and contactless transducers and local automation instruments.

The module is available in 14 models: A623-2/1-A623-2/14, depending on input signals and types of transducers.

Specifications

Number of inputs	4
Number of counters	4
Counter capacity, bits	4 (15 pulse signals)
Minimum input signal duration, μs	2
Input pulse repetition frequency, Hz:	
during interrogation while counting	up to 20,000
during recounting	up to 200,000
General dimensions, mm	235 × 140 × 15

A623-3 Number-Pulse Signal Input Module

The module is intended for receiving, storing and transmitting to UVK a signal of arrival before a given number of signals from contact and contactless transducers.

The module comes in 14 models.

Specifications

Number of input channels	1

Counter capacity, bits:		
when installed in processor or in RVV		16
when installed in RSO		10
Minimum input signal duration, μs		2
Transducer signal voltage, V:		
	logic "0"	logic "1"
	0-0.8	2.0-5.25
	0-1.2	6 ± 1.2
	0-2.4	12 ± 2.4
	0-4.8	24 ± 4.8
	0...-1.2	-6...±1.2
	0...-2.4	-12...±2.4
	0...-4.8	-24...±4.8
Dry contact transducer impedance, Ω:		
logic "0"		0-150
logic "1"		more than 6,000
General dimensions, mm		235 × 140 × 15

A631-6 Code-Current Converter

The module is intended for converting electrical digital coded signals to a continuous DC signal.

Specifications

Number of channels	1
Input coded signal, bits	11
Output signal, mA	0-5
Precision class	0.2/0.15
Maximum conversion time, μs	60
Number of occupied outputs to 2K interface	2
Number of occupied sample codes	1
Load impedance, kΩ	0-2.5
Signal level, V:	
"1"	2.4-5.25
"0"	0-0.8
Pulse duration, μs	not less than 0.2
General dimensions, mm	235 × 140 × 23

A631-7 Code-Voltage Converter

The converter is intended for converting a sequence of codes to audio frequency voltage.

Specifications

Word length, bits	8
Output voltage range, V	0-1
Reproducible frequency band on -3 dB level, Hz	300-3,400
Nonlinear distortions in frequency band, %	not more than 6
Load impedance, Ω	not less than 100

Pulse repetition period on 1TO-T converter line, μs	75, 150, 300
General dimensions, mm	235 × 140 × 20

A641-8 Contactless Control Module

The module is intended for switching DC and AC circuits. The module has two design variations:

A641-8/1 -- for switching DC load;

A641-8/2 -- for switching AC load.

The module is connected to UVK through an A641-3 module.

Design execution -- insertable ASVT-M unit.

Specifications

Number of output signals during load control:	
DC	2
AC	4
Switchable voltage, V	24-220
Switchable current, A, not more than:	
for A641-8/1	0.2-5
for A641-8/2	0.2-4
General dimensions, mm	217 × 140 × 176

A641-9 Contactless Code Control Module

The module is intended for switching DC electrical circuits. It has one output to the 2K interface. The module has electrically isolated output keys and control circuits.

It is designed as a printed circuit board.

Specifications

Number of channels:	
input	16
output	16
Switchable current, mA	100, 200
Switchable voltage, V	6-12; 12-48
Active load switching frequency, kHz	10
Input signal parameters, V:	
logic "0"	0-0.8
logic "1"	2-5.25
Switching time, μs	not more than 50
General dimensions, mm	235 × 140 × 15.5

A641-10 Output Pulse Signal Module

The module is intended for output onto 16 channels of pulse signals or of a single code, the values of which are determined by 16-bit code in accordance with a program from UVK. The module occupies one output to the 2K interface. The module is designed as a type B circuit board.

Specifications

Number of output signals	16
Switchable current, A	not more than 0.2
Switchable voltage, V	48
Input signal level, V:	
logic "1"	2-5.25
logic "0"	0-0.8
Output signal level, V:	
logic "1"	2.4-5.25
logic "0"	0-0.4
Residual voltage on open key, V	not more than 0.5
Module output pulse duration, μs:	
minimum	10; 20; 40; 80; 160
maximum	$(2^{16} - 1)t_n$, where t_n =
	= 10; 20; 40; 80; 160
General dimensions, mm	235 × 140 × 15.5

A641-12 Digital Input-Output Signal Module

The module is intended for input into UVK of information from two-position transducers in the form of voltage levels and for transmitting control signals to external DC control mechanisms by closing them onto the power "Common line" by command from UVK. The module comes in 16 models. It is designed as a type B circuit board.

Specifications

Number of channels:	
information	16
service	2
Input signal voltage, V:	
logic "1"	6 ± 1.8
logic "0"	0 + 1.8
Maximum current of each channel, mA	0.65
Number of output channels:	
position	16
pulse	1
Position signal parameters:	
switchable current, mA	up to 200
external power source voltage loads, V	5-48
Residual voltage of connected channel, V	not more than 0.5
Leakage current of switched-off channel, mA	not more than 1

Channel switching time on active loads, μs	not more than 5
Pulse voltage, V:	
logic "1"	2.4-5.25
logic "0"	0-0.4
Pulse duration	from 1 μs to 1 s

A641-15 Output Relay Signal Switch

The module is used for connection to UVK through A641-12 for a distance of up to 1 km on the following kinds of lines: information (16-position code); address (8-bit code).

The four lower-order digits transmit the group address; the four higher-order digits transmit the switch address. There are 16 outputs per group. The switch has eight groups. It is designed as an external instrument for wall mounting.

General dimensions: 600 × 600 × 300 mm.

A651-3 Cross Unit

The unit is intended for connecting and cross-connecting cables. It has three design executions: A651-3/1; A651-3/2; A651-3/3.

A714-5/1 Multiplex Interface Coupler (RIM-1)

The coupler is intended for expanding VK input-output capabilities.

It is connected to VK through two A723-5 in-system communications modules. It takes two outputs to the 2K interface.

The A714-5/1 provides an opportunity to increase the number of peripheral systems connected to VK, to install peripheral systems farther away from the processor and to set up operation of two VK with common peripheral systems.

The two-level peripheral systems addressing that is used in conjunction with the A714-5/1 module is programmed.

RIM-1 is connected to VK, contains 16 outputs to the 2K interface and control circuits, designed to handle 63 logic outputs (63 sampling codes).

It is designed as a self-contained unit.

General dimensions: 482 × 354 × 693 mm.

A714-5/2 Interface Coupling Expansion Module (RIM-2)

RIM-2 is connected to RIM-1.

The number of RIM-2 connected to RIM-1 is determined by the total number of interface units of the peripheral systems.

The maximum number of RIM-2 connected to RIM-1 should not exceed eight. The total number of sampling codes utilized by all peripheral systems connected to RIM-1 and RIM-2 should not exceed 63.

The length of the trunk communications line that connects RIM-1 and RIM-2 should not exceed 8 m.

The module is designed as a self-contained unit.

General dimensions: 482 × 354 × 693 mm.

A722-3 Combined Communications Channel Interface Module

The module is intended for mating the M-6000 processor and switched communications channel of the subscriber telegraph network, with telephone communications channels through data transmission equipment.

The module is connected to the 2K interface.

The operating mode of the module with each communications channel is half-duplex.

There are five models of the module, depending on the number and type of connected inputs.

A711-15 Matcher

The matcher is intended for trunk line connection to VK of systems with outputs to a collective client line (LKP) -- an international interface for electronic test instruments (IEE448). It is designed as two interface units.

Specifications

Number of systems connected by one trunk	not more than 14
Total length of communications line, m	not more than 15
Number of signal lines in trunk	16
Maximum exchange speed, kHz	200

A723-1/1 High-Speed Data Transmission Module

The module is intended for converting parallel binary code from VK to serial binary code, for transmitting it into a communications line (RK 75-4-11 coaxial cable), for receiving signals coming in from the line and for converting them to the original form. It is designed as two interface units.

Specifications

Data transmission speed, Mbits/s	0.4
Length of communications line, km	1
Transmission reliability, failures/bit	not more than 10^{-8}
Operating mode	duplex, start-stop

A723-5/2 Intrasystem Communications Module

The module is intended for exchanging information between two VK and between VK and multiplex interface coupler. The communications line is coaxial radio frequency cable of the RK-75 type or twisted wire pair. It is designed as two interface units.

Specifications

Data transmission speed, Mbits/s:	
on 200 m long line	2.5
on 1 km long line	1
on 3 km long line	0.2
Operating modes	start-stop, half-duplex, word by word
Transmitted word length, bits:	
information	16
service and monitor	3

The modules described above are intended for generating input-output analog and digital signals. Examples of how to set up the input-output channels of these signals are shown in Figures 1 and 2.

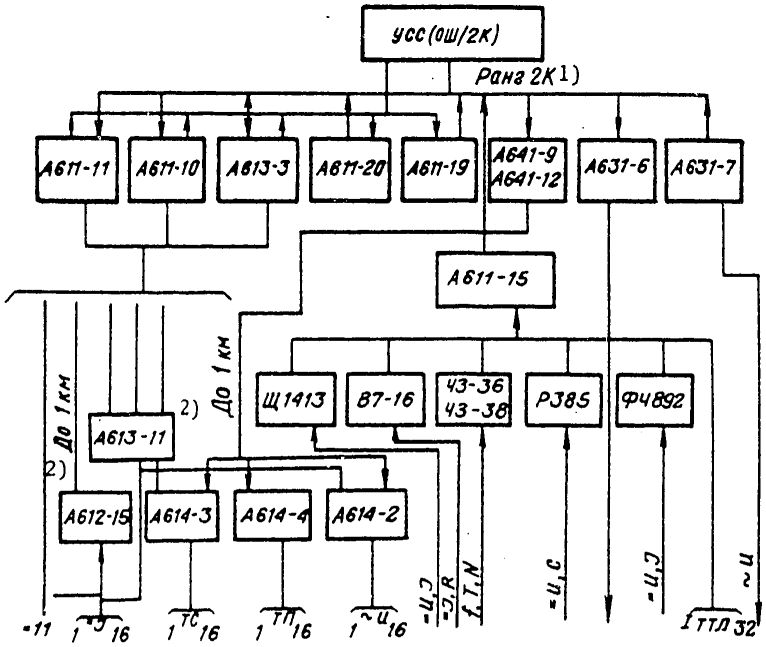

Figure 1. Structural diagram of analog signal input-output channel.
KEY: 1. Rank 2K [УСС=USS; ОШ=OSh; ТС=TS; ТП=TP]
2. Up to 1 km

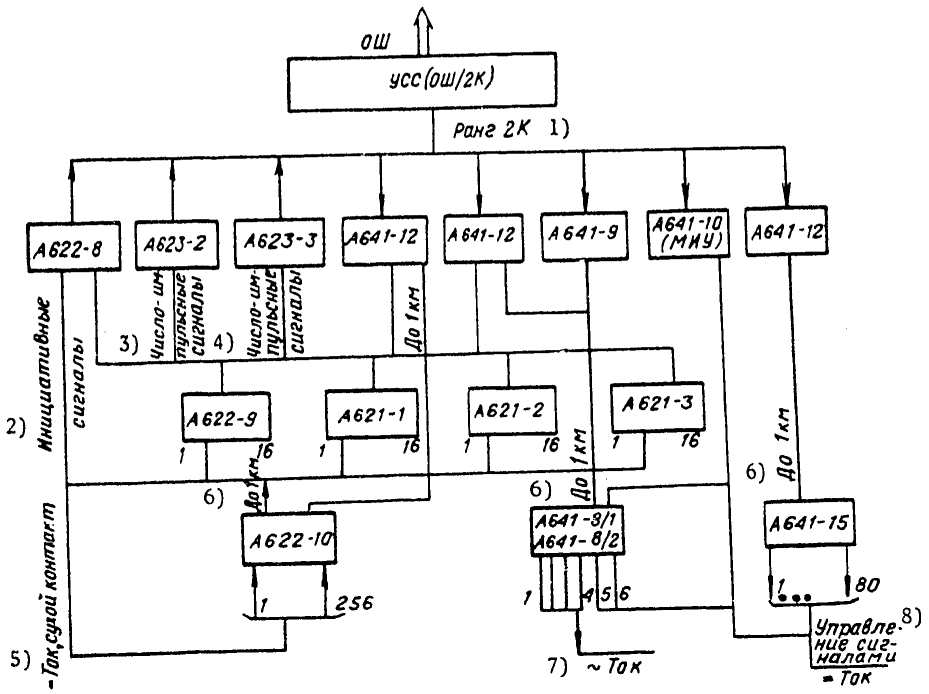

Figure 2. Structural diagram of digital input-output signal channel.

KEY: 1. Rank 2K
2. Initiative signals
3. Number-pulse signals
4. Number-pulse signals
5. Current, dry contact
6. Up to 1 km
7. Current
8. Signal control Current

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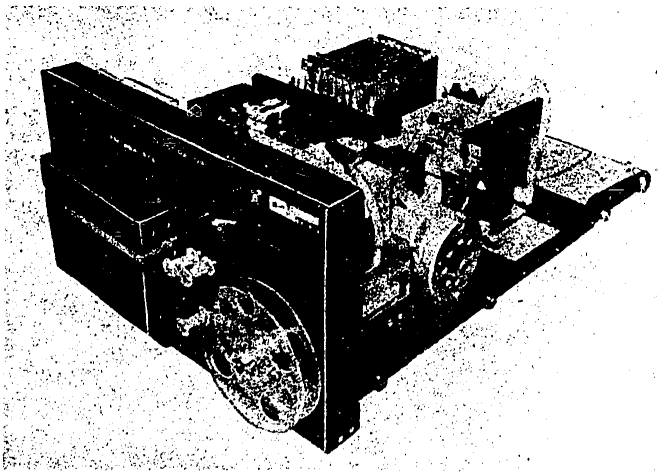
SM 6202 PERFORATED TAPE INPUT-OUTPUT SYSTEM

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The system is intended for input of information from perforated tape and output of information onto perforated tape during operation in SM EVM complexes with the "Common line" interface.



The system (see the figure) consists of a combined perforated tape input and output system of the SPTP-3-03-01 type (manufactured in Poland) and a controller.

The system is mated with a computer through the "Common line" program channel.

Specifications

Operating modes:	
input	start-stop or continuous
output	start-stop
Reading method	photoelectric
Maximum reading speed, lines/s	not less than 300
Maximum perforation speed, lines/s	not less than 50
Information carrier	five-, eight-track perforated tape
Representation of information	binary 7-bit code; binary 8-bit code
Power systems of SPTP-3-03-01 from AC main:	
voltage, V	220
frequency, Hz	50
Controller powered from DC source, voltage, V	5 ± 5%
Input power:	
of SPTP-3-03-01 system, V·A	30
of controller, W	not more than 7.5

SM 6305 UVATsPU Output System

The system is intended for readout onto paper carrier of alphanumeric information. It is used in combination with SM-3 and SM-4 computer complexes.

The system includes an alphanumeric parallel printer (ATsPU) of the SM-6315 type, controller, cable.

There are four models (SM 6305.01, SM 6305.02, SM 6305.03, SM 6305.04), depending on printing speed and the number of printed symbols.

Specifications

Model	Printing speed, lines/s	Number of printed symbols	Programmable carrier format control unit (BUF)
SM 6305.01	500	96	No
SM 6305.02	500	96	Yes
SM 6305.03	700	64	No
SM 6305.04	700	64	Yes

Interface of system	"Common line"
Buffer operational storage volume	132 eight-digit words
Symbol generation method	impact, typing
Number of symbols per line	not more than 132
Number of copies	not more than 5
Paper width, mm	80-420
Type SM 63/5 ATsPU power from AC line:	
voltage, V	$220^{+\ 10\%}_{-\ 15\%}$
frequency, Hz	50 ± 1

TEZ controller powered by DC source with voltage, V	5
Input power, V·A	not more than 730
General dimensions, mm	830 × 650 × 1,150
Weight, kg	not more than 232

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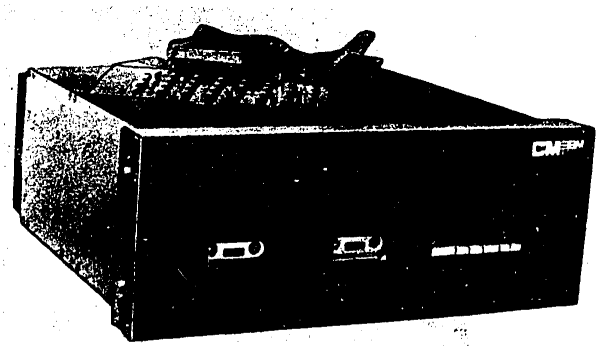
TYPE A311-4 EXTERNAL CASSETTE MEMORY MODULE

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The module is intended for the preparation, input, output and storage of data arrays. It is nomenclature product of ASVT-M and SM EVM. It is manufactured in four models: A311-4/3 and A311-4/4 built-in; A311-4/5 in instrument execution for operation in computer complexes with output to the 2K interface (M-6000, M-7000, SM-1, SM-2); A311-4/6 -- of instrument execution for operation in video terminal stations (based on the DM-500 and DM-2000 display modules) with output to the 2KS interface.



The module consists of two VK-1 cassette stores, operating serially, a logic unit and power unit, installed in the same case.

The recording method is serial wide-pulse modulation using two tracks. The set must be turned over manually in order to change from one track to the other.

In the autonomous operating mode on instructions from the console the module selects a store, indicates the state of stores, rewinds the magnetic disk between the beginning and end of markers in both directions, moves the magnetic disks to

one zone in both directions and stops them in between-zone intervals (MZP). The module can also operate with a computer complex and display module. Recording is protected.

Specifications

Number of stores in module	2
Data transmission speed, kbytes/s	not less than 0.375
Capacity of information on magnetic tape track during recording with zones of maximum length, kbytes	not less than 150
Module memory capacity, kbytes	not less than 600
Recording density, binary characters/mm	22
Programmed zone length, bytes	1-2048
Magnetic tape transport speed, m/s	0.2
Magnetic tape rewind time, s	up to 90
Power from single-phase AC line:	
voltage, V	220 ± 22%
frequency, Hz	50 ± 1
Input power, V·A	not more than 85
Stabilized power of DC voltage, supplied by power unit, V	+5 ± 0.25; +12 ± 0.6; -12 ± 0.6
Ambient temperature, °C	5-45
Relative humidity, %	40-90 (at 30°C)
Atmospheric pressure, mm Hg st.	630-800
Tolerable vibration:	
frequency, Hz	up to 25
amplitude, mm	not more than 0.1
General dimensions, mm:	
A311-4/3 and A311-4/4	not more than 483 × 177 × × 462
A311-4/5 and A311-4/6	not more than 490 × 191 × × 462
Weight, kg	not more than 25

The average service life is at least 6 years. The warranty period from the day of placement in operation is 18 months.

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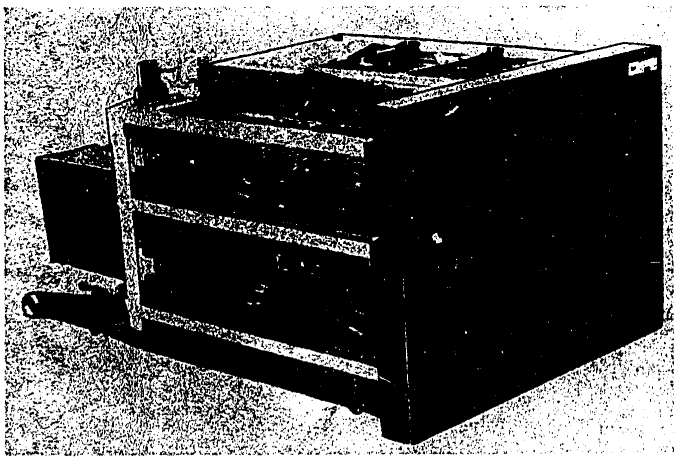
SM 3102 OPERATIONAL MEMORY SYSTEM

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The operational memory system (UOP) is intended for receiving, storing and reading out operational information in the form of binary codes in control computer complexes with the "Common line" (OSh) systems interface.



In any exchange operation UOP functions as a control system (executor) in relation to the controlling system (task master), as which a central processor usually functions.

During exchange through OSh each control signal, transmitted by the task master, must be confirmed by a response signal from the executing system, after which exchange continues or ends. In the absence of a response signal the task master can register an OSh error.

The system performs the following operations: reads words with regeneration, reads words without regeneration (with a pause), writes words and writes bytes.

The system is designed as an operational memory unit and power unit, fastened to a common base, which can be removed from the rack on guides. The operational memory unit is designed as a printed circuit board with mounted electronic parts.

Specifications

Operational memory volume, kwords	16
Bit configuration of word, bits	16 + 2 test
Order of sampling	arbitrary
Storage element	ferrite core, annular M5VT-1-K-0.6 × 0.4 × 0.13
Operation cycle time, μs:	
read word with regeneration, write word	not longer than 1.2
write byte	not longer than 0.7
read word without regeneration (with a pause)	not longer than 0.6
Sampling time, μs	
AC main power:	
voltage, V	220 $^{+\ 10\%}_{-\ 15\%}$
frequency, Hz	50 ± 1
Input power, V·A	not more than 400
General dimensions, mm	482.6 × 265 × 772
Weight, kg	not more than 32.1

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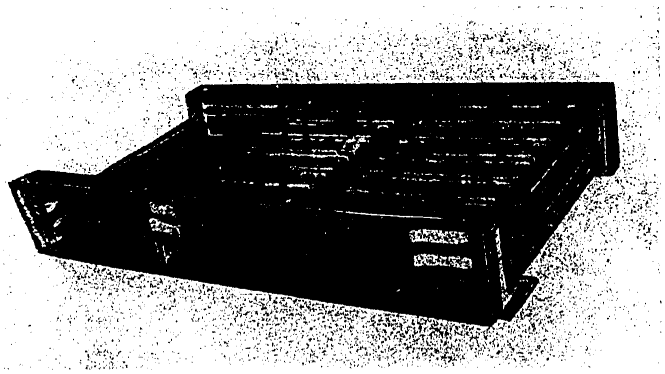
SM-3 ARITHMETIC EXPANDER (RA)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The expander is intended for use in UVK [Control computer complex] SM-3. Together with the SM-3P central processor it performs number processing operations most frequently encountered in programs: multiplication and division of integers, multiple arithmetic and logic shifts, normalization.



The arithmetic expander performs the listed operations an order of magnitude faster than the SM-3P processor and is programmable.

The use of the RA SM-3 expander significantly reduces the total arithmetic program run time, especially of general purpose number processing subroutines with a floating decimal.

Architecturally and structurally up to two independent programmed arithmetic expanders can be connected to the same UVK SM-3.

The RA SM-3 unit is a standard SM EVM systems unit. It is installed in a standard AKB [Self-contained building block] of SM EVM.

The software includes a set of systems tests and a standard package of arithmetic operations, included in the DOS SM, DOS ARM, DIAMS, DOS RV, FOBOS operations systems.

Specifications

Type of interface	"Common line"
Feature of "Common line" communications	data exchange in system-executor mode
Bit configuration of processed data	8; 16; 32
Operation execution time (not including operand loading operations and result sampling), μs:	
multiplication (of two 16-digit numbers with a 32-digit result)	4.0
division (of 32-digit number by 16-digit with answer 16-digit quotient and 16-digit remainder)	4.5
arithmetic (or logic) shift of 32-digit number by number of digits assigned before beginning of operation	4.0
normalization of 32-digit number and simultaneous counting of number of shifts	4.0
Component base	IS, SIS, TTL, K155, K131 series
Type of systems control	programmed with electrically programmed PPZU 256 × 4 bits
Power voltage	5 ± 5%
Input power, W	not more than 20.0
Systems operating mode	continuous
Accrued operating time per failure (calculated), hr	not less than 6,000
Average repair time, min	not more than 40
Maximum repair time with probability of 0.95, hr	not more than 2.5
Service life, years	not less than 6
General dimensions, mm	267 × 456 × 68
Weight, kg	not more than 3.0

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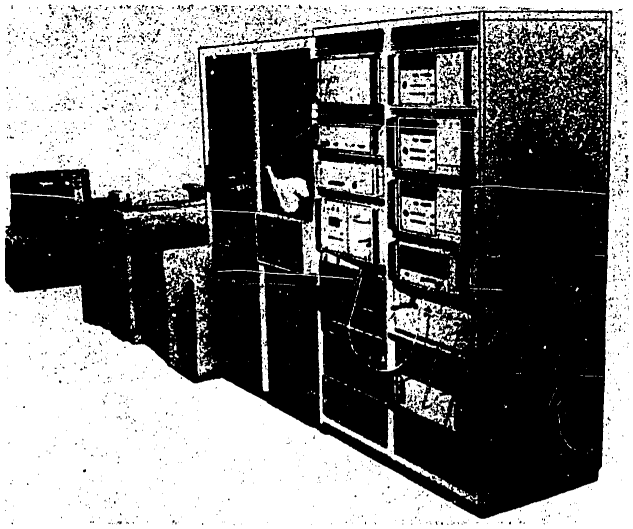
IVK-7 TEST-COMPUTER COMPLEX

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The complex is intended for the building of automated scientific research systems. It provides program switching, amplification, digital measurement, recording of DC signals, program assembly, storage and processing of measurement data and transmission of control signals to an experimental setup.



The complex has such functional capabilities as primary measurement data processing; acquisition of the results of indirect assembled and combined measurements, including in real time; control of units during the course of an experiment, including the organization of interrogations, queues, establishment of priorities;

monitoring of the performance of units and metrologic characteristics of the complex; service processing of information received (representation of the results in the form of tables, graphs, histograms, etc.); data storage; generation of control actions on an analyzed subject (in the form of analog and (or) digital signals); interactive operation.

Realization of all the functional capabilities of the complex is assured by the right type of program and algorithmic software, and by applied software within the framework of the IVK dialogue programming system. The applied software solves basic problems in experimental planning, processing and representation of measurement results.

The complex is designed on the basis of the serially produced ASET and SM EVM systems of the SM-3, SM-4 types, connected by a single "common line" interface. The complex includes the UVK SM-3 base set and two meter racks with the following functional systems:

F4221 analog-digital converter;

three F799/2 meter signal switches;

F723/1 digital-analog converter;

F7073/4 DC amplifier;

F7073/7 DC amplifier;

N-306K stencil plotter;

F7046/7 calibrated voltage source;

Shch1516 digital DC volt meter;

digital data input-output system;

autonomous control panel;

systems interface unit;

VS-5-10A power source.

The technical specifications of the systems (see the table) are determined by the makeup of a complex.

Speed is up to 5,000 measurements per second.

Power from the AC main: voltage 220 V; frequency 50 Hz.

The area necessary for setting up a complex is not more than 25 m^2.

Weight does not exceed 1,000 kg.

1) Тип устройства	Диапазон входного 2) сигнала	3) Относительная погрешность	4) Сопротивление	5) Время преобразования
Ф4221	± 1В	0,2;0,15	6) Входное ⩾0,5 МОм	⩽100 мкс
Ф799/2	± 10В	0,1	7) Переходное замкнутой линии ⩽1000м, 8) разомкнутой ⩾10⁶Ом	⩽10 мкс
Ф723.1	± 10В	0,15;0,1	9) Выходное ⩽0,5 Ом	⩽100 мкс
Ф7073/4	± 10мВ	0,1	6) Входное ⩾ 10 МОм	⩽10 мкс
Ф7073,7	± 100мВ	0,05	Входное ⩾ 10 МОм	⩽10 мкс
Ф7046·7	± 0,1В; ± 1В; ± 10В;	0,003	9) Выходное ⩽0,1 Ом	⩽20 мкс
Ш1516	± 0,05В; ± 0,5В; ± 5В; ± 50 В	$\pm\left[0{,}01 - 0{,}005\left(\frac{U_{вых}}{U_{вх}} - 1\right)\right]$	6) Входное ⩾ 10 МОм	⩽40;400 мс

KEY: 1. Type of system
2. Input signal range
3. Relative error
4. Impedance
5. Conversion time
6. Input
7. Transient impedance of closed line
8. of broken line
9. Output

[Ф=F; Щ=Shch; В=V; Ом=Ω; мкс=μs; мс=ms]

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ORGANIZATION OF AUTOMATED CONTROL SYSTEMS SOFTWARE SUPPORT OF NATIONAL COMPUTER CENTERS

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 3 pp

[Text] The Ministry of Instrument Engineering and Automation and Control Systems established the Central ASU [Automated control system] and Program Library (TsFAP ASU) for supplying organizations and enterprises of the country, irrespective of their departmental subordination, with ASU software.

The centralized automated control system algorithm and program library (TsFAP ASU), in accordance with "Statute on the procedure of the delivery into service of complete developments," accepts ASU algorithms and programs, developed by organizations and enterprises, irrespective of their departmental subordination. In the acceptance of software TsFAP ASU gives preference to systems for automating the planning of automated control systems, for automating ASU task programming, and to typical programs for solving problems of functional ASU systems, which reduce the labor involved in ASU programming and planning and assure their utilization by many clients.

TsFAP ASU is made up of PPP [Applied programs package] and SMO [not further identified] for third-generation computers. The library presently contains about 150 PPP and SMO of ASU with a total volume of 6 million machine instructions.

In 1980 the library will contain 10 million machine instructions.

TsFAP ASU includes PPP and SMO that can be used for the development of various types of ASU at different levels of management.

The library contains packages for organizing and conducting the ASU information base, for organizing a computer process, for automating ASU programming and planning, for implementing optimum planning and control procedures, for solving problems of functional subsystems of automated control systems and problems of functional subsystems of national economic sector management; for solving problems of functional subsystems of nonindustrial automated management systems, and it also contains method-oriented applied program packages.

TsFAP ASU accepts PPP and SMO from organizations of the Ministry of Instrument Engineering and Automation and Control Systems in accordance with subject matter.

Organizations and enterprises of other ministries and departments can refer their developments to TsFAP ASU of an association by exchanging PPP and SMO by agreement and in accordance with contracts made with an association.

When TsFAP ASU receives PPP and SMO it tests them on test examples of the developing organization.

Clients are serviced as follows: with information materials, transmittal of software, attending of software, and training of specialists of client organizations.

Information materials released by the library enable clients to become familiar with the functional capabilities of the library software, with its makeup, prospects of composition and recommendations on the utilization of software during the development and adoption of systems.

Abstracts, subject and bibliographic indexes of the literature enable the clients to keep track of the trend of software development, improve programmer labor organization and increase the functional reliability of systems.

Clients receive, in accordance with work done by an association on information support, the following: a TsFAP ASU PPP and SMO catalogue, updated to 1 January of the current year, with brief descriptions of the components of the library; a catalogue of PPP and SMO that go into the library in a quarter (after each quarter); brief descriptions of the application of PPP or SMO accepted by the library; recommendations on the use of library programs; materials of seminars, meetings and conferences conducted by library specialists on questions of the development and application of ASU programs; abstract surveys on ASU software; bibliographic and subject indexes of the literature on basic subject trends in relation to the development and utilization of ASU software.

Transmittal of software includes: recording of transmitted programs on client's magnetic tape or magnetic disk, transmittal of program documentation, transmittal of new versions of programs and of modifications in the program documentation within the term of a contract.

Library specialists perform three kinds of attendance work:

1. They attend PPP and render assistance to clients on the selection of planning decisions during the utilization of PPP; they offer consultations on the description of selected planning decisions in the PPP input language and on rules pertaining to the writing of client units; they render assistance in the discovery and correction of errors during the adoption of the attended PPP; they transmit new versions and revisions of the operational documentation of the attended PPP; they take part in trials of the attended PPP on the client's information.

2. They attend PPP for refining the client's parameters (PPP generation); they describe selected planning decisions in the PPP input language; they acquire working programs that fit the description in the PPP input language;

3. They attend PPP for the purpose of developing a set of problems to be solved by a given PPP. During the completion of work on this kind of attendance, in addition

to work called for by the first and second kinds of attendance, they work out planning decisions on the utilization of PPP at the client's facility and develop basic planning decisions on the organization of the information base; they develop a system of classification and coding and technological instructions on data processing; they take part in the test operation of a system.

Thus, work in all kinds of attendance is finished with the adoption of software at the client's facility.

Client specialists are trained in the course system in lectures and practical exercises. The training program is developed by library software attendance specialists.

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GENERAL PURPOSE OPERATIONAL PERFORATED TAPE SYSTEM (PLOS SM)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for preparing, debugging and running client programs in assembler language in the single-program mode and is used for automating simple control systems for scientific experiments and scientific-technical calculations.

PLOS SM is used in SM computer complexes, built on the SM-3P processor.

In PLOS SM all systems programs are on perforated tape. The program and data input-output takes place through the input-output system from perforated tape. A client conducts dialogue with the systems programs with the aid of instructions from the terminal keyboard.

PLOS SM contains the following programs: assembler language translator, input-output dispatcher, text editor, debugger, OZU [Direct access memory] output program, initial loader (performs loading of programs from perforated tape), absolute loader (performs loading of programs in absolute format), and a package of standard subroutines for performing floating and fixed decimal arithmetic operations and computation of elementary functions.

The system operates with the minimum set of hardware, which includes: SM-3P processor; 8K word OZU; perforated tape input-output system.

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REAL-TIME OPERATIONAL PERFORATED TAPE SYSTEM (PLOS RV)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for solving a wide range of problems in scientific research automation systems and industrial control systems. PLOS RV is used in SM EVM computer complexes, built on the SM-3P or SM-4P processor.

PLOS RV performs multiprogram operation on a priority basis. The system has a flexible and efficient input-output operation processing system, which provides independent tasking from external systems and enables them to back up and use jointly external systems and to be switched to alternative systems. The operator has at his disposal a large set of systems instructions, which are transmitted through the console.

PLOS RV offers the following capabilities: simultaneous completion of real-time tasks (up to 127); completion of one main task; initiation of tasks by operator inquiry, programmed inquiry, interrupt and timer inquiry; control of task completion time on each priority level by a tracking timer. Tasks are programmed in assembler language. The system is delivered on perforated tape carrier.

PLOS RV includes the following programs: monitor, text editor, composer, assembler, debugger, PLOS RV generation modules.

The minimum configuration of hardware used for the operation of PLOS RV includes an SM-3P or SM-4P processor, 16K word OZU [Direct access memory], timer, input-output perforated tape system, alphanumerical video terminal.

Auxiliary systems include an alphanumeric printer, additional 28K word OZU units, analog-digital signal input-output systems, eight auxiliary terminals, magnetic disk storage (without operation with files).

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BACKGROUND OPERATIONAL REAL-TIME BASE OPERATIONS SYSTEM (FOBOS)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The system is intended for building specific versions of operations systems for task-oriented computer complexes and can be used in laboratory research automation systems and test control and for solving scientific-technical and other problems of a computational nature in the background mode.

FOBOS is used in SM EVM computer complexes, built on SM-3P or SM-4P processors.

FOBOS is a real-time system and is characterized by the minimum response time, in comparison with other operations systems, to an external stimulus. In order to operate the system needs from 16K to 28K word memory.

FOBOS offers the client a flexible real-time input-output service system. The FOBOS monitor and program-driver package services a wide range of external SM EVM systems. By connecting nonstandard external systems to SM EVM it is possible to expand the collection of drivers for servicing these systems.

The system enables a client to write programs in macroassembler, FORTRAN-IV, BASIC and DIASP languages. The system is delivered on a disk carrier.

The FOBOS set includes the following programs: monitor, text editor, composer, file operation program, librarian, debugger.

Auxiliary FOBOS programs perform the following functions: comparison of text, file change, code revision, module subject revision and printout.

The minimum configuration of hardware used for FOBOS operation consists of an SM-3P or SM-4P processor, alphanumeric video terminal, OZU [Direct access memory] with a capacity of at least 16K words, timer, magnetic disc storage and perforated tape input-output system.

Accessories include up to 28K word OZU, an alphanumeric printer, punch card reader, extra magnetic disk storages (including floppy disks).

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HIERARCHICAL DISTRIBUTED INFORMATION SYSTEM (IRIS) FOR HANDLING BANKS AT MULTICOMPUTER SM EVM-M-4030 COMPLEXES

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for managing centralized data banks (TsBD) at UVK [Control computer complex] M-4030 and for supporting operation with them at multicomputer SM EVM-M-4030 complexes and is used in information retrieval systems, statistical data processing systems, finance systems, frame systems, operational accounting and planning systems, records control systems, ASUTP, experimental and test data acquisition and processing systems.

The system operates in real time and provides telecommunication access. Access to data banks, set up under the control of IRIS, is gained both in package, and in dialogue modes. The IRIS system enables a client to engage in exchange in a special language, close to natural. The system can be connected to a client program system, in which the programs are written in assembler M-4030, macroassembler SM EVM, FORTRAN and COBOL languages.

IRIS consists of three interacting components:

IRIS/BD is the heart of the system and manages the data bank at M-4030 (M-4030-1);

IRIS/TO provides telecommunication access to TsBD both through terminals connected to M-4030, and through SM EVM terminals;

IRIS/KM is a collection of programmable interfaces, which enable clients to work with TsBD at multicomputer M-4030 (M-4030-1)-SM EVM complexes.

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NUMERICAL ANALYSIS PROCEDURES PROGRAM PACKAGE (ChAP)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The program package is intended for expanding the applications of direct access disk storage systems of the SM-3 and SM-4 control computer complexes for solving numerical analysis problems and it can be used for automating technological processes and scientific experiments, for carrying out scientific-technical calculations and for constructing mathematical models of continuous and discrete processes.

The package is a library of program modules in FORTRAN-IV language, which enables the client to develop the package configuration necessary for solving specific problems. The package is an open system and can be expanded by the client as necessary.

The package functions under the control of disk storage systems of the SM-3 or SM-4 UVK [Control computer complex] with a FORTRAN-IV language translator. The package is delivered on eight perforated tapes with modules and two perforated tapes with check problems. The package includes 50 modules, about 26,000 words in instructions and about 480 pages of documentation.

ChAP consists of the following modules: modules for solving routine equations, modules for numerical integration of functions, modules for operations on polynomials and for finding the roots of polynomials, modules for computing special functions and modules for approximating and interpolating functions.

The modules of the package do not contain input-output data operations, which must be done by the client's programs, written in FORTRAN-IV language.

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'YeS EVM-UVK INFORMATION EXCHANGE' APPLIED PROGRAM PACKAGE (PPP YeSM)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The package is intended for controlling data exchange between data processors in YeS [Unified series] EVM and UVK [Control computer complex] of the M-6000, M-7000 and SM EVM types in control systems, built on the basis of inhomogeneous multicomputer complexes (primarily in industrial-technological ASU [automated control system]).

PPP YeSM performs input-output operations between YeS EVM and UVK; establishes, maintains and finishes communications between data processors, solving client problems in a multicomputer complex; it recodes data; it controls transit data; it solves YeS EVM client problems in real time; it performs autonomous and non-autonomous testing of communications lines; assembles traffic statistics.

The YeSM package is a collection of communications software, shared by the computers of an inhomogeneous multicomputer complex, capable of being adapted to a specific computer-to-computer exchange system. It controls communications in accordance with the following communications plans:

YeS EVM-SKA (A711-1/6)-UVK for a distance of up to 50 m through a program channel and KPDP [not further identified];

YeS EVM-SKA (A711-1/6)-ARS (A723-2)-MBPD (A721-1/1)-MBPD (A721-1/1)-UVK for a distance of up to 1 km;

YeS EVM-(RI-8901)-(APD-21S)-UVK for a distance of up to 10 km.

The communications drivers monitor client task requests for the completion of input-output operations, carry out the exchange procedure called for in the package, detect errors during the course of exchange, process them and advise client tasks about the result of the completion of requested operations.

The communications service tasks and subprograms in UVK perform indication of communications lines, monitoring of established connections, schedules data processing processes, controls transit messages, prints and corrects communications service tables in UVK and recodes symbolic information.

The communications control program (PUS) in YeS EVM is a message stream-oriented interface with a short time response between YeS EVM and UVK client tasks, which adapts the computer-to-computer traffic to a specific system, carries out the exchange procedure called for in the package, performs dynamic planning and organization of client task completion in real time, controls transit messages, organizes and processes message schedules in main memory, collects traffic statistics and performs nonautonomous testing of enabled connections.

The technical communications service program complex tests the performance of communications equipment with autonomous debugging and trouble-shooting.

The package software on the UVK end were developed in consideration of the requirements of OS RV [Operational real-time system], DOS RV [Operational real-time disk system] and DOS ASPO [not further identified] UVK, and on the YeS EVM end in consideration of requirements of OS YeS with a control program in the MVT and MFT modes with subtasks. The package software of UVK can be used for communications in YeS EVM directly for client tasks by means of the VTAM access method in the DOS YeS medium.

The functional capabilities of the package can be utilized in virtually all data processing systems, built on the basis of inhomogeneous multicomputer complexes.

PPP YeSM is a system that provides future expansion in the following directions:

development of task-oriented complexes, controlling immediate data processing and the computing process in a multicomputer complex;

control of communications in accordance with new communications plans: YeS EVM-MPD (YeS-8403)-MODEM (YeS-8010)-MODEM (YeS-8010)-ADS2 (A721)-UVK for a distance of up to 13,900 km; YeS EVM-SKA-ARS-(MSAPD-MPP)-(APD-MPP)-(APD-MPP)-(MSAPD-MPP)-UVK for a distance of up to 15 km;

development of unified control software for terminals and remote EVM in an inhomogeneous multicomputer complex.

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DATA TELEPROCESSING SYSTEM (STOD)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for controlling data transmission processes on communications lines, for servicing long-distance data processing systems, message concentrators and switches based on UVK [Control computer complex] SM-3 or SM-4 and for use in industrial research, scientific developments and control systems.

STOD is designed on the modular principle. The system gives the client the following capabilities: initialization of data transmission lines, reception and transmission of messages on communications lines, bufferization of messages, synchronization of message transmission, connection of systems subprograms to client program. The system comes in two models: one for autonomous operation and the other for operation under the control of DOS [Disk operations system].

STOD consists of the following basic modules: data teleprocessing monitor, subroutines for servicing terminals and input-output service subroutines.

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DISK DIALOGUE MULTICONSOLE SYSTEM FOR SOLVING INFORMATION PROBLEMS (DIAMS)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The system is intended for controlling data bases and for solving information-logic problems and for use in automated operational control systems, scientific research control systems, economic data processing systems and other systems, where there is a need for the acquisition, storage and processing of data in the mode of collective access to the bases of many clients with different, including remote terminals. DIAMS is used in SM EVM computer complexes, developed on the basis of the SM-4P or SM-3P processor with an arithmetic expander.

DIAMS is designed on the modular principle and provides the client with extensive capabilities: multiprogram problem solving; operation in the dialogue and program modes; development and management of an hierarchical tree structure on data base disks; ready access to a wide range of external systems, included in the nomenclature of SM EVM hardware; development, debugging and running of programs in high-level dialogue language; line data processing; simultaneous access to the data bases of many clients (up to 40) with different terminals (up to 48); authorization of access; protection of client programs and data; interaction between client tasks; generation of versions of the system for specific hardware configuration and for given functions; operational modification of systems configuration; diagnostic error monitoring.

DIAMS gives the client a high-level dialogue programming language, oriented toward variable-length line data processing, processing of numerical and logic information and logic variables. The system is delivered on disk carriers. The DIAMS operations system is located entirely in direct access memory and occupies a volume of 22 ro 48k bytes.

DIAMS consists of an operations system and an applied program package. The operations system consists of a dispatcher, input-output monitor, data base interpreter and supervisor. The applied program package contains systems programs necessary for the systems administrator, and library programs, accessible to all clients.

The minimum configuration of hardware used for DIAMS operation includes: SM-4P processor (or SM-3P with an arithmetic expander); 16K word direct access memory (here two clients can work simultaneously); a magnetic disk storage (with fixed

heads or of the cassette type), magnetic tape storage, timer, input-output perforated tape system, alphanumeric video terminal, alphanumeric printer.

The direct access memory can be expanded to 124K words for the SM-4P (this enables up to 40 clients to work and provides connection to up to 48 terminals) and up to 28K words for the SM-3P (up to 16 clients).

The system operates up to eight replaceable disks or disks with fixed heads, up to four magnetic tape storages; floppy disks, alphanumeric printers, etc.; up to 48 alphanumeric terminals. Data transmission equipment (up to four long-distance communications dispatchers) are used for connecting remote terminals.

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DISK OPERATIONS SYSTEM (DOS SM)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for developing, debugging and running programs in the package and dialogue modes. DOS SM is a general purpose operations system.

DOS SM is used in SM EVM computer complexes, built on the basis of SM-3P or SM-4P processors.

DOS SM provides the following capabilities in the dialogue and package modes: disk recording of systems and client's files using multilevel catalogues, copying, printing and protection of files; translation, composition and debugging of programs, written in FORTRAN-IV or macroassembler languages; editing of symbolic files; development of libraries of subject and load modules.

DOS SM is designed on the modular principle and contains packages of control and processing programs. DOS SM includes the following systems programs: monitor, FORTRAN-IV language translator, composer, librarian, debugger, editor, file operation program.

The minimum hardware configuration, used for DOS SM operation, consists of an SM-3P or SM-4P processor, 16K word OZU [Direct access memory], magnetic disk storage, perforated tape input-output system, alphanumeric printer, alphanumeric video terminal.

Accessory systems include: up to 28K word OZU, timer, magnetic disk storage, magnetic disk storage with fixed heads or of the cassette type, punch card input system, additional terminals, initial hardware loader.

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REAL-TIME DISK OPERATIONS SYSTEM (DOS RV)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for use in automated scientific research and planning-design systems and in data acquisition and analysis systems. DOS RV is used in SM EVM computer complexes, built on the basis of the SM-3P or SM-4P processor.

The basic features of DOS RV are: real-time operation in the multiprogram mode; priority dispatching in combination with time quantizing dispatching; offers capabilities for working with files developed under DOS control; capability of task loading from disk and perforated tape; restoration to operation after power failure; tasks can be included in the system during the generation of the system; work can be organized with additional external systems; it is independent of the input-output systems.

The tasks performed under DOS RV control can be written in assembler, macro-assembler or FORTRAN-IV language, expanded by real-time operations systems.

DOS RV includes a set of systems instructions, transmitted through the console terminal.

DOS RV offers the following capabilities: simultaneous completion of up to 127 tasks in real time; completion of a single background task; completion of tasks on four priority levels, initiation of tasks at the operator's command, programmed interrogation, interrupt by interrogation and from the timer; determination of the time it takes to complete a task on each priority level during the generation of a system.

DOS RV includes a set of control programs (perforated tape task loader, disk and perforated tape task loader), a set of service programs (editor, assembler, composer, debugger, a program for working with files) and systems programs.

The minimum hardware configuration used for operation of DOS RV includes an SM-3P or SM-4P processor, at least 16K word direct access storage system, console terminal, perforated tape input-output system, disk storage and global loader.

Additional systems include: up to 28K word direct access memory, alphabetic printer, magnetic disk storage with fixed heads, up to eight extra terminals.

Any client terminal during DOS RV system generation can be designed as a console or used for operator instruction input.

The DOS RV system offers the capability of working in a configuration with additional external standard and nonstandard systems by connecting the drivers of these systems to DOS RV during generation.

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DIALOGUE PROGRAMMING SYSTEM (DS SM)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for the development, debugging and running of client programs, written in FOKAL dialogue language, for automating scientific research, in scientific-technical and economic calculations and in education.

DS SM is intended for operation in the single-program mode in SM EVM computer complexes, built on the SM-3P or SM-4P processor.

DS SM enables a client to work in the dialogue and program modes. The system is delivered on perforated tape carrier. The maximum direct access memory volume is 4K words. The volume of memory occupied by the interpreter program is 2.8K words.

DS SM was developed as an input language interpreter program and performs the following functions: prepares client programs, debugs them (edits original text, prints out client error codes, controls the printing of the program text), loads client programs into OZU [Direct access memory] from perforated tape, prints them out on perforated tape or prints text, performs arithmetic operations on numbers, performs standard functions.

The minimum hardware configuration used for DS SM operation includes an SM-3P or SM-4P processor, at least 4K word OZU, perforated tape input-output system, alphanumeric video terminal based on the "Videoton-340" system.

The expanded peripheral hardware includes a printer with a "Konsul" keyboard and an alphanumeric serial printer.

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TEST-MONITOR OPERATIONS SYSTEM (TMOS)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for trouble-shooting in UVK [Control computer complex] SM-3 and SM-4 and for facilitating the repair process. The system also is intended for improving the effectiveness of the labor of the personnel who service computer complexes and is used for automatic testing of SM-3 and SM-4 computer complexes. The system combines the test systems of SM-3 and SM-4 into a single test-monitor system.

TMOS performs the following functions: organization of an archive of test programs and test documents; callout and running of test programs; correction of test programs; development, printout and correction of test files; automatic starting of chains of test programs; duplication of carrier of test-monitor system; generation of a version of the test-monitor system. TMOS is delivered on disk carrier.

TMOS includes the following program components: monitor, correction and generation programs, text editor.

The hardware configuration used for TMOS operation consists of an SM-3P or SM-4P processor; 8K word OZU [Direct access memory]; perforated tape input-output system; alphanumeric terminal.

The expanded peripheral system includes an up to 28K word OZU; alphanumeric printer and IZOT 1370-12I magnetic disk storage.

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TIME RESOURCE SHARING DISK OPERATIONS SYSTEM (DOS RVR)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The system is intended for aiding the functioning of SM-4 computer complexes in scientific research control systems, in operational control systems, for solving scientific and engineering problems and in education. The time sharing disk operations system (DOS RVR) is a general purpose operations system. DOS RVR is used in computer complexes, built on the basis of the SM-4P processor.

DOS RVR uses the BASIC-PLUS programming language. The system prepares, debugs and runs programs and generates specific versions of the system. The system services up to 24 clients in the dialogue mode and utilizes a wide range of SM EVM external systems in the time sharing mode. DOS RVR provides the client an opportunity to expand its functions and to protect data by file duplication. The system is built on the modular principle, and nonresident parts of the monitor are dynamically placed in operational memory, and overlapping is used for systems programs; distribution of processor time, of operational memory and of external systems among tasks is dynamic.

DOS RVR contains the following software systems: monitor, executive program, planner, file operation programs, external systems service program, interpreter, generation and initialization systems, servicing programs.

The system functions with the following minimum collection of hardware: SM-4P processor, console terminal, 32K word operational memory, external memory systems on industrial tape, two external memory systems on magnetic cassette disks.

The system supports the functioning of the following additional systems: up to 124K word operational memory, punch card reader, perforated tape input-output system, extra console terminals (up to 24), external magnetic tape cassette memory systems, data transmission equipment, external industrial magnetic tape memory, up to eight magnetic cassette disk external memory systems, up to four magnetic disk external memory systems with fixed heads and floppy disks.

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REAL-TIME OPERATIONS SYSTEM (OS RV)

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The system is intended for solving a wide range of control problems in real time, from small systems for laboratory research to multiclient processing and control systems. OS RV is used in SM EVM computer complexes, built on the basis of the SM-3P or SM-4P processor.

OS RV operates in the real-time multiprogram mode and systems resources are shared on a priority basis. The system solves both real-time problems and background problems. OS RV serves many terminals, and any client terminal can be used as a command terminal. Disks are used for maintaining systems files and as the basic data carrier. This facilitates the development of a general file system, temporary outloading of tasks, operational memory, speedy task initiation and operation with overlaps. Task loading into memory, temporary outloading onto a disk during execution are done in one access to the disk, which increases the speed of the system. Tasks for OS RV are programmed in macroassembler and FORTRAN-IV languages.

OS RV includes the following programs: control program, dialogue and package editor, FORTRAN-IV and macroassembler language translators, composer, debugger, librarian, file operation programs and systems generation program.

The minimum hardware configuration used for OS RV operation includes an SM-4P or SM-3P central processor, alphanumeric video terminal, initial systems loader, operational storage system (16K words or 24K words, depending on the type of processor), cassette disk, timer.

Additional equipment includes: arithmetic expander, floating arithmetic equipment, memory dispatcher.

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APPLICATIONS

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IMPROVEMENT OF MANAGEMENT OF KUNTSEVSKIY RAYON OF MOSCOW ON THE BASIS OF 'RAIS-KUNTSEVSKIY RAYON'

Moscow SREDSTVA YES EVM I SM EVM IN IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The main purpose of the development of "RAIS-Kuntsevskiy Rayon" is improvement of rayon management on the basis of the application of economical-mathematical methods and computer technology, aimed at improvement of social services in the territory as an integral community of the largest city.

"RAIS-Kuntsevskiy Rayon" is being adopted in Moscow's Kuntsevskiy Rayon, which occupies an area of 4,500 ha and has a population of more than 330,000. The housing fund of the rayon is about 5 million square meters. The rayon has 46 general education schools, more than 120 kindergartens and daycare centers, 8 hospitals and 10 polyclinics, 12 movie theaters and culture halls, more than 100 libraries, 101 bookstores, 152 public restaurants and 154 social service enterprises. The rayon spends more than 30 million rubles annually on services for the population from the rayon budget alone. The ray ispolkom [executive committee] solves more than 8,000 problems during the year for operational management.

The "RAIS-Kuntsevskiy Rayon" system (see the figure [not reproduced]) consists of 12 subsystems, which perform 55 tasks, including 16 optimization and balance and 11 logic information tasks. The total number of tasks (numerator) and number of priority problems (denominator) are parenthesized in the figure.

The system will be adopted in two stages.

The first stage includes five subsystems (25 tasks): subsystem for comprehensive planning and management of the socioeconomic development of the rayon (one problem is solved, in which the attainable level of rayon public services is taken into consideration and analyzed); rayon economic planning and management subsystem (six accounting-analytical problems are solved for assessing the completion of the rayon plan on construction, organization of social services, scrap metal collection, byproduct raw materials collection, garbage collection and accounting of the results of social competition); housing fund subsystem (this subsystem solves 11 information retrieval problems on accounting, registration, processing and transmittal of answers to questions about the rayon housing fund, apartment rental and tenants); highway construction and organization of social and public services subsystem (two analytical-accounting problems are solved); commerce subsystem (five analytical-accounting problems are solved).

The second stage includes seven subsystems (21 problems and 9 new problems in the subsystems of the first stage): operational management and control subsystem (five problems); rayon budget planning and management subsystem (three problems); "Census" subsystem (two problems); national education subsystem (three problems); health subsystem (three problems); culture subsystem (one problem); construction subsystem (four problems).

The total volume of information to be transmitted is $4.5 \cdot 10^7$ characters. The daily volume is $1.77 \cdot 10^5$ characters. The peak daily volume is $15.67 \cdot 10^5$ characters.

The "RAIS-Kuntsevskiy Rayon" software consists of a set of program components, several DOS/YeS [Disk operations system/Unified series] control and service programs and PL/1 language translator.

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ASUTP WIDE-FLANGE BEAM ROLLING MILL

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 2 pp

[Text] The automation of the wide-beam rolling complex embraces all basic technological sections: in the blooming mill -- the soaking pit sections (ONK), "1500" stands, hot guillotines (NGR); on the general purpose roller mill (UBS) -- continuous furnace sections, "1300" stands, main general purpose stands (GUK), hot and cold saws.

ASUTP has a nonhierarchical structure with high-level information-control computer complexes (IUK) and automated local program-logic decentralized control systems (ASPU, LSA), data input and display systems (SVPI) for operating technologists (OT), a set of primary technological information transducers (KD), final control mechanisms (IM), automatic drive control systems (SAUP), and low-level data conversion and transmission systems (SPPI).

ASUTP of the "1500" blooming mill performs the following functions:

ingot heating control in soaking pits (heating IUK-ONK and LSA);

control of ingot buggy and conveyance of metal on roller tables along working line of blooming mill;

programmed control of ingot upsetting in "1500" mill during reverse rolling (IUK-RO and ASPU-NM);

measurement of length of blooms and billets, calculation and implementation of effective cutout plans (IUK-R1), control of supportless stopping of blooms for cutting and hot guillotines (ASOR);

control of marking and billet packaging.

ASUTP UBS performs the following functions:

control of billet heating (heating IUK NZ and LSA) in continuous furnaces (MP), conveyance of billets to furnaces, loading of billets with a given step, delivery into furnaces, removal and delivery of billets to stand section at a given rate (ASU MUP);

control of the clamps of the "1300" reducing stand (ASPU-"1300") and control of the main GUK-1, GUK-2, GUK-3 general purpose stands and VK1, VK2 auxiliary stands, including synchronization of GUK1, VK1 and GUK2, VK1 stand speeds; control of roller tables of section and stopping of hydraulic descaler, acquisition and processing of technological information necessary for completion of the technological rolling process and equipment (IUK-UK, ASPU-UK);

measurement of strip length after rolling in general purpose stands, calculation of effective cutout plan (IUK-R2); control of moving saws in accordance with the cutout plan and correction in accordance with metal temperature (ASPP); control of supportless stopping of strip for cutting (ASOP), delivery of saws, feedout of cut beams, marking and delivery to cooler section (Kh1, Kh2);

control of conveyance of beams and stopping in front of six cooler sections in accordance with a given loading plan; delivery of beams into collecting zone, beam edging, positioning of beam at a given distance apart; conveyance of packages of beams in cooling zone (SAUKh).

ASUTP includes: about 500 converters for 20 different kinds of primary technological data (photographic relay, code, pulse, radio isotopic position sensors, rolling force meters, length of rolled stock, speeds, accelerations of electric drives, statistical rolling moment, etc.); about 200 specialized systems of 50 different kinds (logic programmable systems, consoles, displays etc.); 6 control computer complexes of the SM-1, SM-2 types.

ASUTP performs the following functions: in the blooming mill -- shortening of the ingot cycle by 3-5%, reduction of the rolling cycle time by 2%, reduction of rolling wastes by 1% due to efficient cutout; at UBS -- increase of furnace productivity by 20% and of stand productivity by 20-25%, reduction of cutout and cutting wastes by 1%, etc.

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MULTIMACHINE AUTOMATED COMPLEX

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The complex is intended for automating scientific research in nuclear physics, high-energy physics, solid state physics and radio biology and performs the following tasks:

control of experiments in real time and compression of experimental data;

acquisition, storage and operational processing of data from several concurrent experiments;

provides the researcher with remote access (through subscriber terminals) to control of data set and selection and adjustment of processing programs, included in specialized libraries;

performs operational work with data archives, developed by the system;

organizes the transmission of arrays of experimental data to the main computer complex for final processing.

The complex has a hierarchical structure and consists of several multimachine laboratory subsystems with a high degree of autonomy, oriented at implementation of the collective utilization of base computers. All subsystems are connected through a concentrator computer to the main computer complex. Each subsystem includes meter stations (IS) and exchange terminals. A typical IS consists of a small computer, KAMAK electronics and data display systems. Computers of the YeS [Unified series] series are used in the subsystems as base computer systems. The distance between different levels of the hierarchical network ranges from 10 m to 2 km. Data exchange speed between computers is 20-50K bytes/s. Computers are connected by cross-pair telephone cables, utilizing the channel-channel, KAMAK-KAMAK and KAMAK-channel principles.

The software of the base computers of all subsystems of the complex is developed on the basis of the same structural and functional principles: program systems are organized as a group of interacting programs, stored in different program sections. A high priority section contains a control program, consisting of a telecommunications subsystem, which implements a format of exchange with remote computers and terminals; magnetic tape and disk access control subsystem; client instruction

translator; processing control subsystem, which generates requests to start client programs; statistics acquisition subsystem. Fast data processing is performed in program sections, each of which can be used both by a monopoly and by a group of clients, depending on relative priorities. Each processing section has monitor, which provides connection to the control program, loads client programs and interprets requests from programs for data exchange with magnetic tapes, disks and peripheral computers. The base computer software offers storage of data on tape and of arrays of data on disks with automatic processing program starting and creates data archives on disks and performs operational starting of fast processing programs.

The IS software includes a collection of control programs, data acquisition and primary processing programs and experiment control programs.

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'MAYAK-1' TEST-COMPUTER STATION

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 1 p

[Text] The "Mayak-1" test-computer station is a part of the multimachine automated complex, developed at LIYaF [Leningrad Institute of Nuclear Physics] imeni B. P. Konstantinov of the USSR Academy of Sciences. The station is built on the base of the IVK-1 complex and is intended for solving problems in experimental low- and moderate-energy nuclear physics. "Mayak-1" is a combination of software and hardware systems that perform precision multichannel amplitude analysis of signals arriving from nuclear radiation detectors.

Makeup of station: IVK-1 base set, special purpose functional modules and physical information display system (raster display). The nomenclature of special purpose functional modules includes a spectrometric amplifier, two discriminator-analyzers, analog processor for analyzing and sampling analyzed signals and for normalizing or converting input signals, "time-code" converters, "code-voltage" converters, comparators for comparing codes in two selected zones with the code of the crate data trunk. The comparator is used in the spectrometer channel stabilization system and along with the "code-voltage" converter performs the functions of a meter. The "time-code" converter, along with an analog processor, comprises ATsP [Analog-digital converter]. All modules feature programmable parameter control. The raster display is built on KAMAK module and industrial TV electronics. There is a set of control commands: light up a point, take away a point, shift italics, etc.

Specifications

165.10 Spectrometric Amplifier

Generation time constant, μs	0.25-7.5
Gain	2-2,048
Integral nonlinearity	$\pm 0.5 \cdot 10^{-4}$

17.02 Discriminators-Analyzers

	1st	2nd
Input signal, V	0-2.5	0-5
Discrimination threshold, mV	25	50
Output voltage	25 mV + U = 1/2U	50 mV + U = U

161.05 "Time-Code" Converter

Word length	16
Filling frequency, MHz	100

L 840 Raster Display

Text format	32 64-character lines
Graphics format, dots	128 × 128
Symbol set, characters	96 (KOI-7)

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INDUSTRIAL COMMUNICATIONS SYSTEMS FOR SM-3 AND SM-4 CONTROL COMPUTER COMPLEXES

Moscow SREDSTVA YES EVM I SM EVM I IKH PRIMENENIYE [YeS EVM and SM EVM Systems and Their Application] in Russian 1979, 4 pp

[Text] The systems are intended for analog and digital input-output and signal normalization. They normalize signals from resistive thermometers, correct the cold solder temperature of thermocouples, perform analog signal input, switching and analog-digital conversion, digital, initiative and pulse signal input, pulse, digital and analog signal output, autonomous initiative channel address retrieval, data exchange with a processor through a "common line" interface.

The industrial communications systems feature a unified hardware base with the SM-3 and SM-4 UVK [Control computer complex], providing unified principles of the construction of task-oriented and specialized control complexes; extensive nomenclature of analog and digital input signals; guaranteed metrological characteristics through the entire analog input metering channel; high noise immunity of the analog and digital input channel; large volume of test and client software.

The industrial communications systems include an analog input system (UVA), digital input-output system (UVD) and external normalization unit (BVN).

Analog Input Signal System (UVA)

UVA is used in SM-3 and SM-4 computer complexes. It is intended for the input and conversion to parallel 12-digit binary code of DC voltages in the following ranges: -10...0...+10 mV; -20...0...+20 mV; 0...35 mV; -50...0...+50 mV; -100...0...+ 100 mV; -1...0...+1 V; -5...0...+5 V; of direct currents in the -5...0...+5 mA range.

Depending on the utilization of the "common line" interface connecting equipment (there is or is not a BKI-AV interface unit) and on how the UVA metering channel is controlled (there is or is not a BKU-AV control unit), and also on the utilization of a contact or contactless switch, there are six models of UVA: UVA0-UVA1 -- the basic modifications (with contact and with contactless switches, respectively), which have an interface unit for connection to a processor; UVA2-UVA3 -- modifications for expanding the number of input channels (UVA4-UVA5 -- in one rack, UVA2-UVA3 -- with racks).

A structural diagram of UVA is presented in Figure 1.

UVA is structurally housed in self-contained building blocks. Each UVA modification has 64 input channels.

Specifications

Input error, %	
voltage in ranges:	
-10...0...+ 10 mV; 0...10 mV	±0.6
-20...0...+20 mV; 0...20 mV	±0.5
-35...0...+35 mV; 0...35 mV	±0.5
-50...0...+50 mV; 0...50 mV	±0.5
-100...0...+100 mV; 0...100 mV	±0.4
-1...0...+1 V; 0...1 V	±0.25
-5...0...+5 V; 0...5 V	±0.25
current in ranges:	
-5...0...+5 mA; 0...5 mA	±0.25
Input channel interrogation speed, channel/s:	
with relay switch	200
with contactless switch:	
for up to 100 mV signals	up to 2,000
for 1 and 5 V, 5 mA signals	up to 6,000
Interference suppression coefficient, dB:	
normal interference on 50 Hz	60
general interference with unbalanced 1 kΩ impedance on direct current and 50 Hz alternating current:	
for up to 100 mV signals	not less than 100
for 1 and 5 V, 5 mA signals	not less than 60
AC main power:	
voltage, V	220^{+22}_{-33}
frequency, Hz	50 ± 1
Input power, V·A	not more than 300
Ambient temperature, °C	5-40
Relative humidity, %	up to 90 (at 30°C)
Atmospheric pressure, mm Hg st.	630-800
General dimensions, mm:	
UVA0-UVA3	483 × 356 × 650
UVA4-UVA5	483 × 267 × 650

Digital Input-Output System (UVD)

UVD is intended for receiving signals from digital transducers and for output of digital and analog control signals to different mechanisms and terminals.

By using the system in conjunction with SM-3, SM-4 control computer complexes and with other computers that utilize the "common line" interface it is possible to build highly productive input-output systems, used for controlling technological processes and for automating scientific research. By selecting the right version of the system and by connecting together up to 12 UVD systems of different variations with the output of just one of them to the "common line" interface it is possible to build a system that meets the client's needs.

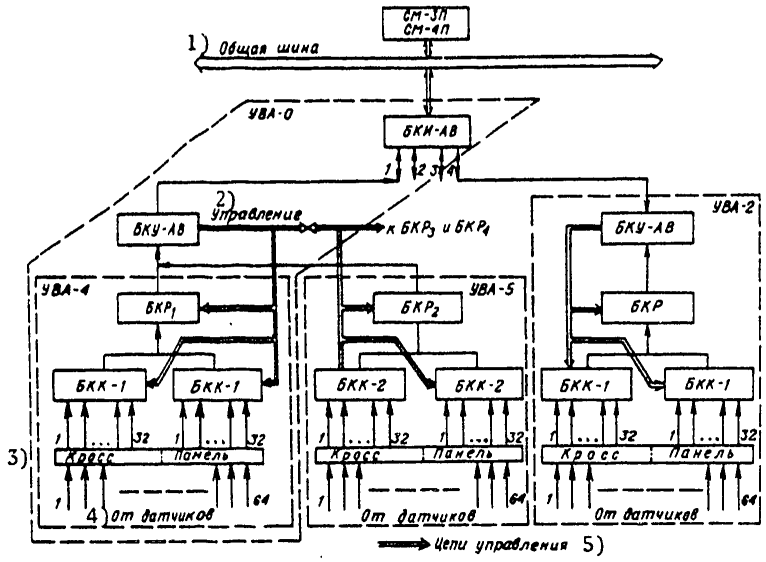

Figure 1. Structural diagram of UVA: БНИ-АВ -- cassette interface unit; БНУ-АВ -- cassette control unit; БНР-АВ -- cassette amplifier unit; БНК-1 -- cassette contact switch unit; БНК-2 -- cassette contactless switch unit.

KEY: 1. Common line
2. Control
3. Cross panel
4. From transducers
5. Control circuits

The UVD comes in 12 models, depending on whether or not there is an interface unit, and also on the makeup of the functional modules.

UVD is designed as a self-contained building block and is installed in a standard SM EVM rack.

A structural diagram of an input-output system based on UVD is presented in Figure 2.

Specifications

Maximum number of channels in self-contained unit:	
digital input	256
initiative signal input	128
input-output	16
digital output	256
analog output	16
Type of signal:	
digital input	two-position positive or negative polarity

initiative signal input	two-position initiative positive or negative polarity
Input signal level, V:	
logic "0"	0...1.2; 0...2.4; 0...4.8; 0...9.6
logic "1"	6 + 1.2; 12 ± 2.4; 24 ± 4.8; 48 ± 9.6
Maximum general interference during input of digital and initiative signals, V	100
Input pulse frequency, kHz	not more than 15
Pulse duration:	
input, μs	not less than 10
output	50 μs-1 ms
Output signal range	0...5 V; 0...5; 0...10; 0...20 mA
Nonlinearity, %	not more than 0.2
Pulsation of output signal, %	not more than 0.1
Maximum output voltage, V	48
Maximum output current, A	0.2
Counter capacity, bits	16
Load impedance, kΩ:	
for voltage	not more than 1.5
for current in ranges:	
0...5 mA	1
0...10 mA	0.5
0...20 mA	0.25
Output signal transient time, ms	not more than 1
Ambient temperature, °C	5-40
Relative humidity, %	up to 90 (at 30°C)
Atmospheric pressure, mm Hg	630-800
General dimensions, mm	483 × 400 × 650

Software

The UVA and UVD software is delivered along with the systems and contains:

UVA "Metrologiya" program, which utilizes statistical techniques for analyzing metrologic characteristics on each metering channel;

measured parameter comparison program with settings;

parameter averaging program;

program for linearizing the nonlinear characteristics of transducers and for scaling;

"UVA Driver" program;

"UVD Controller Test" program;

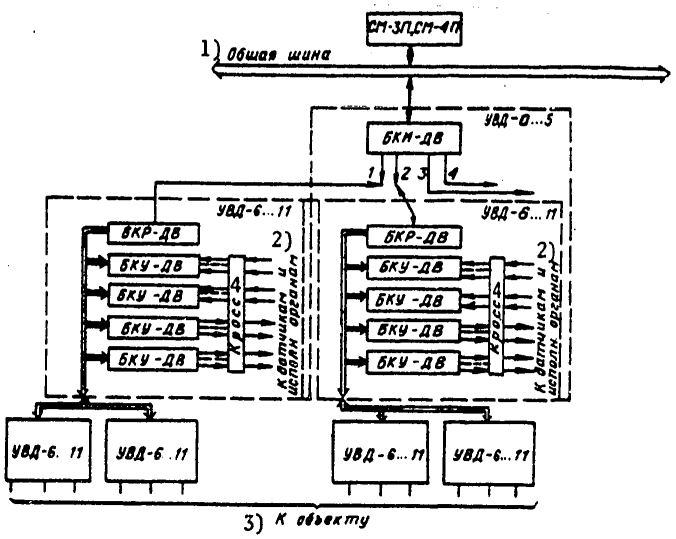

Figure 2. Structural diagram of input-output system based on UVD: БНИ-ДВ -- cassette interface unit; БНР-ДВ -- interface expansion unit; БНУ-ДВ -- cassette control unit for four work positions for functional modules.
KEY: 1. Common line
2. To transducers and controls
3. To facility
4. Cross
[УВД=UVD]

"UVD Module Test" program;

"UVD Driver" program.

External Normalization Unit (BNV)

It is intended for normalizing the signals from resistive thermometers, for automatic compensation of the thermal emf of the loose ends of thermionic thermometers due to the difference of the temperature of the loose ends from 0°C; shifting of the entire range of chromel-copel thermionic thermometer output signals if they have negative values, into the positive range of values; conversion from individual cables, carrying signals from thermionic thermometers and resistive thermometers, to a common (group) cable.

The BNV units are installed at places where transducers are concentrated.

Specifications

Basic tolerable error of compensation of thermal emf of loose ends of thermionic thermometers, mV:

for KhK and KhA	not more than $\pm(1.1 + 6.0\ 10^{-3}t)$
for PP, VR5	not more than $\pm(1.8 + 6.0\ 10^{-3}t)$*
Error of reduction of signals of resistive thermometers with standard graduations to 0-35 mV DC range, %	not more than ±0.25
Connecting line between BNV and resistive thermometers	three-wire
Maximum cross section of wires of inserted cables, mm^2	2.5
Power dissipated in resistive thermometer, connected to BNV, mW	not more than 2.5
Line connecting BNV with thermionic thermometers	two-wire
Range of output normalized signal of resistive thermometers, mV	0-35
Maximum number of transducers connected to one BNV	16
AC main power:	
voltage, V	$220\ ^{+\ 22}_{-\ 33}$
frequency, Hz	50 ± 1
Input power, V·A	not more than 50
General dimensions, mm	456 × 465 × 220
Weight, kg	not more than 11

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*t is the temperature of the air (°C) surrounding the loose ends of thermionic thermometers.

END