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USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

(FOUO 8/81)

Excerpts from the Journal 'COMPUTER TECHNOLOGY OF THE SOCIALIST COUNTRIES'

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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FOREIGN BROADCAST INFORMATION SERVICE
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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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EXCERPTS FROM THE JOURNAL 'COMPUTER TECHNOLOGY OF THE SOCIALIST COUNTRIES'

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN in Russian
No 7, 1980

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COMPUTER TECHNOLOGY OF THE SOCIALIST COUNTRIES

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN. SBORNIK STATEY, VYPUSK 7 (Computer Technology of the Socialist Countries, Collection of Articles, Issue No 7) in Russian 1980 signed to press 6 Mar 80 pp 2-4, 152

[Annotation, foreword and table of contents from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] This international collection discusses questions about the investigation, development, application and use of computer facilities created in accordance with the agreement on collaboration in the area of computer technology between Bulgaria Hungary, the GDR, Poland, Cuba, Rumania, the USSR and the CSSR.

Questions of the operation and servicing of computers are examined in the articles in the book.

The collection is addressed to workers engaged in the development and use of YeS computer facilities in various sectors of the national economy.

Foreword

The effective use of the possiblities of computer facilities is determined to a great degree by the organization of their operation and servicing. The organization of centralized servicing of technology developed in collaboration has always been an object of attention of the Intergovernment Commission. With growth of the computer pool in the countries and the development of specialization and cooperation of the countries, questions regarding servicing became an independent direction of work and the Council for Complex Servicing was organized as a new working organ of the Commission.

By complex servicing is understood all the activity involved in the installation, technical servicing and maintenance of computers, the maintenance of programs and also the planning of computer centers, the instruction of personnel in operations and servicing, with the development and production of service and auxiliary equipment, etc.

In the countries participating in the Agreement sufficient experience has already been accumulated in the organization of complex centralized servicing, and the

exchange of that experience is very important for specialists in that area. It is understandable that all questions regarding complex specialized servicing greatly concern the users of computers.

Taking this into account, the editorial board considered it possible in the present issue to expand the section in which materials on complex servicing are published and to start the publication of articles discussing collaboration of the countries in that area.

In the remaining sections of the collection are published, as usual, articles on new computer facilities, the application of computers in control systems and questions about software.

The editorial board of the collection includes: Me. Rakovskiy, editor-in-chief (Intergovernmental Commission Coordination Center), N. V. Gorshkov (Council on Complex Servicing of YeS Computers), H. Choppe (GDR), Ye. N. Mel'nikova, responsible secretary (Intergovernmental Commission Coordination Center), B. N. Naumov (Council of Chief Designers of SM Computers), L. Nemet (Hungarian People's Republic), P. Popov (People's Republic of Bulgaria), V. V. Przhiyalkovskiy (Council of Chief Designers of YeS Computers), Yu. P. Selivanov, responsible editor (USSR), A. Ye. Fateyev (USSR), N. I. Cheshenko (Council on Application of Computer Facilities), B. Sova (CSSR) and K. Stuka (Hungarian People's Republic).

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COMPLEX SERVICING--A GUARANTEE OF EFFECTIVE USE OF COMPUTER FACILITIES

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN. SBORNIK STATEY. VYPUSK 7 (Computer Technology of the Socialist Countries. Collection of Articles. Issue No 7) in Russian 1980 signed to press 6 Mar 80 pp 5-9

[Article by R. I. Goronov, engineer (USSR) and M. Kuba, engineer (CSSR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Excerpts] Computer facilities require unique services, different from the traditional services adopted for the product of general machine building.

From the very start of its activity the Intergovernmental Commission, understanding that the creation and use of computer technology is a unified process, has devoted special attention to the complex servicing of those facilities. For this purpose, in 1969 provisions were made within the framework of the Council of Chief Designers of YeS Computers for the formation of the Council of Specialists No 10 of the Council of Chief Designers of YeS Computers (SS-10) on questions of collaboration in the area of complex servicing (in spite of the fact that the computer facilities were still just starting to be developed at that time).

The dynamics of change of indicators of the working reliability of YeS computer facilities in operation in countries participating in the agreement have shown in the past 2 years that the operating time of the main computer equipment has considerably increased: since 1978, by 50 percent for the YeS-2000 processor and by more than 50-100 percent for the YeS-2021, YeS-2030 and YeS-2640 processors. That indicator has also been considerably improved for such devices as the YeS-5052 and YeS-5061 magnetic disk stores, the YeS-5017 (GDR) and YeS-5012 (BPR) magnetic tape stores, the YeS-6012 (USSR) and YeS-6016 (CSSR) punched tape input devices, the YeS-7031 (GDR), YeS-7031 (USSR), YeS-7033 (PRR) alphanumeric printers, etc.

At the "Robotron" combine in the GDR there is a center for training instructors and specialists in the operation and servicing of YeS and SM computer facilities. There is a hotel at the center. The training center receives technical facilities in time from the first industrial series for the advance preparation of specialists and instructors. There are 200 instructors on the staff of the training center who systematically develop the necessary training aids, for which purpose they are sent for 6-10 months to the organizations which develop new YeS and SM computer hardware and software.

Similar training centers have also been created in other countries participating in the agreement. The construction of a training center and a hotel for students

has been completed in Minsk (USSR). Construction of a methodical training center in Moscow is continuing. A Bulgarian center is in operation; the erection of a training and hotel complex for it has been started in Sofia. In Hungary, with UNESCO participation the SAMOK training center has been created; at it specialists are being trained in the area of computer technology both for countries participating in the agreement and for developing countries.

At the present time preparations are being made for the organization of complex servicing of new YeS computer facilities--the Ryad-2 and mini-computer systems of the first line, in particular, the training of instructors and specialists in the operation and servicing of those facilities has been started.

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STATE OF THE ART AND PROSPECTS OF DEVELOPMENT OF COMPLEX SERVICING OF COMPUTER FACILITIES (YeS COMPUTERS) IN THE USSR

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN. SBORNIK STATEY. VYPUSK 7 (Computer Technology of the Socialist Countries. Collection of Articles. Issue No 7 in Russian 1980 signed to press 6 Mar 80 pp 9-15

[Article by L. N. Il'in, candidate of technical sciences, and G. V. Bakhmurov, engineer (USSR),from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] The complex servicing of computer hardware and software includes an extensive list of services: from installation and introduction into operation to the centralized servicing of computer technology and shared multicomputer centers.

We will present a consolidated list of the services being performed in the Soviet Union for the computer centers of users by specialized complex servicing enterprises:

--the installation, introduction into operation and warranty repair of equipment, computers and computer complexes;

--centralized servicing of computer facilities (regulatory work, scheduled and preventive maintenance, repairs upon call, emergency repairs, centralized repair of units and devices, modifications of devices according to documentation of the chief designers, etc;

--deliveries, introduction into operation, generation and accompaniment of new versions of operating systems (operating systems and disk operating systems);

--deliveries, introduction into operation, generation and accompaniment of packages of applied programs;

--planning of computer technology and attachment of standard modules of arrangement of computer hardware;

--creation of a national fund of algorithms and programs and networks of regional funds of algorithms and programs and their accompaniment;

--creation of a network of consultation points at regional servicing centers in cities of the country;

--training and retraining of specialists for work with computer hardware and software in specialized training centers;

--interaction with national organizations on the technical servicing of the socialist countries.

To render those services an all-union association has been formed which includes the following main subsections:

--a special scientific-production association which consists of scientific-production and training centers;

--production associations which include specialized territorial administrations;

--specialized territorial administrations which include regional servicing centers and repair and restoration production facilities;

--regional servicing centers which consist of production service laboratories and technical servicing points;

--a specialized administration for the delivery and making up complete sets of spare parts;

--a plant for the manufacture of computer center auxiliary equipment;

--a production publishing combine.

The development of the scientific principles of a complex servicing system, the training and retraining of specialists of users and the manufacture of experimental models of service equipment for complex servicing have been entrusted to the scientific-production association.

Let us dwell in greater detail on each complex of services enumerated above from the point of view of their effectiveness for users in the given state of development of complex servicing. Production associations are successfully coping with the installation, introduction into operation and warranty repairs of computers of the YeS system. Practically all YeS computers are being introduced into operation by regional servicing centers, and this has permitted manufacturing plants to release skilled specialists and use them in the stand debugging of hardware.

The main problems in the introduction of YeS computers into operation are:

--the equipping of regional servicing centers with diagnostic and special hardware and software to curtail the periods required for the introduction of computers into operation;

--the creation of stocks of spare parts, tools and accessories;

--the wide introduction of specialized tools.

During the centralized servicing of computer facilities three categories of servicing are envisaged:

Category 1, complete servicing, is provided for computers within the city limits; it envisages the performance of schedules preventive maintenance in complete volume and the performance of repairs on call;

Category 2, partial servicing, is provided for computers up to 100 km distant from the servicing center; it envisages the performance of scheduled preventive maintenance in a volume of monthly work and the performance of repairs on call and emergency repairs;

Category 3, servicing on call, is provided for computers more than 100 km from the servicing center; it envisages the performance of emergency repairs in volumes and periods agreed upon with the user.

Emergency repairs during complete servicing start after work on call has been done that is, after 3.5 hours, and are done by a team or specialists with higher qualifications than specialists on scheduled preventive maintenance.

The introduction of three servicing categories is explained by the fact that at each regional servicing center there is a large zone of activity. Since YeS computers are preferentially concentrated in cities, the computer centers of users are mainly covered by complete servicing (about 85 percent).

About half the computers of the YeS system have been transferred to centralized servicing. The main positive results of that transition are:

--increase of the daily working time of computers;

--decrease of the numbers of computer center operating personnel;

--centralized suppying of spare parts;

--centralized repair of standard replacement units, power units, fans, typewriters, etc.

A very important type of service of complex servicing is supplying users with new versions of operating systems. At the present time the delivery, introduction into operation, generation and accompaniment of YeS disk operating systems (DOS) and operating systems (OS) have been completely entrusted to service enterprises. Those enterprises deliver new versions of OS and DOS for all newly produced YeS computers and, in addition, the versions DOS 2.2 and OS 4.1 for YeS computers installed earlier. It is planned to sharply increase the output of YeS computer complexes to completely satisfy the needs of the user for basic software.

Service organizations accomplish the introduction of YeS DOS and OS into operation and the generation of a specific variant of the YeS DOS and OS for a specific configuration of the user's computer hardware.

The YeS DOS and OS are accompanied according to agreement with the user for 1-5 years during the functioning of a given OS and DOS version. During that period the following work is done:

--consultations are held with users on the use of OS and DOS, including new versions;

--changes are introduced into the documentation and machine OS and DOS carriers.

The following services complex of service organizations is the delivery, introduction into operation, generation and accompaniment of packages of applied programs (PPP's). Their centralized delivery is accomplished according to agreements with users. Starting in 1980 a set of PPP's will accompany each newly produced computer.

Each user has the right to select any PPP's from the set and obtain them with the computer.

According to the standards the PPP's are to be introduced during a period of 7-15 days, depending on the complexity of introduction of the PPP's. The generation of PPP's is still not being accomplished for all packages. PPP's are accompanied for 1-5 years in accordance with separate agreements with the users.

Also an important services complex are the delivery and attachment of standard documentation on the disposition of YeS computer hardware of a specific configuration on the grounds of the purchaser and the selection of the computer center interior and equipment. The documentation is delivered to users in the form of standard modules (the disposition of computer hardware in the machine room, the data preparation room, in the operators' and programmers' rooms, etc).

It is planned in 1979-1980 to create on the basis of the sector fund of algorithms and programs a national fund of algorithms and programs for the YeS computers. Its functions are:

--interaction with national funds of the socialist countries;

--leadership and coordination of the activity of regional funds in this country;

--interaction with sector funds of ministries;

--transmission of standard algorithms and programs to the USSR state fund.

At the present time a network of regional funds is being developed, the duties of which will include:

--supplying users of a region (a republic, several oblasts or an oblast) with operating systems and packages of applied programs available in the sector fund;

--consulting with users on questions of YeS computer software;

--bringing to industrial production new versions of operating systems, documentation and machine carriers of packages of applied programs.

Groups for coordination fo work with users have been formed at each regional center. The group is headed by the chief engineer of the center. There is consultation monthly on questions of:

--computer center planning;

--the introduction of computer hardware into operation;

--centralized servicing of hardware;

--the introduction, generation and accompaniment of YeS computer software.

Monthly or quarterly conferences are held with users on problems of the quality of servicing of hardware and the accompaniment of software.

One urgent question of complex servicing and the effective use of computer technology is the instruction and improvement of the qualifications of users and specialists of regional servicing centers. The main directions of instruction and the improvement of qualification of specialists are:

--the operation of hardware (for engineers, technological engineers and operators);

--the operation of basic software (for system programmers);

--the development and debugging of applied programs (for applied programmers).

The principal merits of the centralized training of specialist users of the YeS computer system are:

--a ramified network of training centers (planned in 15-18 cities of the country);

--introduction of interactive systems of instruction and of the latest technical devices of the type of trainers, magnetic video recorders, etc;

--a "stepwise" system for raising the qualification of specialists of users.

The demands of users for training still are not being completely satisfied. It is planned in the Eleventh Five-Year Plan, with the introduction of new training centers, to sharply increase the number of persons trained.

Side by side with the class system of instruction a system of correspondence and extramural instruction is being introduced, one intended for specialists of remote computer centers. Students pursue theoretical studies independently (teaching aids are being developed for that) and practical courses are held in the training centers.

Teachers and instructors of complex servicing are taught in the training centers. Those from the socialist countries are taught under contracts.

Special attention is given to the preparation of specialists in complex servicing with the following specializations:

--the introduction and servicing of computer facilities;

--the introduction, generation and accompaniment of operating systems;

--the introduction, generation and accompaniment of packages of applied programs;

--standard disposition of computer hardware (since 1980);

--economic principles of complex servicing;

--organization of funds of algorithms and programs (since 1980);

--organization of complex servicing.

To improve the centralized servicing of Soviet computer technology it is necessary to develop interaction with national organizations for complex servicing, as that will permit introducing everything progressive that is available in each country as regards complex servicing. The interaction is accomplished through the Coordination Center of the Intergovernmental Commission for Computer Technology on practically all aspects of servicing:

--the introduction of computer hardware into operation;

--the warranty repair of computer hardware;

--reciprocal deliveries of spare parts;

--exchange of technical documentation;

--deliveries of sets of operating systems and packages of applied programs;

--participation in international exhibitions, symposiums and seminars;

--interaction of national funds of algorithms and programs (since 1980);

--instruction of instructors and students under contracts;

--exchange of complex servicing technology.

The system of complex servicing of computer facilities is being developed and the countries participating in the agreement are obtaining mutual advantage from the interaction of national organizations of technical servicing of computer facilities.

Let us dwell on the guarantees presented to users by the system of technical servicing of computer facilities.

1. The introduction of computer facilities into operation. The period of 20-45 days is required for the introduction of medium-capacity computers into operation, and 45-80 days for that of high-capacity computers.

2. Repairs under warranty. Repairs of computer facilities under warranty are done for 1 year from the moment the facilities are put in operation.

3. Providing useful machine time of computers. The technical servicing of YeS computers assures: 5 hours of useful machine time during single-shift computer operation, 10-12 hours during two-shift computer operation and 15-20 hours during three-shift computer operation. Failures are eliminated in 3.5-24 hours.

4. Centralized repair of standard replacement elements and typewriter units is done in the course of 5-20 days.

5. Centralized supply of spare parts. The maximum time for spare parts delivery is 48 hours within the zone of activity of the regional servicing center.

6. Guarantees of complex servicing of YeS computer software. All YeS computers are provided with operating systems in a centralized manner. YeS DOS and OS are put in operation in the course of 5-7 days, and their generation under the configuration of users' computers is accomplished in the course of 30-45 days.

Packages of applied programs are delivered at the request of users. Depending on their complexity, packages are put in operation in 7-15 days. Under the configuration of users' computers packages of applied programs are generated in the course of 30-45 days.

Regional funds of algorithms and programs permit obtaining consultation on questions regarding the state of the art and prospects of development of YeS computer software.

7. Guarantees of centralized training. An extensive network of training centers assures the preparation of specialist-users on 150 training programs:

--operation of YeS computer hardware--in the course of 2-4 months;

--operation of operating systems--in the course of 2-4 months;

--operation of packages of applied programs--in the course of 2-4 months;

--development and application of applied programs--in the course of 2-4 months.

Prospects of development of services of complex services of computer facilities. Development of the system of complex servicing of computer facilities will permit:

--assuring the planning and the introduction into operation of computer centers on the basis of YeS computers in the course of 6-12 months (without taking into account construction of the computer center building);

--presenting useful machine time to users in a centralized manner in accordance with their needs;

--accomplishing centralized repair of YeS computer hardware at specialized repair plants;

--delivering in a centralized manner YeS computer hardware needed by users of the configuration and with the required number of sets of computer center auxiliary equipment;

--introducing systems for remote servicing of YeS computer hardware.

Analysis of work done on the complex servicing of computer technology has shown that the following efficiency indicators can be achieved:

--a reduction of the cost of an hour of useful machine time by 10-15 percent;

--a reduction of the cost of putting in operation, generating and accompanying packages of applied programs of up to 50 percent.

The number of engineering and technical workers released as a result of the introduction of complex servicing is: 7 for the YeS-1020, YeS-1022 and YeS-1030, 12 for the YeS-1033, 11 for the YeS-1035, 14 for the YeS-1040, 10 for the YeS-1045, 13 for the YeS-1052, 9 for the YeS-1060, 10 for the VK-1010, 17 for the VK2R33, 15 for the VK2R35, 11 for the VK2R60 and 2 for the ARM.

As a result of the introduction of complex servicing, on the average two system and four applied programmers are released per YeS computer.

The introduction of centralized technical servicing will permit already in the Eleventh Five-Year Plan considerably increasing the efficiency of application of computer technology in the national economy and saving manpower and material resources.

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COMPUTER DEVELOPMENT AND PRODUCTION AT THE VIDEOTON PLANT

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[Article by J. Kazsmer, chief designer, SM computers (Hungarian People's Republic), from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] In spite of a number of successes achieved by Hungarian scientists in the area of the creation of cybernetic devices, computer production was not set up in Hungary until 1970. To solve problems requiring large capital investments, Hungarian resources alone were insufficient. The development of computer technology on an industrial scale could be started only on the basis of use of the possibilities offered by the multilateral intergovernmental agreement concluded in 1969. As a result of successful dynamic development, starting in 1969 the VIDEOTON Computer Plant became the production center of Hungarian computer technology; in 1978 that enterprise produced 10 percent of all product made by the Hungarian electronic industry.

The activity of VIDEOTON in the area of computer technology, in accordance with the scales, characteristics and traditions of our country, has been aimed at mini computers and peripherals used with them (primarily displays and printers). We will supplement with that equipment a number of articles of the YeS computer system.

In the first years of industrial production of computer technology (1970-1973) we developed and debugged the production of the 1010-B and YeS-1010 mini computers, which are widely used in the economic and scientific areas of the socialist countries. Those devices are characterized by advanced design and technological solutions, modularity of construction and wide possibilities of application.

Distinctive features of the YeS-1010 computer -- a 64 Kbyte memory, a 1 microsecond cycle, microprogrammed control and a software system -- make it possible to use them effectively in real-time systems.

On the basis of the YeS-1010 computer even in the first years of production we were able to create data base servicing systems working in a complex remote data processing regime, and also computers controlling technological processes requiring high reliability of the technology. In the last 8 years, together with computer users, highly reliable systems have been created in many areas. There is no need to enumerate them here, but the volume of work done can be illustrated by two

figures: according to information available to us YeS-1010 computers are used in 70 areas of application, and in the socialist countries 5000 specialists are engaged in the creation of user systems based on that computer.

By the end of 1979 more than 1000 YeS-1010 computers will have been produced, a considerable portion of which will be used in the socialist countries. However, a large number of those machines will also be delivered to countries of Asia and Europe. On the basis of experience accumulated by us we are continuing to improve the YeS-1010 computer in order to increase both its capacity and the areas of its application. With these requirements taken into account we developed and in 1975 conducted international tests of the new YeS-1012 computer. Its capacity is almost one order of magnitude larger than that of the YeS-1010 because of built-in decimal processors and processors with a floating point. The external storage volume increased: together with rapid fixed disk storages, replaceable disk storages with a capacity of 7.25 Mbytes are used. The set and quantity of data transmission lines have been increased, the YeS-1012 presents the possibility of using as many as 60 terminals, and they can be arbitrarily selected from a set consisting of various terminals, starting from a simple teletype and ending with synchronous terminals requiring a complex algorithm.

The expanded set of instructions is also suitable for commercial purposes.

It is known that for complete use of the possibilities offered by modern hardware modern software also is needed. Our mathematician-developers were the first to apply to the YeS-1012, as well as to a mini computer, a multi-task operating system and effective data base servicing and remote processing systems. For the YeS-1012, along with the high-level FORTRAN and BASIC languages, which have recommended themselves well in the YeS-1010, use is made of the languages COBOL and PROCOL (it has the character of a real-time FORTRAN), and translators have been developed for them.

In the course of development of computer production we never set ourselves the goal of organizing large-series production of mini computers, as that is beyond our possibilities. We consider our task to be the satisfaction on a high level of special requests not performed by enterprises of the country which produce large series of computers, that is, our task is activity in overcoming a shortage. We also subordinate to that goal the development of new articles and expansion of the possibilities of production.

One of the principal characteristics of the production capacities, technology and system of production of the Hungarian People's Republic is great flexibility, which can assure the satisfaction of specific requests. Flexibility is assured, firstly, by highly qualified personnel and, secondly, by processes and technological installations controlled by computers. In our production shops and sections over 50 percent of the workers are qualified specialists, and 7 percent of the technological processes are serviced by specialists with higher education. Most of the most important types of equipment have numerical control or are controlled by a computer. Such equipment is used for sheet stamping and punching of parts, the processing of castings and also for complex measurement and monitoring processes.

Another characteristic feature of the Hungarian production technology is the assurance of quality and reliability on a very high level. It is impossible to provide

an acquaintance with the complex system of assuring reliability within the framework of the present article, but to illustrate the efforts applied to increase reliability one can describe a system of technological pre-running which is accomplished on four levels. On the first level, purchased elements and peripherals are subjected to prolonged tests. How substantiatedly those tests are conducted is shown by two figures: during the prolonged tests 2 percent of the integrated circuits fail, and peripherals reach indicators of reliability considered stable only after 150 hours of technological pre-running. On the second level, 24-hour tests are conducted at 50°C of printed circuit plates and power units, and then on the third level follows a 24-hour technological pre-run of complete central processors at 50°C. On the fourth level a 100-hour check is made of the functioning of systems with sets made up and a configuration in accordance with user requests. That test is carried out by means of a special system of programs developed for that purpose. After the above-described system of technological pre-running has been introduced, the readiness coefficient of the complete systems (that is, together with peripherals) delivered to the user exceeds 90 percent.

Upon sale of the first computers it became clear that without the organization of technical servicing it is impossible to solve the question of effective use of computers. In 1971-1975, together with organizations of NOTO (Natsional'naya organizatsiya tekhnicheskogo sluzhivaniya--National Technical Servicing Organization) formed at that time by agreement with them we organized our technical servicing centers in all the socialist countries. At first they engaged in servicing computers and putting them in operation, and at the present time Hungarian specialists are systematically participating in the development of system plans of users and the compilation of user program systems and systematic consultations with users.

One must acknowledge as true the tendency toward considerable increase of expenditures on rendering services (including on software) within the range of expenditures on computer introduction into operation. Some statistical data show that expenditures are distributed in a 1:1 ratio and in the near future a shift of 4:1 in favor of expenditures on services for mini computers is proposed. Many consider that those correlations characterize only expenditures on the production and development of the basic software and hardware. However, due to that error the planning of commodity turnover, commercial activity, technical servicing, etc, are slowed down. It is advisable to solve the given problem in the near future; that will assure more effective use of computer facilities.

In spite of the existing difficulties, our goal is the further development and expansion of technical servicing centers so that they can render services to the users in the development of computer facilities, systems planning and the compilation of users' programs, can render help during the introduction of a system and represent machine time before delivery of the computer. Such intensive support of users can curtail the time required for attaining effective operation of complex systems by 10-12 months. The acceleration of the introduction of systems into operation is rapidly reflected in our national economies, as the period of repayment of capital investments also can be reduced by 10-12 months.

In the course of development and production of a very small YeS computer model sufficient experience was accumulated to take an active part in realization of the SM computer program, as a result of which a new family of computers will be created

with use of the "ZM" principle of the YeS computer program. The new family consists of a mini computer (a modernized version of the YeS-1010), the medium-sized YeS-1011 computer and the largest computer of the family, the SM-42, of the SM computer program. Modernized versions of the YeS-1010 and YeS-1011 underwent tests in 1978 and production of them was started in the same year. Tests and production of the SM-52 are planned for 1980.

The family has a modular structure, the memory bus is a main line and computer modules are connected to it; the control is microprogrammed. The main memory capacity of the smallest model is 64 Kbytes (with the possibility of expansion to 128 Kbytes). The YeS-1011 memory can be increased to 512 Kbytes, and in the SM-52 the maximum memory capacity is 1024 Kbytes. In each computer a main memory based on ferrite cores or semiconductor circuits can be used arbitrarily. A very characteristic feature of the hardware is the use of LSI and microprocessors and, as a result of that, decentralization of "intellectuality" in the high-capacity units for coupling with peripherals. The use and servicing are greatly improved by the possibilities of microprogrammed self-diagnosis, remote loading and remote control.

Each model of the family is top-down program-compatible with models of the YeS-1010 family, that is, programs developed for the YeS-1010 can be run on them without limitations. In that case models with large capacity also have more effective software systems. Thus, for example, a high-capacity multi-task operating system has been developed for the YeS-1011, one which assures remote data processing, data base servicing and the processing of operative requests. Thus the YeS-1011 hardware and software system for the first time within the framework of the YeS computer program makes it possible to solve problems in effective distributed processing.

The SM-52 central processor is constructed of microprocessors. A high-speed microprocessor with suitable effectiveness assures the solution of emulation problems. Thanks to that property the SM-52 actually represents a computer working in three modes. The first mode is the computer's proper mode, the second--emulation of the YeS-1011, and the third--emulation of SM computer programming. We hope that thanks to that property and its high capacity the SM-52 will permit satisfying the needs for such computers and will contribute to the construction of high-capacity real-time interactive control systems.

In 1977-1980 another important program development is the creation of the YeS-1015 family. Experience accumulated in the implementation of that program will permit, on the basis of the YeS Ryad-3 computer, creating on the basis of unified hardware a set of mini-computer modules which will satisfy the requirements of a number of YeS and SM computer models.

Investigations have shown that that possibility can be economically accomplished on the basis of a single computer category--the YeS-1015 and the SM-52. We consider this new family of computers to be the basic article of the L980-1985 period, one which will gradually replace the series YeS-1010M, YeS-1011 and SM-52. It is planned to conduct tests of the YeS-1015 in 1979, the development of YeS-1016 and YeS-1017 models has already been started and those computers will be the principal ones in our production.

The computer technology sector in Hungary, which has arisen as a result of socialist integration, can exist and develop only on the basis of collaboration of the

socialist countries. In the years of collaboration all have been convinced that on the basis of collaboration, a common program and division of labor it is possible to achieve outstanding results. The experience accumulated in our countries, the capacities which have been created and the thousands of highly qualified specialists will serve the common interests of socialist collaboration.

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PROSPECTIVE MAGNETIC DISK STORAGE DEVICES FOR MINI-COMPUTERS

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN. SBORNIK STATEY. VYPUSK 7 (Computer Technology of the Socialist Countries. Collection of Articles. Issue No 7) in Russian 1980 signed to press 6 Mar 80 pp 21-28

[Article by N. Botev, complex program manager, and B. Tsonev, scientific associate, Institute of Computer Technology, and L. Yordanov, engineer (People's Republic of Bulgaria) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Excerpts] Presented below are the characteristics of cassette-type plug-in magnetic disk stores (Table 1) and floppy magnetic disk stores (Table 2) which have successfully undergone joint tests in the producer-countries and have received numbers in the YeS and SM computer systems. However, those stores did not satisfy the steadily growing requirements of computer complexes based on mini-computers as regards capacity, reliability and operating conditions. In the present article the authors have tried to describe their contribution to magnetic disk stores with good prospects for SM computers.

Table 1. Cassette-type plug-in magnetic disk storages

Parameters	SM-5400 Bulgaria	SM-5401 Poland
Maximum capacity, Mbits	50	50
Transfer rate, Kbytes/s	180, 312	312
Mean access time, ms	50	40
Rotation rate, rpm	1500, 2400	2400
Number of tracks on surface	204	204
Number of heads	4	4
Information carrier:		
plug-in cassette	YeS-5269-01	MERA 847
permanent disk	Yes	Yes
Mean time between failures, hrs	2000	2000
Productivity between failures, bits	10^{10}	10^{10}
Interface	MM SM 007-76 computer each	

In spite of indisputable successes achieved in the area of development of new means of information storage, investigations show that in the next 10 years mobile magnetic storage devices will preserve their leading position in computer technology. This is due to the possibility of multiple use of a magnetic carrier, the absence

Table 2. Floppy magnetic disk storages

	YeS-5074 Bulgaria	MF-3200 Hungary	PL x 450 Poland
Maximum capacity, Mbits	3.2	3.2	4 x 3.2
Exchange rate, Kbits/s	250	250	250
Transit time to adjacent track, ms	10	10	-
Head press time, ms	10	25	30
Head damping time, ms	40	40	90
Rotation rate, rpm	360	360	360
Number of mechanisms per casing	1	1	2
Number of heads per mechanism	1	1	1
Number of tracks on a surface	77	77	77
Information carrier:			
floppy disk	IBM "Diskette" on all three		
used carrier surfaces	1	1	2 (the carrier must be turned to use the second surface)
Interface	MM SM 010-77 computer on each		-
Reliability, hrs	2000	1000	2000
Productivity between failures, bits	10^9	10^9	10^9

of a need to regenerate information for its preservation, the not-yet exhausted possibilities of increasing the recording density and the rate of data exchange, and also the low cost of storing a bit of information. It is evident from Table 3 [1.2] that magnetic disk stores with mobile heads provide storage of information in a system more cheaply by an order of magnitude than charged coupling storages and by two orders of magnitude than bubble domain storage devices. Observers of the magnetic disk storage device market think that, in spite of the steady reduction of prices for external storages, the now-existing correlation between the cost of storage per bit for magnetic disk storages, charged coupling storages and bubble domain storages will be preserved at least to 1985.

The documents in force establish for hardware, depending on the specific conditions, under which computer complexes function, the following requirements:

--the possibility of operating in quarters without air conditioning;
--a modular character of the design, the possibility of its being built into cabinets meeting requirements of the International Electrical Engineering Commission (publication 297).

Conclusion. Having in mind the above considerations, it is advisable to satisfy the increasing requirements for external stores for mini computers with three groups of magnetic disk stores (Table 6). For large information systems it is advisable, if necessary, to borrow magnetic disk stores from the YeS computer system.

Table 6. Prospective groups of stores for mini computers

Magnetic disk store group	Capacity, Mbytes	Exchange rate, Kbytes/s	Mean access time, ms
Cassette type	12, 24, 48	180/806	50
Disk modules:			
plug-in	25, 50, 80	806/1200	40
permanent	25, 50, 75	806/1200	35
Floppy disk	0.4; 0.8; 1.6	16/31/62	-

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SOME PROBLEMS OF PROGRAM SYSTEMS ORGANIZATION FOR THE INFORMATION BASE OF COMPUTER-AIDED MANAGEMENT SYSTEMS IN AN INTERACTIVE MODE

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[Article by V. M. Vinogradov and B. A. Zolotukhin, engineers (USSR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Excerpts] A number of program systems intended for the formation and management of data bases are functioning in the USSR and abroad. Thus, in our country the following have been developed and are being used: the NSI-DOS (a development of the GDR), SINBAD-2, SIOD-2, BANK, BANK-OS, OKA, BASIS, NABOV, etc.

Comparative analysis of data banks in our country has shown that in its sphere of application the BANK system is one of the most universal. It also is the most universal and flexible in the structuring of data, as it permits establishing various connections between recordings of various types and their arrangement, which also has determined their wide use in ASU developments.

Important shortcomings of the system for the control of data bases (SUBD) BANK are: an inadequately developed function of data preparation and centralized updating of data bases, which is entrusted to applied programs of users, work in only a package mode, and the absence of remote processing facilities. However, the tendencies of ASU development require improvement of data transmission and processing. Under the conditions of expansion of the scales of automation and areas of application of ASU's, and also increase of the computing capacity of data processing facilities, sources and users of information can be considerable distances apart, in connection with which new forms and methods of joint use of computer facilities and communications are needed. The remote data processing systems combine the transmission and processing of information, starting from the input of starting data into the automated system and ending with the obtaining of the end product by the user. Comparative analysis of ASU software systems developed in our country has shown that they do not completely satisfy all the requirements presented for them. An acute need for software systems meeting the above requirements have served as the basis for the development of the "software system-base-terminal" system.

The "software system-base-terminal" system is a means of receiving and accumulating data for updating the ASU intra-machine data base and issuing data upon request, and also a means of connecting the inflow of user requests from terminals with the processing program library. The given system is oriented toward use in automated management systems for enterprises with various profiles.

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CENTRALIZED AND SPECIALIZED SERVICING OF YeS COMPUTERS IN THE CSSR

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[Article by O. Plunder and J. Svozil, engineers, and Z. Vokac, technological engineer, (CSSR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] Centralized Technical Servicing

The idea of creating centralized technical servicing of computer technology began to be implemented at "Kantselyarske stroye" National Enterprise (KSNP) after the 16th CPCZ Congress, the resolutions of which dealt on a broad scale with integration of the Czechoslovak economy within the framework of the CEMA member-countries. The KSNP, performing functions of the national organization of technical servicing, makes a considerable contribution to the fulfilment of that important task, one of the main aspects of which is the creation and assurance of centralized technical servicing of Czechoslovak computers of the YeS system. In 1972 the main prerequisites for the formation of such a servicing system were created at the KSNP:

--the basic conception of centralized technical servicing of YeS computers was determined;

--an organizational structure was created;

--finances were allocated for the acquisition of measuring equipment;

--the production capacities of the enterprise were allocated for the preparation of specialized equipment.

In 1973 the KSNP started specific activity in that area:

--technical personnel were instructed;

--deliveries of measuring equipment and automatic machines for technical servicing were made;

--the enterprise's own production capacities were allocated (the concluding stage);

--selection of new workers;

--conclusion of economic agreements with purchasers;

--first installations made of YeS computers.

The subsequent years can be characterized as years of regular development of centralized technical servicing. The overcoming of various difficulties was involved, including unpreparedness of the purchaser (non-observance of the periods of transfer of computer centers into operations by the builders) and the gradual growth of the prestige of centralized technical servicing among users.

The following stage of development of centralized technical servicing, 1978-1979, was characterized by increase in the complexity and integration of the presented services. As a result of the distribution of new computer systems, especially their peripherals, on the basis of socialist division of labor among the CEMA member-countries, and also as a result of the adoption of international documents which unify the organization of technical servicing, a need has arisen to modify the organizational structure of those sections of the KSNP wihch assure the centralized technical servicing of computer technology. In connection with that and on the basis of recommendations of the Council for Complex Servicing of YeS Computers the following organizational subdivisions are being created:

--control and emergency services;
--laboratories and narrowly specialized work places;
--a service responsible for change of technical documentation;
--warehousing.

The paramount task of the technical services is the centralized technical servicing of YeS-1021 (YeS-1025) computers produced in Czechoslovakia, and so the material presented below deals with those computer systems.

Transfer of a computer into operation at the user's includes several preparatory stages. In the first stage the purchaser prepares a preliminary plan for construction of the computer center, including a schedule of work on construction and on the organization of contractual technical servicing, and assures deliveries connected with construction and the starting of the computer.

In the second step the computer center is constructed. At the end of that stage the purchaser must finish the training of personnel and have at his disposal the necessary number of workers for the computer center (operators, input and output monitoring workers, data preparation workers, etc). The organization of technical servicing in that stage consists in the introduction of production capacities for the installation of a computer and the theoretical training of personnel in technical servicing for a proposed computer. The computer manufacturer by this time has completed his production and prepares for the testing and transfer of the machine to technical servicing organizations.

In the third stage the purchaser together with technical servicing organizations accepts the computer, arranges it in a room of the computer center according to plan, accomplishes the necessary debugging and checks the functioning of the air conditioner.

In the fourth stage, during execution of all points of the protocol on the preparation and completion of construction, the technical servicing organization can install a computer and transfer it to the purchaser for operation after transfer tests of the hardware and software.

In the last stage of organization of technical servicing it becomes possible to use machine time in the volume indicated in the contract for the warranty period and after its expiration.

If the purchaser does not need the technical servicing service, he does certain preparatory and operating work independently, without the intervention or help of the technical servicing organization.

Assuring centralized servicing. The main goal of technical servicing is to assure very high productivity of the computer. This can be achieved by increasing the operating efficiency [1], which for a single-program computer intended for package processing is calculated with the formulas:

$$E = V \cdot K; \tag{1}$$

$$K = \frac{T_s}{T_s + T_0}, \tag{2}$$

where E is the real computer productivity, operations/s;
V is the computer productivity without consideration of failures and repairs, operations/s;
T_s is the mean failure-free work time;
T_0 is the mean restoration time after elimination of a failure.

Let us consider how it is possible to influence the values of the second formula in order to increase the real computer productivity. The mean time between failures is defined as the length or volume of work between failures, the value of which is an indicator on the basis of which the design and production of hardware are evaluated. The design and level of production can also be influenced in the process of operation partially and only on subsequent articles of the given series, but not on articles already made in which only very slight changes are possible.

Often, to achieve the required mean failure-free work time of computer hardware, redundancy is used, that is, a computer configuration with a larger number of devices of a certain kind than is necessary. In the case of failure of operated equipment the servicing person puts reserve equipment into operation and calls a technical service specialist to make the repair. Such a failure does not mean, however failure of the entire computer system, but only recurrence of the corresponding problem or a portion of it, starting with the last check point in the program. In connection with that it can be considered that the mean time between failures will depend not only on the design and technology of production but also on the operating conditions. The latter are precisely reflected in the contract concluded between the organization of centralized technical servicing and the purchaser.

In the contract, questions directly influencing operation of the computer are determined first:

--technical conditions, an important portion of which are the computer operating conditions;

--a minimum configuration of computers with necessary redundancy, thanks to which the computer as a system is considered suitable for operation;

--it is the responsibility of the purchaser to divide the solution of tasks by check points into working intervals of 15-30 minutes; the possibility of performing the procedure is built into the basic software, which is a component part of the delivery.

In accordance with formula (2) the ratio between the mean failure-free time and the mean restoration time, which affects the real computer productivity, is determined indirectly by the mean restoration time. The latter designates the mean time of forced unplanned downtime caused by searching for and eliminating a single failure and depends on the following factors:

--on the design of the computer, the division of its modules to simplify location of the failure and ease its elimination;

--on the qualifications and specifications of the technical service workers;

--on the distance of the workers of the computer technical service and on the general organization of labor;

--on the presence of and the possibility of obtaining spare parts.

Let us analyze the specific realization of the above-enumerated factors affecting the mean restoration time at the KSNP. On the basis of operating experience accumulated by the organization of technical servicing starting in 1973, that is, the year the first computer was started, and in the course of subsequent years, the design of the YeS-1021 computer and peripherals is constantly being improved to increase the working efficiency of the computer. In 1975 a Permanent International Complex Rationalizer Team was formed within the framework of the general direction of the Trust of the Industrial Automation Plants Association. It processes systematically collected data on faults during the operation of YeS-1021 computers and feeds suggestions to the makers of separate parts of the computer regarding improvement of their design and technology of manufacture. This in turn exerts an influence on the continuous improvement of the entire article, and also on improvement of the indicator of the mean time between failures of the entire system and separate devices, reduction of the laboriousness of repairs and improvement of system diagnosis, which accelerates the finding of the fault. The complex rationalizer team working at the enterprises discusses proposals of a technical and operational character arriving from users, who through the Association of YeS Computer Users, organized within the framework of the KSNP, and collaborate with the organization of technical servicing in solving all urgent operating problems.

A clear example of collaboration of all parts of the Trust of the Industrial Automation Plants Association is improvement of the computer, which was begun with 121 items. Preliminary operation of the improved article has shown that the reliability and working rate of the computer were increased and the labor-intensiveness of its production, start of the processor and repair was reduced.

The technical servicing of computers entering the sphere of centralized servicing is done by KSNP workers whose work places are directly at the computer centers of users. Instantaneous communication with the technological engineer is thus assured in case of computer failure. This method of technical servicing permits reducing to a minimum the number of technical personnel at various working places and contributes to the resolution of any situation arising at any user's facilities.

If the servicing person at a given service point cannot cope with the failure by himself, he can appeal for help to the nearest point in that area. If that proves inadequate, the dispatcher organizes repairs directly at the place of a group of highly qualified specialists. The technical personnel of points and the group of highly qualified specialists have specially equipped automatic machines at their disposal which permit reducing the waiting for necessary spare parts and the conducting of repairs by specialists.

During repair of a peripheral in the workshop the user is offered the possibility of obtaining that equipment at the Rental Service of the KSNP main plant in Prague.

Spare parts availability--the next factor with a direct influence on the indicator of the mean restoration time--is assured by the appropriate warehouse organization.

The warehouse organization. Warehousing is organized on the principle of a multistage hierarchic structure with consideration of the territorial distribution of computers in the sphere of technical servicing:

--a central warehouse which supplies all the territory of the CSSR is situated in Prague at the main KSNP enterprise;

--regional warehouses are present at each regional enterprise (at Plzen, Hradec Kralove, Brno and Ostrava);

--warehouses of computer centers.

The central warehouse organizes the purchase of the entire assortment of spare parts at manufacturers and suppliers. That warehouse equips regional warehouses and computer center warehouses with necessary spare parts. The assortment of the central warehouse is very broad and the total volume of spare parts is determined by the standards.

The assortment and quantity of spare parts in warehouses situated directly at the users' are also determined by the standards, the basis of which is the principle of obligatory obtaining of spare parts. Individual warehouses are filled with spare parts by means of an automated system based on the YeS-1021 computer. A spare part is delivered to the computer user at the moment of repair; later the user is sent a bill for payment.

A computer is installed and electronic modules suitable for repair are replaced by the corresponding warehouses:

--the warehouse of the installation group;
--the warehouse of plug-in modules;
--the warehouse of the technical servicing laboratory;
--the warehouse of the group of highly qualified specialists.

The functions of all warehouses except the plug-in modules warehouse are similar to those of local warehouses.

Plug-in module warehouses are formed at the center and at all oblast enterprises and contain mainly TEZ's [unidentified] and power units, that is, spare electronic parts of a computer that can be repaired in the technical servicing laboratory. At a

technician's request a defective computer is replaced by an operating module from the plug-in module warehouse. The defective modules are shipped to the technical servicing laboratory for repair. If the technical servicing laboratory is unable to perform the repairs, however, a plug-in module is shipped from the manufacturer. The user of the computer pays for that service in accordance with the type of plug-in module.

Spare parts standards have been developed for the warehouses of each level; in accordance with them determinations are made of the quantity and assortment, products list and the number of spare parts needed to fill the stores. Data on the exchange of spare parts between warehouses can be obtained by starting from the initial data obtained as a result of automated processing. The number of spare parts issued to and consumed by individual users is registered, and also the volume of spare parts present in the warehouse by groups.

The warehouse system of YeS-1021 computer spare parts permits rationally raising warehouse capacities, efficiently supplying work places and laboratories and also obtaining objective information about the expenditure of spare parts and about requests to supply various spare parts.

Conclusion. Centralized technical servicing in Czechoslovakia is a necessary prerequisite for achievement of the following goals:

--unified control of technical servicing intended for a very broad circle of users of computer hardware;

--accomplishment of technical servicing on an industrial basis which eliminates qualitative and quantitative scattering of resources and manpower in providing those services by the users themselves;

--reduction of material and equipment supply to a minimum;

--a saving of manpower on the scales of the national economy;

--continuous improvement of qualifications, specialization and the general level of training of technical servicing workers;

--assurance of international collaboration, cooperation and integration in the use of technical servicing of the computer hardware of CEMA member-countries, including the provision for all the importation and exportation of peripherals and computer systems as a whole.

The realization of this short list of goals will depend on the creation of favorable conditions. The principal document on which further activity will be constructed with respect to the development and improvement of services of the National Organization of Technical Servicing and, consequently, of centralized technical servicing, is Government Resolution No 61/1977 on the concept of the development, production, introduction and use of computer hardware.

However, in the process of creating a centralized technical servicing a number of questions of a technical, organizational and legal character, etc, have not yet been successfully solved:

--the creation of conditions favorable for continuous assembly of workers engaged in direct technical servicing at the user's premises;

--optimization and further improvement of material and technical supply above all of spare parts, measuring equipment and equipment for specialized work places; improvement of relations between suppliers and purchasers;

--expansion of capacities for making repairs in large workshops, increase of the number of workers and means of technical servicing at specialized work places and in workshops;

--improvement of the quality of consulting activity of commercial and technical services in the process of introduction and use of computer hardware;

--organization of the service for changes of computer hardware;

--organization of centralized emergency service.

For the further development of centralized technical servicing, with the volume and complexity of the work done taken into account, it is necessary to use all forms of increase of labor productivity, improvement of management, rationalization and organization of socialist competition, and also appropriate methods of increasing the material incentive of workers.

The KSNP NOTO has long used methods directed toward improving the quality indicators widely used in centralized technical servicing. Criteria have been developed in accordance with which workers receive bonuses for the completion ahead of schedule of tasks in computer installation and for the attainment of a high coefficient of its technical utilization. A permanent socialist competition has been arranged both between specific production sections which provide centralized technical servicing and between specific computers. The main indicator for summing up the results of socialist competition also is the coefficient of technical utilization, which is an indicator of the working efficiency of the computer.

A rationalizer and innovator movement has been organized, to the development of which both the economic management and the social organizations contribute. The rationalization is done systematically by means of thematic tasks, the execution of which is materially stimulated.

These and other methods, for example, the movement to save manpower, to increase interchangeability, to overfulfill the production plan, etc, are guarantees of improvement of the indicators of effectiveness of centralized technical servicing.

Special Technical Servicing (Special Service)

With the requirements for complex technical servicing taken into account, it seems advantageous at first to introduce in time a "Special Service," in which the performance of specific work is distributed between the user and the service organization.

The user performs the following work:

--systematic preventive maintenance (daily and weekly);

--elimination of ordinary computer faults;

--registration in a log of the performance of preventive maintenance and elimination of faults and preparation of primary statistical reports on reliability;

--acquires measuring equipment and also special equipment and instruments needed for inspection and regulatory work;

--making up a set of spare parts with a short service life (lamps, filters, belts, fuses, knobs, switches, etc) and also a set of definite electronic circuits (TEZ's and power units) and the principal readily replaceable spare parts;

--reports to the service organization dispatcher about complex faults and emergencies in accordance with the agreed-upon situation.

The service organization performs the following work:

--monthly and quarterly preventive maintenance;

--inspection and complete preventive maintenance once a year;

--elimination of complex faults and emergencies by means of special and measuring equipment, instruments and spare parts within the times indicated in the agreement;

--carries out the service in shifts;

--carries out centralized repair of the main electronic circuits (TEZ), power units and memory units in laboratories;

--provides dispatcher service.

The service organization has its own central spare parts warehouse.

Needed to service YeS computers are highly qualified specialists, expensive universal measuring apparatus for the equipping of laboratories and a considerable quantity of spare parts. Therefore during technical servicing the YeS computer user must have available the necessary number of specialists, measuring equipment and spare parts. In Slovakia 62 YeS computers had been introduced into operation by the end of 1977. If one starts from the fact that in 1978 those machines were provided with special service during two-shift operation, one can calculate the necessary number of workers and the necessary expenditures on that kind of service (see table).

Model of YeS computer	Quantity	Technical workers	Cost of measuring equipment, 1000 crowns	Cost of spare parts, 1000 crowns
YeS-1010	13	65	1,066	1,950
YeS-1021	18	144	2,250	2,070
YeS-1030/33	21	210	14,700	10,500
YeS-1049	10	120	10,200	17,650
Total	62	539	28,216	32,170

In complex technical servicing, curtailment of the number of technical workers by about 70 percent and a saving on expenditures (measurement equipment and spare parts) of about 60 percent are proposed. During special technical servicing it is proposed to reduce the number of technical workers by 20 percent, and the saving on expenditures ought to amount to 40 percent.

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FUNCTIONS OF THE 'KANTSELYARSKE STROYE' ENTERPRISE AND ITS PARTICIPATION IN ESTABLISHING COMPUTER SERVICES OF THE CSSR NOTO

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[Article by Y. Traibold, engineer (CSSR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Excerpts] Commercial and technical services of computer systems arose practically simultaneously with the first deliveries of electronic computers in 1959-1961. The commercial and technical services section started its work on 1 January 1972.

The commercial and technical services assure and coordinate the deliveries above all of YeS computers and also of some special auxiliary equipment or technology not yet being manufactured.

In the Fifth Five-year Plan the KSNP delivered 115 YeS computers to users in the CSSR, including 11 YeS-1010 from the Hungarian People's Republic, 50 YeS-1021 of CSSR production, 36 YeS-1030 from the USSR and 10 YeS-1040 from the GDR.

Such a quantity corresponds in the main to the needs of our national economy.

In the Sixth Five-year Plan the enterprise will enter upon still more important tasks. The plan envisages delivering about 300 YeS computers during that period.

Service computer centers. The developing technology requires that the KSNP not only sell and service computer hardware but also operate it.

For YeS computers complex service requires much more intenstive training and more voluminous services. For those purposes computers have been installed as follows: a YeS-1021 and a YeS-1030 in Prague, a YeS-1010 at Plzen, a YeS-1021 at Hradec Kralove, a YeS-1040 at Brno, a YeS-1021 at Ostrave and a YeS-1021 at Gottwaldov.

All this serves to accomplish the following goals of the NOTO organization:

--the development of YeS computer applied software;

--presentation of machine time to future users of the YeS computer;

--inspection of hardware for computers;

--training of its own technical personnel and programmers;

--training of qualified groups of YeS computer users.

During the Sixth Five-Year Plan YeS second-line computers will be installed in a similar manner and used.

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THE GDR NOTO: ITS FUNCTIONS AND TASKS IN INTERNATIONAL COLLABORATION

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[Article by H. Boerner, NOTO manager (GDR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] The Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology directly after its formation in 1969 adopted decisions directed toward the creation in countries participating in the Agreement of National Complex Servicing Organizations (NOTO) for YeS computer facilities

In accordance with that decision, performance of the functions and tasks of the GDR NOTO was entrusted to a national enterprise, the "Robotron" combine.

The bases for determination of the functions and tasks of the GDR NOTO were and are the assumptions in effect on the YeS computer general complex servicing system and also assumptions and recommendations of the Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology relating to complex servicing of YeS and SM system facilities.

In accordance with those assumptions, decisions and recommendations the GDR NOTO performs all kinds of complex servicing which assure the effective application of YeS and SM computer facilities, for example:

--the collection of suggestions and the consideration and refinement of the requirements for YeS and SM computer facilities within the limits of competence of the GDR NOTO;

--services in the planning, construction and equipping of computer centers;

--sales of YeS and SM computer facilities;

--installation and introduction into operation of YeS and SM computer hardware;

--organization and accomplshment of technical servicing of YeS and SM computer hardware;

--assurance of permanent, functional emergency and dispatcher services;

--delivery and servicing of the software system;

--supplying users of YeS and SM computer facilities with spare parts and accessories, special tools and instrumentation;
--instruction of specialists in the technical servicing and operation of YeS and SM computer facilities;
--providing the information service with data on changes in the hardware and software systems in the warranty period;
--help in the preparation and conclusion of contracts for the complex servicing of YeS and Sm computer facilities delivered in trading between countries participating in the Agreement;
--gathering and analysis of data on the work of YeS and SM computer hardware.

These kinds of servicing are performed by GDR NOTO enterprises belonging to the "Robotron" combine national enterprise.

During collaboration of the "Robotron Export-Import" foreign trade enterprise those multilateral services of complex servicing are also performed by GDR NOTO specialists for YeS and SM computer hardware which the GDR NOTO has delivered and is delivering to other countries.

In performing tasks of complex servicing of YeS computer facilities and especially in the preparation of new YeS and SM computer facilities for use the GDR attributes much importance to the multilateral collaboration of the YeS computer NOTO of countries participating the Agreement in the Council on Complex Servicing of YeS Computers (Sovet po kompleksnomy pbsluzhivaniyu YeS EVM--SKO YeS EVM).

Representatives of the GDR NOTO work in the SKO YeS EVM sections "Instruction of personnel in the technical servicing and operation of computer facilities" and "Program funds and services of program system accompaniment" and participate in the development of methodical materials, in the preparation of which experience of the GDR is used to a great extent.

With consideration of the experience of the GDR in the leadership of the Council of Specialists No 10 of the YeS EVM SGK ("Servicing YeS EVM facilities"), the GDR NOTO in the SKO YeS EVM has been entrusted with leadership of the Council of Specialists for "Technical Servicing, Spare Parts and Reliability."

In the accomplishment of tasks of multilateral collaboration the GDR NOTO, jointly with representatives of all national parts of the SKO YeS EVM, turns special attention to:

--organization of regular and timely supply of spare parts;
--improvement of the emergency and dispatcher systems;
--improvement of the information service on changes for YeS and SM computer facilities;
--conclusion and implementation of contracts for the delivery and servicing of computer facilities with strict monitoring of the observance of documents of the CEMA and the Intergovernmental Commission for Computer Technology.

The proposals and methodical guideline materials developed within the framework of that multilateral collaboration contains the basic principles by which the GDR

YeS EVM NOTO is guided during further improvement of the complex servicing of computer hardware in the GDR and the further development of bilateral collaboration with the YeS EVM NOTO's of particular countries.

In that case the GDR NOTO starts from the fact that:

--the YeS EVM NOTO of the supplier-countries (or the manufacturer-countries) and the countries purchasing YeS and SM Computer facilities are jointly responsible for the qualitative training and performance of tasks of complex servicing, thanks to which the prerequisites are created for the effective use of YeS and SM computer facilities;

--the goal of collaboration of the NOTO's of countries consists in having the NOTO's of purchaser-countries take on themselves the servicing of imported facilities (complete data processing systems, control systems, processors, peripherals, remote data processing systems, basic software systems, etc);

--bilateral collaboration of the YeS EVM NOTO's of partner-countries and foreign-trade enterprises is based in practical work on normative documents of the CEMA and the Intergovernmental Commission for Computer Technology and decisions and recommendations of the Council for Complex Servicing of YeS Computers.

The bilateral collaboration of the GDR NOTO's and those of partner-countries is accomplished on the basis of agreements and annual work plans containing specific tasks connected with the preparation and use of contemplated deliveries of YeS and SM computer facilities. These tasks include, for example, the instruction of personnel in the operation, application and servicing of YeS computer facilities, services in the planning of computer centers, the installation, introduction into operation, generation and servicing of YeS computer facilities, equipping with spare parts, delivery and accompaniment of software, the use of applied programs (for example, for the organization of the supply of spare parts according to unified principles) etc.

As a result of such bilateral collaboration the YeS EVM NOTO's of the purchaser-countries were able to obtain a great saving (of manpower and resources). More rational use of specialists for servicing permitted improving the complex (or partially complex) servicing of installed computers, reducing time spent on emergency calls and assuring a large reserve for training for the reception of new articles.

The practice of many years of experience of the GDR YeS EVM NOTO's with "SoyuzEVM-kompleks" and "Elektronorgtekhnika" in the USSR, OSTsV in the Hungarian People's Republic, the KSNP and DSNP in the CSSR and other partners is a bright example of socialist integration.

The rate and effectiveness of economic growth and, consequently, the solution of the socio-political tasks, and also progress in all areas of social development depend substantially on how all the possibilities of the collaboration of CEMA member-countries are used. The GDR NOTO's, like the NOTO's of all countries participating in the Agreement, will make its contribution to that process.

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ORGANIZATION OF MAINTENANCE OF MANAGEMENT CONTROL SYSTEM SOFTWARE

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN. SBORNIK STATEY, VYPUSK 7 (Computer Technology of the Socialist Countries. Collection of Articles, Issue No 7) in Russian 1980 signed to press 6 Mar 80 pp 99-103

[Article by V. S. Kuznetsov, deputy chief, All-Union Association Soyuzsistemprom, and V. P. Tikhomirov, candidate of economic sciences (USSR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] The volume of work on ASU designing is steadily increasing, the range of problems solved by ASU's is expanding and the economic effectiveness of the functioning of ASU's is being raised. At the same time a tendency is noted of increase of expenditures on the development of ASU software, and at the present time they amount to 50 percent of the total expenditures on ASU design. They can be lowered by a transition to idustrial methods of designing ASU software. The essence of those methods consists in the organization of large-scale computer software development in the form of standard ASU software and their centralized maintenance and introduction into ASU's being developed.

Computer software must be standardized, universal, automatically adjusted to specific conditions of application. Included in software are packages of applied programs (PPP's), automated design systems, standard design solutions, etc. Software acquires the character of industrial production, and then their distribution according to orders determined the number of copies, and centralized maintenance and the rendering of a number of services on their introduction, the character of the industrial services.

In the distribution of ASU software by orders the following work is done:

--verification of the efficiency of software, elimination of errors discovered in the course of running the software at the user's;

--modification of software to expand the sphere of its application;

--adjustment of software to specific conditions of application in ASU's;

--instruction of specialists in user-organization work with ASU software.

Plans of ASU software without change of control algorithms are tested, corrected on the basis of the test results and copies are made and sent to the purchaser, that is,

all the types of work are done which are needed for giving the ASU software a commercial form and for the wide introduction of those facilities into ASU's for organizations and enterprises of various sectors of the national economy. In case of necessity software is modified according to users' orders.

Centralized maintenance of software becomes a necessary element of the software production industry, as it assures the possibility of deliveries of ASU software of guaranteed quality upon the orders of enterprises and organizations.

The first step in the organization of centralized deliveries of computer software by orders was the formation in 1974 of the NPO (Scientific-Production Association) "Tsentriroprogrammsistem." Its main task is providing enterprises and organizations of the country with ASU programs. The association includes the Scientific Research Institute of ASU Software, the ASU Planning and Design Office, a printing plant and the training methods consultation center.

The NPO "Tsentriroprogrammsistem" does the following work:

--compiles a specialized fund of algorithms and programs intended for automated control systems for sectors of the national economy, enterprises, organizations and objects of the non-industrial sphere;

--provides users (according to contracts) with ASU software and the documentation necessary for its operation;

--renders help in the introduction of software in ASU's (attachment to specific conditions and consultations);

--efficiently introduces changes in transferred software and documentation for it, starting from the results of analysis of its functioning;

--teaches specialists of organizations and enterprises which have concluded contracts with the NPO on the delivery of ASU algorithms and programs, and also on work with transferred software according to the course system;

--disseminates advanced experience in the development and application of ASU programs and issues informational, training, instructional and methodical materials.

The ASU Specialized Fund of Algorithms and Programs (Spetsializirovannyy fond algoritmov i programm--SFAP) includes standard ASU software which can be used in the development of ASU's of various types and levels of management.

ASU SFAP software is intended for the following goals:

--the organization and management of the ASU information base;

--automation of ASU programming and planning;

--solution of the tasks of functional subsystems of the ASU for industrial associations and enterprises (ASUP);

--solution of tasks of functional subsystems of sector ASU's (OASU);

--solution of tasks of functional sybsystems of ASU's for non-industrial objects (ASU NO), and also method-oriented applied packages of programs (PPP's).

In the formation of an ASU SPAF special attention is given to the complexity of the software. This means that the ASU SPAF includes, not uncoordinated, random

software, but PPP's of definite families, and each successive package of a family expands the functional possibilities of those available.

The following PPP families have been formed for the organization and management of the ASU information base in ASU SPAF's: of types SIOD, UNIBAD and OKA. Around the PPP's of those families are grouped functional software which accomplishes the tasks of ASUP subsystems. The ISUP PPP family, oriented toward the application of ISOD data banks, is an example of that.

Together with families of functional PPP's oriented toward definite data bases, in the ASU SPAF there also are autonomous functional PPP's which accomplish separate functions of control if the information base was formed by its own resources (PPP-Sbyt, PPP-UMTS and PPP-UTPP). The class of functional PPP-OASU's contains 11 PPP's which realize the subsystems of ASU-Pribor-2: the planning and records of managers and workers, production quality control, control of planning and capital construction, control of financial activity, etc. The class of functional PPP-ASU NO's is formed of software which accomplishes functions of control of objects of various sectors of the non-industrial sphere. Packages of programs present in the ASU for organizations of wholesale and retail trade, transport, material and equipment supply, social insurance, scientific and technical information services, etc. The class of method-oriented PPP's contains software for the solution of tasks of linear, nonlinear, integer separable, partial-integer programming, network planning and management.

On 1 January 1979 the ASU SFAP included more than 150 standard software devices which permit orienting programs for ASU's for enterprises and organizations of various levels of management and sectors of the national economy. Organizations of different ministries and departments of the USSR participate in compiling the SPAF. Also received in a SPAF is software developed by organizations of the CEMA countries within the framework of the Unified Coordination Plan of the Intergovernmental Commission on Collaboration of the Socialist Countries in the Area of Computer Technology.

In 1978 the NPO "Tsentriroprogrammsistem" delivered on the orders of 600 organizations of the country over 2000 items of software and more than 1000 specialists of user organizations received training at the association.

The realization of progressive control methods and algorithms in PPP's raises the scientific and technical level of the ASU's and correspondingly the effectiveness of their functioning.

The total fund volume ought to reach 8 million instructions in 1980, and 22 million in 1985.

For the further development of the ASU software production industry in the USSR a large group of measures is being accomplished on the formation of the State Algorithm and Program Fund (Gosudarstvennyy fond algoritmov i programm--GosFAP). Materials from the central, specialized (intersector), sector (departmental) and territorial (republic) funds and their branches and departments are directed into it.

The GosFAP system includes a large number of organizations which form the sector and specialized funds of algorithms and programs for ASU's of enterprises, associations

and organizations of all sectors of the national economy, and also for the ASU's of technological processes and scientific research and developments.

In the central fund a General Catalog of GosFAP Materials and a State Program Register are compiled, a central information and reference service is organized on materials relating to the activity of organizations hllding GosFAP funds, and information about software is published and distributed.

Specialized (intersector) funds and their branches and departments contain and distribute materials on software with a definite profile, intended primarily for use at enterprises and in organizations and institutions of corresponding sectors of the national economy.

Sector (departmental) funds and their branches and departments (oblast and urban funds) contain and distribute materials on software intended primarily for use at enterprises and in organizations and institutions of the corresponding sector of the national economy.

Territorial (republic) funds and their branches and departments contain and distribute materials on software intended primarily for use at enterprises and in organizations and institutions of republic subordination situated on territory assigned the given fund.

The GosFAP is formed and functions on the basis of a unified procedure for the formulation, reception into the fund, making up a complete set, transmission to users and use of fund materials. That procedure is established by the "Charter of the USSR GosPAF" and instructions issued on the basis of it: "Instructions on the procedure for preparation and formulation of materials presented to the USSR GosFAP," "Instructions on expertise and reception of materials in the USSR GosFAP" and "Instructions on maintaining the State Program Register."

Organizations maintaining the specialized, sector and territorial funds of algorithms and programs have started working on software maintenance and supplying it to users. To satisfy the requirements of organizations and enterprises of the country for software more completely in the Tenth Five-Year Plan by organizations of various ministries and departments of the country, under the leadership of the USSR State Committee for Science and Technology a complex program on the creation of over 100 items of ASU software for mass use is being implemented. The work will also be continued in the next Five-Year Plan.

Much attention is being given to the study and dissemination through the ASU SFAP of advanced foreign experience in the creation of ASU on the basis of software. The results of work of the Unified Plan of Collaboration of CEMA Countries in the Area of the Application of Computer Hardware are being used to create ASU PPP's. Several hundred ASU's are being developed with use of PPP's included in the Soviet part of the joint fund of applied programs.

In the country, therefore, the foundations have been laid for an industry for ASU software production, one manufacturing and delivering software as ordered by users. The organization of centralized ASU software maintenance will permit in a short time raising the scientific and technical level of ASU's, reducing expenditures on their design and increasing the effectiveness of their functioning.

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INCREASING THE EFFECTIVENESS AND METHODS OF COMPLEXING THE YeS-1040 COMPUTER

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[Article by P. Jaepel, candidate of technical sciences (GDR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] Starting in the 1970's the coupling of several computers acquired increasing importance on an international scale. The principal reasons for this are the following.

On the one hand, unification of several computers in a multimachine complex of major users facilitates the servicing of equipment, improves the organization of labor and increases the loading of machines. During interaction of the corresponding components of an operating system and the programs of the user of that complex the main tasks of the user can be solved more rapidly, reliably and with better results. On the other hand, a multimachine complex provides the possibility of increasing the reliability of solution of the task, for example, during failure of one processor the solution of tasks is automatically continued by another processor.

In addition, the possibility arises of creating complex systems constructed of computers of several levels of the hierarchy (including control computers), and also uniting computers for purposes of remote processing (for example, uniting a computer processing data with a computer controlling channels).

At the "Robotron" Scientific Production Combine the coupling of computers has been studied for several years. A number of computer couplings have been accomplished, in particular the coupling of YeS-1040 models with one another, and also with small computers. The necessary prerequisites have been created for coupling the YeS-1040 with the YeS-1055.

A survey of the principles of the coupling of YeS computers, starting from their apparatus possibilities (Figure 1), is given below.

Direct signal control. Direct control is (starting with machine No 46) a function of the central processor of the model YeS-1040 computer. It serves for the exchange of control information between coupled central processors. One bit can be transmitted through direct control on a single instruction. Data exchange between central processors through direct control is impossible. Direct control is used in

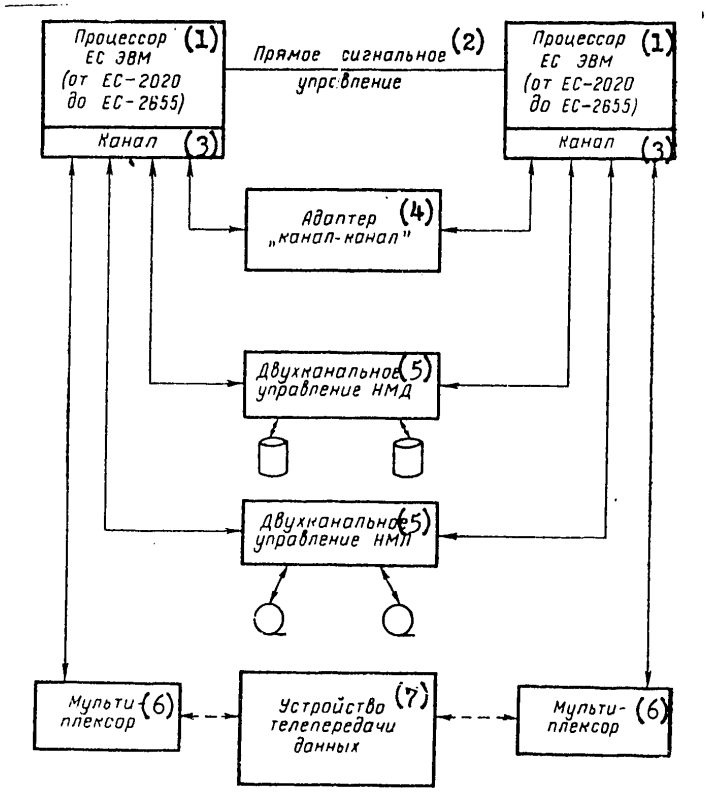

Figure 1. Methods of coupling computers with one another.

1 -- YeS computer processor (from YeS-2020 to YeS-2655)
2 -- Direct signal control
3 -- Channel
4 -- Channel-channel adapter
5 -- Two-channel control of magnetic disk stores
6 -- Multiplexor
7 -- Long-range data transmitter

Interaction with other methods of control, for example, jointly with a two-channel storage control unit or a direct-access storage for coupling the model YeS-1040 with small computers.

Direct signal control is accomplished by the component "Warranty of several computers" of operating system version 6.0.

Coupling through a channel-channel adapter. A channel-channel adapter represents one of the main possibilities of coupling one computer with another. By means of that adapter, and also by direct control and jointly used means of direct access (disks), multimachine systems are realized. A channel-channel adapter represents an information line between the channel of a model YeS-1040 and the channel of a

model YeS-1055 (the connection of another YeS computer of the first or second line also is possible). In that case the central processor is considered a control device. The distance between computers can reach 60 meters.

Data are transmitted in a regime of maximum loading through a multiplex unit or a selector channel with the velocity of a slower channel.

A channel-channel adapter functions in one of two regimes: a regime of compatibility or an expanded regime. In the regime of compatibility the adapter performs the orders of a model YeS-1040 (that is, all YeS computer mofels of the first line) and in the expanded regime, new functions of YeS computers of the second line. Switching from regime to regime is accomplished by special instructions during the working time of the adapter.

The contents of some registers and the indications of state of the channel-channel adapter were shown on the YeS-7069 operator's panel. From that panel the channel-channel adapter is transferred to the autonomous regime or the regime of work with a computer.

The channel-channel adapter is used in two variants:
--data exchange between two computers through the channel-channel adapter;
--optimization of the distribution of developed user programs among several coupled computers by transmitting information through the channel-channel adapter.

In accordance with those variants in the YeS OS operating system there are two kinds of program components of different levels, the S-26 and S-15.

In component S-26 of the YeS OS operating system, version 6.0, provision was made for means of transmitting information between YeS computers of the first and second lines through a channel-channel adapter. The information is transmitted in the form of data units.

Component S-15 of the YeS OS operating system version 6.2 serves for the control of complexes of several coupled computers, that is, for example, for the coupling of the model YeS-1040 with a computer of the second line through a channel-channel adapter and jointly used peripherals.

Component S-15 of the modified YeS OS operating system assures centralized monitoring of the entire system through the leading computer and the working computer (Figure 2).

The leading computer also distributes tasks over the working computers, and the peripherals over user programs and controls the system input and output.

Thanks to the combination of several computers in a complex the large user has at his disposal a highly productive and readily serviced system which assures reliability in the presence of computer or operating system errors. A combined chain of tasks is recorded on an external store, and so when there is a failure of the working or leading computer restart is possible, restart which is to a considerable degree automated by means of component S-15. It simplifies the preparation and organization of the total running of a program and thanks to that facilitates servicing. This is especially advantageous to users who have a need every day for a high carrying capacity of articles during work with various data carriers.

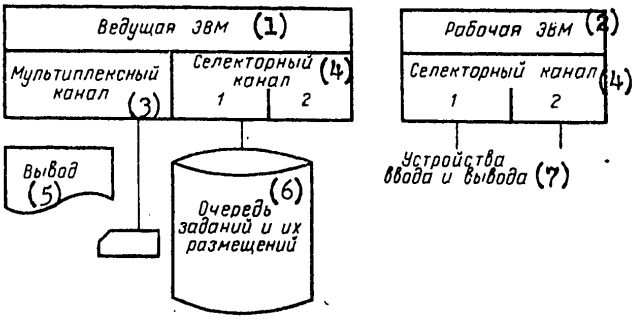

Figure 2. Coupling of several computers.

1 -- Leading computer
2 -- Working computer
3 -- Multiplex channel
4 -- Selector channel
5 -- Output
6 -- Line of tasks and their arrangement
7 -- Input-output devices

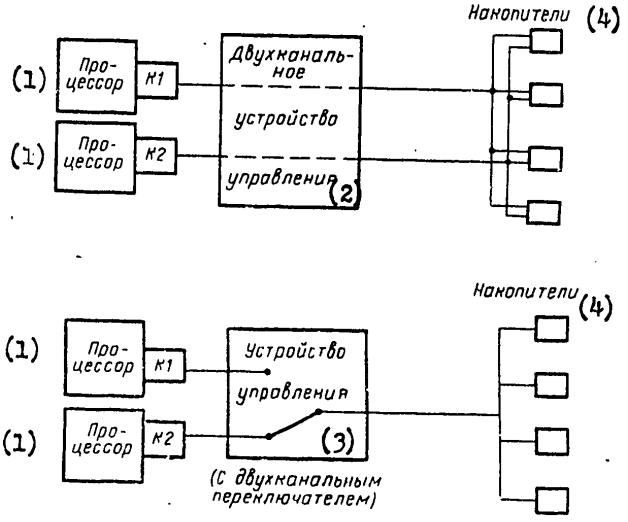

Figure 3. Circuits for connection of a two-channel control device and a control device with a two-channel switch.

1 -- Processor
2 -- Two-channel control
3 -- Control (with two-channel switch)
4 -- Stores

Single-channel operation. According to this principle several computers can be coupled in two variants, with two channels and with a two-channel switch (Figure 3).

Control devices with two channels. At the present time in YeS computers there is a YeS-5521 control device with two channels for control of magnetic disk stores. By means of that device simultaneous transmission of data between the immediate-access momory and to magnetic disk stores is possible. The device consists of two control units, and only some central functions are performed together.

Control devices with a two-channel switch. In a YeS computer there are the following control devices with a two-channel switch (for magnetic disk stores): the YeS-5555 for 7.25-Mbyte disks, the YeS-5561 and YeS-5568 for 29-Mbyte disks and the YeS-5566 for 100-Mbyte disks. The development of control devices with a four-channel switch for 100- or 200-Mbyte plug-in magnetic disk store is planned. A control device with a single switch assures data transmission only between the main memory and one peripheral, but in that case parallel data transmission to two or more devices simultaneously is impossible. In the use of those two variants the differences consist only only in the effectiveness and carrying capacity of the tasks.

For the connection of several channels to a single control device there are two methods of complexing: connection to the central processor and connection of two central processors to a single device. The two methods are used in the coupling of control devices to the YeS-1040 and couplings of several YeS-1040 computers with one another and with small computers.

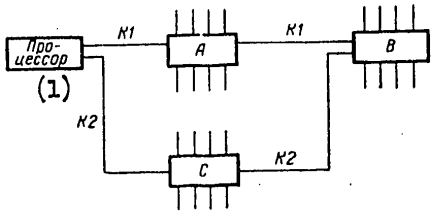

Figure 4. Circuit for connection of several control devices to one processor.

1 -- Processor

In the first method (Figure 4) contral devices A and C are connected to a single channel and device B to two channels. Connection with device B through channel K1 is impossible; if at that moment the device is serviced on control device A, the connection can be made through channel K2.

In the second method (Figure 5) both the central processors have access to the same stores, that is, to the same files. If a connected device controls a store with direct access, then a separate file can be reserved for work with a single central processor. The control device can alternately establish a connection between the central processors and various stores.

Figure 5. Circuit for connection of two processors to a single control device.
1 -- Processor 2 -- Control device

The store is reserved by the operating system during the time of a single input-output operation and can be envisaged for a longer time through a macrostructure in the user's program (maximally to the end of completion of the task).

By means of those control devices a number of couplings of the YeS-1040 computer model with itself and with small computers have been accomplished according to the multichannel work principle.

Coupling through a long-range data transmitter. Needed to realize this method of coupling is the so-called duplex regime, in which a communications channel can transmit information simultaneously in both directions. In that case the multiplexors are connected to the computer multiplex or connector channel and works with a standard input-output interface of a YeS computer, just as any other control device.

Information is transmitted through the long-range transmitter at a relatively low rate. During the simultaneous control of channels, the processor and multiplexers the data from k computers can be transmitted at a higher rate in a time-sharing regime.

Evaluating the above-described possibilities, we can conclude that the following variants of coupling will be realized by the mid-1980's:

1) an input-output adapter with and without direct signal control;
2) two- or multichannel devices for the control of stores with direct access (with and without direct control);
3) combinations of variants 1 and 2.

Complete assurance of coupling through a channel-channel adapter in a YeS OS operating system, version 6.0, is envisaged, starting in 1979.

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STANDARDIZATION OF COMPUTER INSTALLATION IN THE HUNGARIAN PEOPLE'S REPUBLIC

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[Excerpts] Hungary actively contributes to the implementation of plans of socialist integration being expanded on the basis of the Complex Program for the Development of Computer Technology, adopted by the CEMA countries, and from the very start participated in the development, production and complex servicing of YeS computer equipment.

Our national economy is concentrating more efforts in the present Five-Year Plan period than earlier to implement the plans for the development and application of computer technology. Thanks to that by the end of 1980, with a doubling of the number of used facilities, the percentage of imported YeS computers will amount to about 80 percent of all installed machines. Such a change in the homogeneity of the computer pool causes a need for an identical approach to questions in the planning and allocation of computer centers within the framework of complex maintenance.

[66-2174]

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OPERATION OF SM COMPUTERS (SM-3)

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[Article by P. Sh. Yankelevich, candidate of technical sciences, and Shepinskiy, L. A., engineer (USSR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] At the present time the SM (small computer) system, jointly developed and produced by the socialist countries, is becoming more and more widely distributed. Those machines are being constructed on a modern design-element base with the use of integrated microcircuits with medium and high degrees of integration.

During the introduction of new computer facilities a number of questions connected with their generation usually arise. In this article information is presented about the organization of the computing process and the technical operation of the SM-3.

The machine has been in operation at the computer center of the Institute of Electronic Control Machines for one year and includes:

--an SM-3P processor with a timer;
--an SM-3100 main storage (OZU-P-32K-18/1);
--an alphanumeric terminal based on an SM-7206 (VIDEOTON 340);
--a punched tape input-output device based on an SPTP-3 mechanism;
--a serial alphanumeric printer based on an SM-6302 mechanism (DZM-180);
--an IZOT 1370 magnetic disk store (SM-5400).

Work on the SM-3 computer was organized in an interactive mode, that is, in a mode of direct communication of the user with the machine. Such an operating mode is stipulated by the character of the tasks to be solved--the debugging of the SM computer software and the development of automated control systems. Users' tasks are not run by computer center operators. The machine works around the clock.

Used as the main operating system is the general-purpose DOS SM disk operating system. For the development of a complex of programs connected with the automation of research experiments and the creation of a hierarchic distributed information s tem, a real-time disk operating system and a background in-line operating system FOBOS respectively have been introduced.

Experience in the operation of disk operating systems has shown that in organizing a computing process on an SM-3 computer it is advisable to have working, system and personal disks and collective-use disks.

A working disk is a disk with which each programmer working on a computer can work. The preservation of information in it is not assured. A fixed disk is used as a working disk.

By a personal disk is understood a disk assigned to a certain user. On that disk is stored all the necessary information relating to the task being solved or being debugged and, if it is needed, the operating system under the control of which it is run.

While a program is being run on a computer, to avoid losses of information stored on the personal disk, which can occur due to equipment failures or user errors, the contents of that disk are re-recorded on a working disk and further work is done with a fixed disk. When the work on the machine is concluded the information is returned from the working disk to the personal disk.

The collective-use disk can be presented for work by several users solving or debugging various problems in the general case. That disk is used for work with programs containing a limited volume of information. To avoid overfilling the collective-use disk the engineer-programmer engaged in maintenance of the computer software, after suitable weekly verification, reports to the users about possible overfilling of the disk, and in case of necessity helps to compact it with removal of programs obsolete and not used now.

System disks are disks containing various generated operating systems under the control of which the users' tasks must be run. System disks are used to re-record the necessary operating system on a working disk, in the solution or debugging of tasks of users not requiring storage of the results on a plug-in disk.

Plug-in disks are used as system, personal or collective-use disks. To protect very valuable information stored on plug-in disks (debugged programs, developed programs, etc), those disks are duplicated.

Every month catalogs of all the plug-in disks are printed and the information on them is checked. Such monitoring of the carriers permits revealing faulty disks for subsequent restoration and verification of the effectiveness of the use of carriers in the course of a month.

Magnetic disks are stored in the general file of magnetic carriers on specially equipped racks. The climatic conditions in the file room are kept close to those of the machine room.

The preparation of data--of large information files--is accomplished in the perforator room of the computer on tape perforators. In the absence of such devices the data can be prepared on punched cards and subsequently transferred to a machine with card input. In the computer center of the institute this is done on an M-4030 computer in parallel with solution of the main tasks. During debugging of programs on an SM-3 the information is corrected directly at the operator's panel (on a video terminal).

The technical operation is accomplished by three associate workers. The servicing of the processor, the main memory and the input-output controls is done by a single engineer, a computer specialist. He is the computer chief. An engineer who is a computer specialist is also allocated for servicing the magnetic disk stores. A machinist maintains and regulates the peripherals.

An engineer programmer services the software (generates operating systems, introduces new versions, monitors the condition of disk carriers, etc) and consults with users.

During expansion of the small machines pool the service group must be increased by about 30 percent for each additional SM-3 computer.

Since the computer works fairly reliably, engineers are not needed for the SM-3 on all shifts. The servicing personnnel works only the first shift. After appropriate instruction all users work on the machine independently. In case of equipment failure the user must disconnect the machine and make the necessary entry in the machine-time log.

When the machine is working around the clock, maintenance takes 1-1.5 hours a day, weekly maintenance 3 hours, and there is no monthly or quarterly maintenance. Annual preventive maintenance is planned. Notes regarding computer failures and defects are recorded in a special machine-time lag.

During daily maintenance, work is done in accordance with the requirements for the operation of peripherals, in particular the peripherals are cleaned, devices about the functioning of which comments have been made in the evening and night shift logs are tested and reinstalled and the working efficiency of the machine is verified on a program for testing a disk operating system.

During weekly preventive maintenance the operation of the machine is monitored. The main memory, disk stores and input-output devices are tested. The installation of the magnetic heads is inspected on a test cassette and the correctness of the reading of information from individual magnetic disks is monitored. When there are several machines it is necessary to verify the compatibility of all the available magnetic disk stores. Weekly preventive maintenance also is conducted to perform necessary monthly and quarterly preventive maintenance on individual peripherals in accordance with the preventive maintenance schedule previously established on the basis of instructions on the technical operation of the machine.

Operation of the SM-3 for a year has shown that the largest number of failures and defects occurs on the magnetic disk store. This began to be manifested especially when the number of employed packages increased (over 50 units). The main fault is that during the recurrent insertion of a plug-in disk the information previously recorded on it is not read off. To achieve normal functioning the disk has to be re-inserted, changing the position of the sectors in relation to the synchronous pulse sensor.

The collector motors work insufficiently reliably in IZOT 1370 magnetic disk stores. To avoid noise resulting from sparking of the motor, it is necessary to clean it at least once a month. At the present time in the institute an IZOT-1370-V magnetic disk store with a collector-free motor has been installed on an SM-3 machine; it is much more reliable in operation and produces no noise.

Failures of other devices have been observed relatively rarely. In the course of a year the plates controlling the main stores and two integrated circuits K559IP1P and K559IP2P in the interface units of elements of the DZM-180 alphanumeric printer were replaced. The power source of the magnetic disk store control has failed twice and the DZM-180 printing head once.

Experience in the operation of the SM-3 in the course of a year has shown that during qualified technical servicing, including regular preventive maintenance and repairs, the machine functions sufficiently reliably. The number of failures and defects encountered is not large. The total useful working time of the machine is 3310 hours, of preventive maintenance is 426 hours and of downtime due to equipment repairs is 112 hours per year. A group consisting of three specialists can completely assure the working efficiency of an SM-3 computer. To achieve most effective use of the machine it is necessary to correctly organize the computer process, giving special attention to the work of programmers with magnetic carriers and to the assurance of protection of the information recorded on them.

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GENERAL YeS COMPUTER AND SOFTWARE SUPPLIES AND SERVICING IN THE POLISH PEOPLE'S REPUBLIC

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN. SBORNIK STATEY. VYPUSK 7 (Computer Technology of the Socialist Countries. Collection of Articles. Issue No 7) in Russian 1980 signed to press 6 Mar 80 pp 121-131

[Article by B. Mroczek, master engineer (Polish People's Republic) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] The system of general deliveries requires of an enterprise a constant rise in the volume of computer hardware and software deliveries and also an expansion of efforts connected with the preparation, debugging and transfer of computer systems into operation. The expanded volume of servicing of users flows from the growth of needs, often singular and individual, from their complex realization by a general contractor.

Within the framework of general delivery the Wroclaw Center of Computer Systems for Automation and Measurements ("Mera-Elwro") provides users with the following:

--comprehensive information about hardware or software;

--a plan of the computer system;

--the delivery of hardware and software (basic and applied) and putting it into operation;

--the delivery of selected modules of applied software;

--instruction of personnel;

--warranty and post-warranty servicing;

--delivery of spare parts and service equipment;

--maintenance of software.

The computer system plan takes into consideration the development of the technology and organization of the center's work; selection of the necessary technological and auxiliary development of an ideogram for the realization of investments, technical and economic substantiations and a technical plan for the realization of investments.

The establishment of contacts and the initial collaboration of the general contractor with future users of computer systems are accomplished by means of:

--the organization of exhibitions of hardware;

--participation in fairs;

--advertising activity;

--presentations of information and advertising materials;

--the organization of seminars, conferences, symposiums, meetings, etc;

--conducting special consultations on specific applications of computer hardware, technological possibilities and the designation of proposed facilities, the technology and organization of the work of the computer center, documentation on construction, procedure in the realization of capital investments and training of personnel of the center.

The selection, making up complete sets and delivery of computer hardware in accordance with the needs of user constitute the main tasks of the general contractor. The difficulty of this problem increases especially in the delivery of YeS system hardware to a broad range of suppliers.

The YeS-1032 layouts delivered by the "Mera-Elwro" center are made into sets produced by the center itself and other enterprises in Poland such as "Meramart," "Mera-Blonie" (Blonie Plants of the Mera Association) and "Mera-Elzab," and devices arriving from foreign producers of YeS computer hardware.

Delivered YeS facilities. Table 1 presents a list of YeS devices delivered by the "Mera-Elwro" General Deliveries Office to local processing systems, interactive and other systems with use of long-range transmission equipment and delivered to foreign and domestic users.

The next step in increasing the volume of general deliveries is deliveries of auxiliary equipment of computer hardware centers, in particular of facilities for storage and transportation of information carriers.

Organization of and procedure in complexing systems. All equipment obtained from suppliers in this country and abroad undergo at "Mera-Elwro" a cycle of monitoring in the stage of delivery, being subjected to functional inspection and inspection for application on the basis of technical specifications agreed upon with the manufacturers.

A system with a definite layout ordered by the user is made up from tested and manufactured components. Each system made complete undergoes a test operation lasting several hundred hours, with the application of monitoring tasks and applied programs. That procedure greatly reduces the debugging time of the user's system and facilitates its organization.

The volume of delivered software. An inseparable part of the general delivery of the YeS-1032 system is the basic software, including operating systems and programmed technical servicing procedures (diagnostic programs). For the YeS-1032 a YeS DOS disk operating system version 2.0 and a YeS OS operating system version 4.1 are delivered in the main. Those systems assure effective functioning of the YeS-1032 regardless of the tasks performed by them and their layout.

Table 1

Devices	Model	Manufacturer, country
Central processor with 256-1024-Kbyte main memory	YeS-2032	"Mera-Elwro," PPR
Main memory unit with 256-Kbyte capacity	-	"
Input-output devices		
Operator panel	YeS-7076	"Mera-Blonie," PPR
Alphanumeric printer	YeS-7033	"
Punched card reader	YeS-6016	CSSR
Card punch	YeS-7014	"
Punched tape reader	YeS-6022	USSR
Tape punch	YeS-7022	"
Screen monitor control (local)	M-7904	"Mera-Elzab," PPR
" "	YeS-7916	"
" " punch	M-7980	"Mera-Blonie," PPR
Auxiliary stores		
Magnetic tape store control	YeS-5517	USSR
" " "	YeS-5019	"Maramat," PPR
29-Mbyte magnetic disk store control	YeS-5561	Bulgarian PR
" " " "	YeS-5061	"
Data transfer units		
Data transfer processor	YeS-8371	"Mera-Elwro," PPR
Keyboard character punch	YeS-8575	"Mera-Blonie," PPR
Screen monitor remote control unit	YeS-7905	"Mera-Elzab," PPR
Dependent screen monitor	YeS-7910	"
Independent screen monitor	YeS-7950	"
600-2400-b/s modems	YeS-8006	"Telkom-Teletr,"
	YeS-8013	PPR

In the operating systems delivered for the YeS-1032 computers the requirements have been taken into consideration for such new methods of application as:

--access to the computer through means of remote transfer (BTAM and TCAM access methods);

--work in an interactive regime (CRJE);

--remote job entry and simultaneous access of several users (RJE, TSO).

The following are delivered for technical servicing: autonomous KNTR tests, a DTEC test monitor, tests locating failure of the processor and DTLU channels, OLTER system tests and the OLTSER independent test system.

The second part of the delivered software for YeS-1032 computer systems is a group of programs from various areas of application.

Applied software is programs and systems for scientific and technical applications, and also packages of programs for the planning and management of an enterprise, starting with the technical preparation. The following programs and packages are now being delivered:

1) for scientific and technical calculations--a library of mathematical modules, a transport program, a linear programming system, a system of modelling and simulation of discrete processes MASPE/103, the SYSWI system for retrieval of library information, the GPSS system for general application simulation, the SOWA engineering calculations conversion system, the ECAP package of programs for electrical circuit designing, the WINT interactive system for scientific and technical information retrieval, the MATLAN matrix calculation system, the CSMP system for simulating continuous processes and a solutions table translator;

2) packages of programs for data and arrays handling--the SIGNAL generator of programs for data and arrays handling, the POD data handling package and the SOIZZ arrays creation system;

3) packages for control--a system for monitoring plan realization; the SPSR manpower planning system, the TPP card organization system, programs for retrieval of the structure of an article, a needs planning system and a stocks control system;

4) programs for "Orda-1300" conversion to YeS--conversion of "Orda-1300" tape files to the YeS computer, translation of COBOL from the "Orda-1300" computer to the YeS computer and translation of FORTRAN from the "Orda-1300" computer to the YeS computer.

The applied software delivered by the YeS-1022 computer general supplier, thanks to its universality, can be applied in various areas of the national economy.

In the "Mera" Association a second enterprise engaged in the dissemination and maintenance of applied software and automatic planning is "Mera-sistem."

Technical servicing of YeS hardware. In 1979 eight models of YeS computers were in operation in Poland: the YeS-1010, YeS-1012, YeS-1020, YeS-1021, YeS-1022, YeS-1032, YeS-1040 and YeS-1050--a total of about 100 systems.

The role of "Elwro-servis" in the area of complex servicing of YeS hardware starts with an agreement with the Foreign Trade Office on making up sets of imported equipment, the conditions of their delivery and a service contract.

"Elwro-servis" accomplishes complete and direct technical servicing only for YeS-1032 systems. The YeS-1020 and YeS-1022 systems are provided technical servicing in collaboration with the Electronic Computer Plant (Poznan), and the YeS-1010 and YeS-1012 in collaboration with the "Telkom-Teletr" enterprise (Poznan). The single systems Yes-L040, YeS-1050 and YeS-1021 are serviced by the NOTO (National Organization for Technical Servicing) of the supplier country, just as "Elwro-servis" accomplishes technical servicing of YeS-1032 systems in the CSSR and Hungarian People's Republic.

External connections of "Elwro-servis." The needs of users of YeS hardware are simultaneously assured thanks to the external connections of "Elwro-servis," established in two ways:

1) by service contracts (in Poland and abroad) with the manufacturers of components of the YeS-1032 system. Those contracts are the basis for the technical servicing of operated facilities and guarantees: the instruction of specialists in servicing at the hardware manufacturer's plant, the provision of documentation for

service purposes, systematic and emergency deliveries of spare parts and subassemblies, help equipment manufacturers to eliminate difficult cases of hardware failures at the user's, and the transfer by the manufacturer of documentation on changes in the hardware.

Service contracts have been concluded with a number of Polish computer hardware manufacturers--with "Mera-Blonie" (printers), "Maramat" (magnetic tape stores), "Mera-Elzab" (system monitors), and contracts with foreign-country manufacturers--the Bulgarian People's Republic (magnetic disk stores), the USSR (controls for magnetic tape and magnetic disk stores) and the CSSR (punched card devices).

2) bilateral agreements on organizational and technical collaboration between the NOTO's of manufacturing countries. The most important benefit flowing from the agreements is the possibilities of exchange of experience for the purpose of improving the servicing methods, and also help during the servicing of mutually delivered YeS facilities. "Elwro-servis" carries out this collaboration on the basis of agreements concluded with the NOTO's of the USSR, Hungarian People's Republic, GDR and CSSR.

The main organizational and technical aspects in the activity of "Elwro-servis" are:

--effective adjustment and expansion of systems;
--efficient and effective intervention of the service in emergency situations of hardware;
--help in the introduction of both technical servicing and in the area of software;
--provision with spare parts and subassemblies.

These problems are being solved on the basis of the above-described facilities.

The technical servicing network in Poland. The basis of effective functioning of technical servicing of YeS-1032 systems is a technical servicing network with a base in Wroclaw and departments (service stations) in other cities. Such an allocation of the organizations, which takes into account the location of service stations near the largest number of systems in a given territory, guarantees rapid contact of the user with the sphere of servicing. The work done by the network is coordinated and monitored by a central dispatcher at Wroclaw. The network departments have an identical structure:

--a departmental dispatcher service,
--a group of service coworkers,
--a warehouse of spare parts and subassemblies,
--a repairs workshop, and
--means of transport and communication.

The technological base. Due to the variety of sources for deliveries of YeS-1032 system components, "Elwro-servis" is investing considerable efforts in the stage of preparation and introduction of new types of equipment into the system. The first phase of that stage is instruction at the manufacturer of a leading group of service workers in the area of the development, operation and servicing of equipment. That group conducts a preliminary operation of equipment before delivery to the user and installs the first equipment at the user's facility. The experience accumulated in the process of preliminary operation of equipment and operation in the course of its use is used to improve methods of technical servicing of facilities and increase their reliability.

Principles of spare parts and subassembly supply. The sphere of servicing includes a central spare parts warehouse in Wroclaw and also warehouses at service points. Spare parts for warehouses at service stations are delivered in two conditions:

--in normal conditions--periodic replenishment of stocks (every 3 weeks on the average);
--in emergency conditions in the course of a number of hours (up to 24) (this time depends on the means of transport--aircraft or truck).

In an emergency situation the user has access to the service point warehouse; the central warehouse is the source of replenishment of stocks of the principal spare parts according to plan.

Directions in the development of YeS technical servicing. The steadily growing needs and requirements of users for elevation of the level and increase of the volume of hardware use are stimulating the development of "Elwro-servis" activity:

--the efficiency of technical servicing is growing (the time required for the start of repairs and the time required for the completion of repairs are being curtailed), and this is achieved mainly through wide replacement of subassemblies and functional units in defective equipment;
--the assortment and number of spare parts in the technical servicing network are being increased;
--repair efficiency is increasing and the level of reliability of hardware is being greatly raised as a result of expansion and intensification of collaboration of "Elwro-servis" with the equipment manufacturers and the NCTO's of countries participating in the agreement.

The software service. The software archives and maintenance service, which has been a part of the PPR NCTO since the day it was founded, in 1978 adopted the name of the Program Fund and Maintenance Service (Fonda programm i sluzhba soprovozhdeniya--FPSS). It performs all the tasks in the area of YeS system software.

The FPSS tasks are:

--the formation of program funds, the making up of sets of and the maintenance of software;
--help in technical servicing during debugging of the system;
--generation and testing of operating systems for various configurations and applications;
--the introduction of changes and supplements in the software;
--the introduction and operational testing of software at the user's;
--inspection of the delivered software (consultations, claims for possible errors);
--informational activity.

To perform these tasks the FPSS has at its disposal well-prepared specialists and a polygraphic base.

The software received from users and included in the FPSS is inspected regardless of which inspections it underwent earlier. The purpose of the inspection is to eliminate errors detected during previous tests. The received samples are counted and transferred for preparation of accompanying standards (tapes and program

documentation). Simultaneously the information service prepares catalog cards to bring the user's catalogs up to date and prepares more extensive information for the information bulletin of the "Mera-Elwro" center. Additional information is compiled for the automated information system functioning within the framework of the International Scientific and Technical Information Center. In addition, users obtain information quarterly on changes and new versions in the form of printouts from the computer-aided control system introduced in the NOTO.

Using the catalogs and all the available information, users order software from the FPSS. For foreign users the delivery is accomplished on the basis of a concluded contract. The basic software (tests, operating systems, control tasks) are delivered within the framework of the contract for the delivery of hardware and is transmitted to users during the hardware debugging time. The transmission and introduction of the basic software are an integral part of the debugging which is set in the protocol for transfer of the system into operation.

Special software as a production product has a guarantee, and all the information about errors which have arisen is assembled and analyzed by a designated group of specialists. They study the problem in detail and if its importance is confirmed transfer a given program to the user in order to introduce changes and eliminate errors.

Changes and supplements are transmitted by the FPSS to all users of the given program.

Effective control of complex servicing of users. To automate the maintenance of special software and effective management of spare parts, in "Elwro-servis" an information system has been developed for which the data base consists of the fund of information about the special software, the fund of information about the user and the data fund.

Direct access to primary and processed information is accomplished by means of displays.

The information system is used by the servicing organizations for effective control of the presentation of services. Rapid access to the basic information about the user permits:

--monitoring the delivery dates of computer systems;

--monitoring the dates of receipt of premises, debugging and the warranty expiration dates;

--observing the list of equipment in the warranty period, the list of overdue debuggings, the list of equipment in the debugging stage and the list of overdue deliveries;

--monitoring deliveries of basic software and programs delivered to users by means of:

  --information about delivery dates;
  --information about types of carriers of separate special software modules;
  --information about file numbers of users;
  --preparation of daily lists of special software not delivered to users;

--current preparation of lists of users who have non-current special software carriers;
--receipt of claims and monitoring the periods of their formation;
--analysis of special software deliveries from the point of view of compensating expenditures;
--compilation of specifications of carriers and program documentation.

The information system facilitates decision making and monitoring the work of individual servicing organizations.

Collaboration between the FPSS within the framework of the YeS computer system. The collaboration with the FPSS of other countries and organizations acting within the framework of the YeS computer system applies to:

--coordination of plans in the development of basic software;
--active participation of specialists in the development of software standards;
--participation of PFSS representatives in national and international tests;
--currencyfree exchange of special software between FPSS;
--organization of translation of program documentation.

Collaboration in that area has permitted:

--steadily supplementing deliveries of hardware with all necessary software;
--developing special software standards effective in CEMA countries, thanks to which a modified form of special software documentation and unified principles of storage of originals and standards of machine carriers of information and documentation have arisen. This has eliminated the need to modify the documentation and has greatly facilitated its maintenance;
--eliminating duplication of work connected with the development of basic software by introducing a principle according to which each device included in a YeS computer must be provided with special software by the maker of that device.

The system for instruction of YeS computer users. The "Elwro-servis" as an NOTO organization is engaged in instructing YeS users in the area of hardware and software servicing.

In performing the duties of a general contractor the instruction center trains qualified personnel of users of the YeS-1032 cystem. It also coordinates instruction in the area of the YeS-1020-1022 systems, conducted by the electronic computer plant in Poznan.

Quantitative indicators of the instruction process for the YeS-1032 computer are presented in Table 2.

The instruction of programmers applies to such areas as operating systems DOS YeS and OS YeS, the Assembler DOS YeS and OS YeS, the PL/1 DOS YeS and OS YeS, FORTRAN DOS YeS and OS YeS and COBOL DOS YeS and OS YeS.

Technical servicing personnel are instructed in two groups. Specialists of the first group study the system and become acquainted in detail with the central processor and interface circuits. Specialists of the second group study peripherals with consideration of the mechanical, electrical and electronic circuits of the equipment.

Table 2

Area of instruction	1974 courses	1974 persons	1975 courses	1975 persons	1975 courses	1975 persons	1977 courses	1977 persons	1978 courses	1978 persons	1979 courses	1979 persons	Total courses	Total persons
Software servicing	24	353	15	263	18	165	16	239	17	352	27	540	117	1913
Hardware servicing	-	-	15	213	15	350	43	533	67	863	58	1160	198	3119
Total	24	353	30	476	53	516	59	772	84	1215	85	1700	315	5032

One system specialist and two or three peripherals specialist guarantee complete working efficiency of the YeS-1032 system in a work shift.

To improve the effectiveness of instruction, starting in 1977 the principle of the modular system of instruction was adopted. A definite theme, repeated in different courses and in different alternatives, for example, logical architecture, power circuits, basic technology, etc, is considered a module. This instruction system is being introduced in states through the distribution of modules common to most peripherials, in the form of an introductory course, the production of modules relating to mechanisms of devices, etc.

To assure the required level of instruction those attending courses in the future must have higher specialized education and corresponding professional practice. For specialists in technical maintenance of hardware for data preparation and operators, secondary education is sufficient.

The main condition for the acceptance of students in courses in the technical servicing of hardware is satisfactorily passing an introductory examination in binary arithmetic and the principles of computer technology. The lectures are presented by staff instructors on leave from their work. The instruction time is stipulated by the type of equipment and the character of the course and fluctuates from 2 to 14 weeks. Theoretical classes are usually conducted in groups of 20-25 (4-6 hours per day) and practical courses in groups of 4-6, the number of lectures and practical sessions being practically identical. The training cycle consists in the gradual mastering of separate modules, and a test is given after the completion of each theme. The taking of all the tests is the main condition for admission to the final practical test on the location of defects and the elimination of simulated errors. Practical courses are conducted in specially equipped shops, and also in computer laboratories.

Much attention is given to practical courses and programming courses. The programmer becomes acquainted with the principles of operator servicing, and later receives one or two hours of machine time for the compilation and testing of independently developed programs. Practice of this type permits the programmer to become acquainted with the hardware; this is of great importance in his future work.

The "Elwro-servis" instruction center attributes great importance to the application of a broad gamut of modern audio-visual equipment (motion-picture and slide

projectors, epidiascopes, magnetoscopes and synchronoscopes). That equipment permits students to better master the training material, reduces the instruction time and reinforces knowledge better. The learning process is enriched by charts, photographs, diapositives and films; the closed circuit television system being introduced will serve the same purposes. Training materials prepared especially for course instruction are playing a large role in the teaching process; they supplement the operating documentation. Those materials are being prepared by designers and instructors in accordance with the methodical requirements.

The instruction center periodically organizes seminars, symposiums and lectures during which designers and leading specialists acquaint students with achievements of modern engineering and technology. The program of training courses in the area of YeS equipment is realized on the basis of documents developed within the framework of the Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology. Instruction is done mainly according to standardized programs and is based on general qualification criteria.

Within the framework of NOTO agreements the instruction center participates in conferences of the managements of centers, and also in direct meetings of instructors for the exchange of experience and the improvement and standardization of instruction methods. This is one of the elements of integration in the area of computer technology in countries participating in the agreement.

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THE YeS-1025 COMPUTER

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[Article by I. Klouda, engineer (CSSR) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] The YeS-1025 represents a small digital universal second-line YeS computer system (Figure 1). The computer is intended for the solution of various scientific, technological, economic and special problems in both autonomous conditions and in data processing systems, including systems working in real time and shared multi-computer systems. In relation to remaining second-line computers of the YeS system, bottom-up compatibility has been observed.

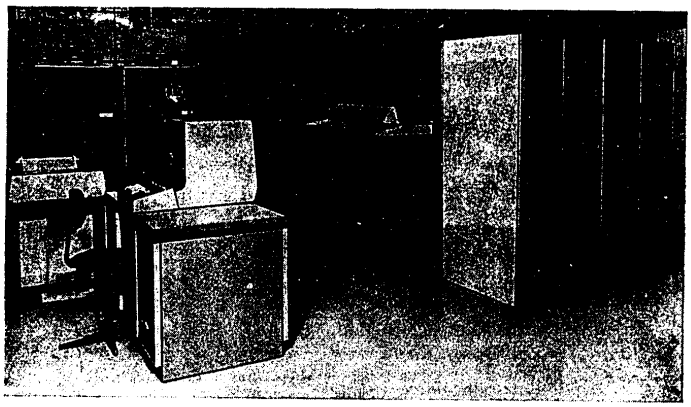

Figure 1. The YeS-1025 computer.

The YeS-1025 system includes a processor and a set of peripherals.

The processor has an aggregate structure and can include from six to nine independent modules (according to the user's order) and a power system.

The main processors of the module are:

--the service module (SRM), intended for the initial recording of micrograms (two floppy magnetic disk stores), for control of the operator's panel (display and keyboard) and for processing information about failures;

--the operational module (OPM), serving for conducting operations determined by commands;

--the organizational module (ORG), controlling the connection between modules and connection of modules with the main memory;

--the main memory (HP), with one or two 128-Kbyte modules;

--the disk module (DSK), intended for direct connection to four 100-Mbyte disk stores;

--the multiplex transfer module (MPX), serving for the connection of peripherals by means of a standard channel.

On the basis of the purchaser's requirements the following equipment can be installed:

--a tape module (PSK) for direct connection to six magnetic tape stores without a control device;

--a communication module (KOM) for connection of external lines.

Such a modular structure permits simultaneous performance of instructions, having a connection with peripherals and performing diagnostic and operator actions.

The enumerated modules assure the following functions:

--implementation of an instruction set;

--functioning of the system in basic or expanded control conditions;

--dynamic conversion of addresses for a virtual 16-Mbyte store;

--detection and correction of errors in the main memory;

--work of the control registers;

--identification of channels and indirect addressing of data in channels;

--recording of erroneous states;

--direct connection of YeS-5066 disk stores with a total capacity of about 400 Mbytes on the YeS-5067 store with the YeS-5667 control;

--work of the multiplex channel (not more than 10 controls for peripherals);

--connection of displays, the keyboard and the service floppy disk store on the operator's panel;

--central and autonomous connection and disconnection of the system in separate devices.

The equipment additionally permits directly connecting about six YeS magnetic tape stores and also connecting remote data processing terminals by means of 16 synchronous communication lines.

Technical characteristics

Clock frequency, MHz	8
Basic data flow width	2 bytes x 2 bits of control
Basic microinstruction cycle, ns	375
Control system	microprogram
Computer capacity, operations/s	33,000 (Gibson I)
Number of instructions	175
including:	
standard set	102
operations with decimals	9
operations with decimals with floating point	44
work with expanded precision with floating point	7
work with clocks	4
conversion	5
provisional exchange	2
servicing of protection key	2
Control memory	Possibility of recording in separate modules
Multiplex channel	For 10 control units
Carrying capacity, Kbytes/s	
in selector mode	33
in multiplex mode	24
Internal main memory	Semiconductor
main capacity, bytes	128K
expandability, bytes	up to 256K
Magnetic disk store	Possibility of direct connection
Capacity, Mbytes	Up to 400 (four devices with 100-Mbyte capacity or two with 2x100-Mbyte capacity)
Magnetic tape store	Possibility of direct connection
Number of devices	up to 6
Terminals	Possibility of connection through communition module of 16 synchronous communication lines
Power system	380/220 V + 10-15% 50 Hz + 1 Hz
Processor power consumption	5-8 kW, depending on configuration
Dimensions, mm	
cabinet	800x1600x1600
operator panel (without display)	750x1500x725
Processor mass, kg	
cabinet	950-1150
operator panel	280

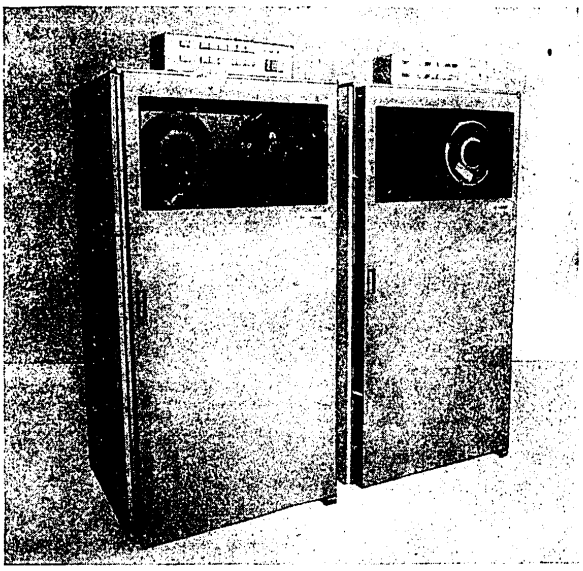

Figure 2. The YeS-5004 magnetic tape store.

The YeS-5004 magnetic tape store (Figure 2) is a device with phase-coded recording of information and automatic loading of tape with a detailed diagnosis, intended for YeS first and second line computers.

In the YeS-5004 two recording methods are possible: phase-coded with a density of 63 bits/mm and NVN1 with a density of 32 bits/mm.

The YeS-5004 store is connected to the control unit by means of a standard interface for YeS computer tape devices. Detailed information about the state and failures is transferred to the device by means of 10 bytes of the basic state. That information is used by the monitoring and diagnosis programs which permit checking the parameters of the apparatus in detail and making a rapid search for defects.

Technical characteristics

Method of recording	phase coded and NVN1
Density of recording, bits/mm	
phase-coded	63
NVN1	32

Data transmission rate	
phase-coded	126
NVN1	64
Number of tracks	9
Tape width, mm	12.7
Maximum tape length, m	732
Reliability during readoff	10^9 errorless bits per erroneous bit
Gap between units, mm	
during recording	15
during readout	12.7 maximum
Tape speed, m/s	2
Fluctuation of velocity, %	+ 1
Tape starting time, ms	3
Tape stopping time, ms	2
Rewind rate, m/s	18
Total reel rewinding time, s	50
Network power	3x380/220 V + 10-15% 50 Hz ± 1 Hz
Maximum power consumption, kW	2
Method of protection	reset or grounding as desired by purchaser
Dimensions:	
height	1600
width	800
depth	800
Mass, kg	400
Operating conditions	Temperature +10 - +35 °C; relative air humidity 40-80%

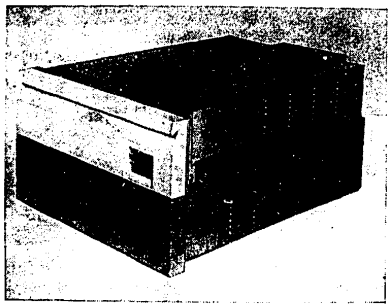

Figure 3. The YeS-5069 plug-in cassette disk store.

The YeS-5069 plug-in cassette disk store (Figure 3) is a universal device for recording and reproducing digital information on a magnetic carrier. It is used as an external store for small computers because it greatly expands their operating capacities and possibilities of application. By means of the YeS-5069 store a disk operating system can be created for which an irremovable disk has been proposed. The store is used above all in computer systems in which a large internal store capacity and a short access time are required.

The YeS-5069 plug-in cassette disk store is used mainly as the external store of small computers. The main external store includes two YeS-5069 stores, a YeS-5569 control and a power source, to which one YeS-5569 control and two YeS-5069 stores can be connected.

Technical characteristics

Total store capacity, Mbits	24 (48)
Track capacity, Kbuts	30 (60)
Number of disks	2
Number of surfaces for recording	4
Number of sectors	8, 12, 16 or 24
Number of tracks	200 + 3
Number of disk rotations, rpm	2400 ± 2.5%
Minimum access time, ms	10
Maximum access time, ms	60
Mean waiting time, ms	12.5 ms
Data transmission rate, Mbits/s	1.25 (2.5)
Recording carrier	YeS-5269 cassette disk (front loading)
Dimensions, mm:	
height	305
width	485 (19")
depth	660
Mass, kg	67
Power by single-phase network, V	220
Power consumed, W	600
External operating conditions	
ambient temperature	+5 to + 40 °C
relative humidity	up to 95% at 30 °C

The YeS-5074 floppy magnetic disk store is intended to serve as the external store for small computers or microcomputers. It also is used for the gathering and preliminary processing of data, the loading of the microprograms of large computers and a number of special applications (rapid access, large capacity and a large transmission rate).

The YeS-5074 is a rotary disk store in which a floppy magnetic disk placed in a protective package is used as the recording carrier. The replaceable floppy disk is loaded into the store in the protective casing. The store includes a clamping and drive disk mechanism, a mechanism for positioning the head during recording and reproduction, recording and reproduction electronics and control electronics.

The selection of the required track is systematically controlled for that store by an electric step-type motor.

The store performs the following functions:

--receives control signals and generates signals of state;
--moves the magnetic recording and reproduction head to the required track;
--reproduces and records data.

Performance of these functions is assured by electronic devices of the store by means of interface signals.

Technical characteristics

Disk capacity (unformatted), bits	3200K
Track capacity, bits	41K
Data transmission rate, Kbits/s	250
Magnetic head	for recording and reproduction (with tunnel erasure)
Recording density on internal track, bits/mm	128
Rotation rate, rpm	360
Time of access to adjacent track, ms	10
Damping time of magnetic heads after last step, ms	25
Magnetic head pressing time, ms	40
Number of tracks	77
Number of recording surfaces	1
Recording orientation	Synchronous pulse
Recording carrier	LBM Diskette or equivalent
Voltage	220 V $^{+10\%}_{-15\%}$ 50 Hz $\pm$ 0.5 Hz
	+27 V $^{+\ 5\%}_{-10\%}$ 1.5 A
	+ 5 V $\pm$ 1.5 A
	- 5 V $\pm$ 0.4 A

The YeS-5503 control for magnetic tape stores (Figure 4) permits connecting magnetic tape stores YeS-5002, YeS-5003 and YeS-5004 (with NVN1 and phase-coded recording) to first and second line YeS computers by a radial method. The attachment of eight magnetic tape stores is possible, or of 16 magnetic tape stores when two or four control devices are connected.

The YeS-5503 has microprogram control with built-in diagnostic tests for its own circuits and magnetic tape store circuits. With the magnetic tape stores the device forms a subsystem which is connected to the computer processor by means of an input-output interface.

Technical characteristics

Operation with computer and autonomous operation	
Number of controlled magnetic tape sotres	8
with switches	up to 16
Data transmission rate, Kbytes/s	64-315

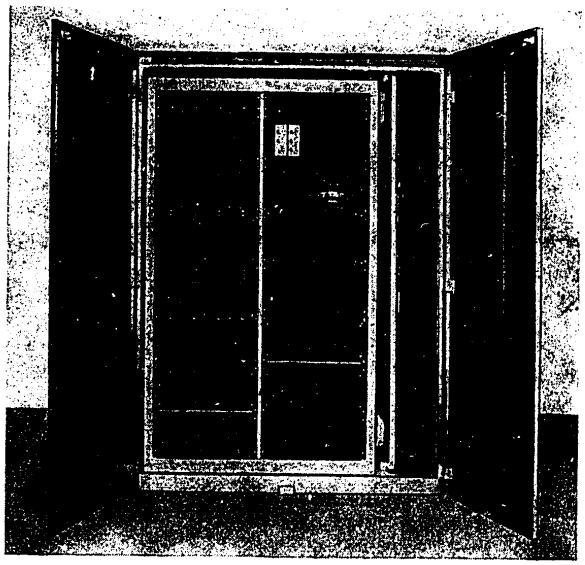

Figure 4. The YeS-5503 control for magnetic tape stores.

Tape velocity of magnetic tape store, m/z	2,3,5
Number of tracks	9
Monitoring of recorded information	Cross checking of parity sign; Checking of sign of longitudinal parity; determination of track with error by means of CPC sign.
Monitoring of state	In autonomous conditions by means of operator's panel; program checks by means of diagnostic programs
Power from three-phase network	220/380 V, 50 Hz - 2 kW
Operating conditions	
temperature	5 to +40 °C
relative humidity	40-80% at 25 °C
purity of environment	0.2 mg dust/m^3
pressure	957-1055 mb

The YeS-5569 control for plug-in cassette disks with attached YeS-5069 disk stores forms a computer external store with a 10-Mbyte capacity. The control for plug-in disk stores control and organizes operations connected with the search for a definite place on the disk, the transmission of data from the computer and recording them in the store or the reproduction of data from the store and their transmission to the computer. The device permits the parallel work of several cassette stores during search of a required sector in a time sharing mode. Data are recorded and reproduced in 256 bytes, and one command permits transmitting up to 6144 bytes of data. The control forms and transmits information about the execution of an order and refinement of the state of the external store.

Technical characteristics

Number of connected cassette disk stores	1 - 4
Connected to computer	Through 2 interface TEZ
Mean data transmission rate	781K 18-bit words/s
Number of instructions	8
Dimensions, mm	480x486x145

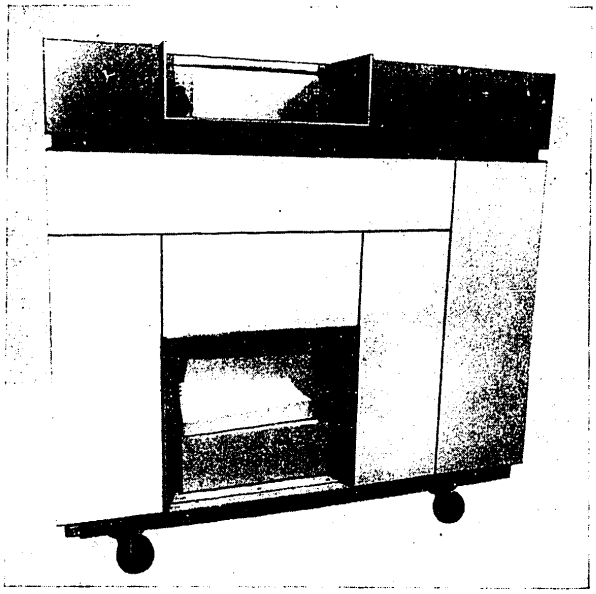

Figure 5. The YeS-7039 alphanumeric printer.

The YeS-7039 alphanumeric printer (Figure 5) serves as the output in a second-line YeS computer. This is a mechanical printer with a horizontally arranged type carrier of the chain type. The YeS-7039 alphanumeric printer permits working with different sets of characters (or different codes of characters) which use all 256 combinations of the 8-bit code.

The printing is done on ordinary paper in accordance with YeS system and CEMA standards with the possibility of making copies. Besides feeding paper one line at a time the device also permits accomplishing (by means of a program) a convenient establishment of the printing format, especially in the printing of record books, tables, etc. Monitoring and diagnostic circuits present in the device facilitate its operation.

The alphanumeric printer in the computer is connected bo the multiplex channel by a standard interface.

Technical characteristics

Line width	132 or 160
Spacing of characters, mm	2.54
Spacing of lines, mm	4.23 or 3.17 (selection of program is possible)
Number of characters on carrier	480
Standard sets of characters	48-96, depending on the DKOI [unidentified]
Characters	OSR-V, size 1
Printing rate, lines/min	1500 for a set of 48 characters; 900 for a set of 96 characters
Number of paper channels	1
Maximum paper dimensions, mm:	
width	450
height	305
Number of copies	One original plus 3-5 copies, depending on paper quality
Inking tape	
width, mm	432
length, m	up to 20
Power (network)	3x380x220 V + 10%
	50 ± 1 Hz

The YeS-9080 device for punched card perforation, checking and decoding (Figure 6) permits manual recording and verification of the correctness of recording of alphanumeric data from original documents on 80-column punched cards, with simultaneous recording on the upper edge of the punched card. Data from original documents intended for perforation in the beginning are recorded by means of a keyboard and punched later.

Data punched and checked for correctness of punching are read from cards and recorded in the store. Data from initial documents, introduced by means of a

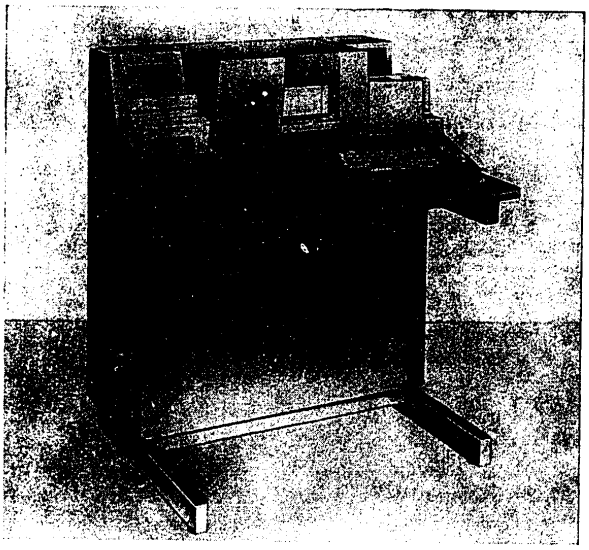

Figure 6. The YeS-9080 device for punched card performation.

keyboard into the control circuits, are compared with data present in the store. When they do not match an error is reported.

Data punched into cards and determined for recording on cards are recorded in the store, and the recording is accomplished:

--simultaneously with punching of a card;
--simultaneously with verifying the correctness of the punching;
--additionally in previously punched cards or in the output punch.

Technical characteristics

Type of card	80-column
Rate of punching with decoding, characters/s	60
Counting rate, characters/s	180
Code	KPK 12
Feeding magazine capacity, cards	600
Receiving magazine capacity, cards	600
Capacity of magazine containing erroneous cards, cards	60
Punching	by columns
Readout	photoelectric by columns
Decoding	Point printing in 5 x 7 matrix
Programming	By instruction card and store
Keyboard	Two-character for 96 characters

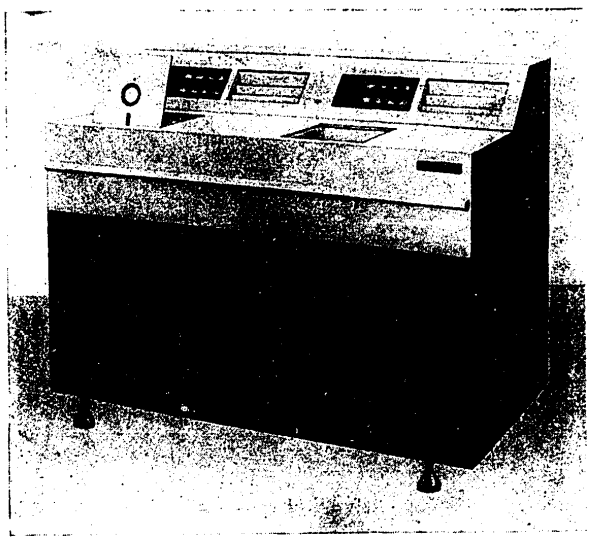

Figure 7. The YeS-5075 floppy magnetic disk store with control unit

The YeS-5075 floppy magnetic disk store with control unit (Figure 7) serves as an input-output device for a YeS system second-series computer.

The YeS-5075 is connected to a standard multiplex, selector or multiplex-unit computer channel and is used as the main input or output of data prepared on floppy magnetic disks (Diskettes). The store is an integral part of the system which supplements the complex of devices for data preparation on the YeS-9110 floppy disk and for direct connection with the computer input-output.

The YeS-5075 is equippec with its own control device with a buffer storage which permits servicing independently two YeS-5074 floppy disk stores and two automatic floppy disk loaders.

The control device is a combined one for independent control of two YeS-5074 units. Two independent addressable input-output devices are connected to a multiplex channel.

Technical characteristics

Type of disk	Initialized floppy magnetic disk (Diskette)
Recording method	With double frequency

Transmission rate, Kbits/s	250
Diskette capacity, bytes	242,944
Capacity of feed and reception magazine, diskettes	20 for each automatic loader
Data reading rate, sectors/min	3600 for each YeS-5074 device
Data recording rate, sectors/min	2200 for each YeS-5074 device
Power network	220 V + 10% - 15%, 50 ± 1 Hz
Maximum power consumption	1.2 kW

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THE YeS-9003 MULTICONSOLE SYSTEM FOR DATA PREPARATION ON MAGNETIC TAPE

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN. SBORNIK STATEY. VYPUSK 7 (Computer Technology of the Socialist Countries. Collection of Articles. Issue No 7) in Russian 1980 signed to press 6 Mar 80 pp 148-151

[Article by A. D. Mikhaylov, candidate of technical sciences, and B. K. Buyukliev, engineer (People's Republic of Bulgaria) from book edited by M. Ye. Rakovskiy, Intergovernmental Commission for Collaboration of Socialist Countries in the Area of Computer Technology, Statistika, 15,000 copies, 160 pages]

[Text] In the informational processing of data by means of electronic computers an important technological stage is the primary registration of data on magnetic carriers, the checking and initial processing of data for subsequent feeding for computer processing. In recent years facilities have appeared for the electronic preparation of data with data output on a magnetic carrier.

The YeS-9003 system (Figure 1) consists of a multiconsole system for data preparation on magnetic tape. The system consists of the following units (Figure 2): a central processor with a main store of 32 Kwords (IZOT 0310); a peripherals control unit (YeS-9003/R001); a chief operator's panel (SM-6312); a mini-magnetic disk store (SM-5400); a mini-magnetic tape store (IZOT 5003); a series-produced mosaic printer DZM 180 and 4-16 data input consoles which include the YeS-9003/A001 keyboard unit and the VKP 171 video monitor. By means of an additionally included adapter it is possible to proceed to the line of direct communication with the computer.

The system is controlled by a specialized data preparation system OSPD/9003. In the "data input" operating mode the resources of the mini-computer assure priority servicing of keyboard panels and solve simultaneous and independent work on each of them.

The keyboard field (the input panel) includes an alphanumeric keyboard for the input of mixed text (Roman and Cyrillic alphabets) and a separate decimal digital field. The group of functional keys makes it possible for the operator to assign and control various operating modes from the panel. The introduced characters are indicated on the video monitor screen. The capacity of the video monitor is 128 characters (four 32-character lines), three lines are used to indicate introduced information, and service reports are produced.

Figure 1. The YeS-9003 multiconsole system for data preparation on magnetic tape.

The buffer store based on mini-magnetic disk stores is intended for storage of an operating system, test programs and recording formats. The main volume of the store is used for data recording. The capacity of the magnetic disk store is 5 Mbytes.

The main purpose of the IZOT 5003 magnetic tape store is the output of information on magnetic tape. Information is recorded in a standard manner in DKOI code, the recording density is 32 bits/mm and the recording method is NVNl. The standard maximum length of the output units is 256 bytes (with the additional possibility of up to 1024 bytes). Besides the output of information, the magnetic tape store is used as an input device in the registration of the OSPD operating system and the loading of test programs and also in the input of data prepared in another system or processed on a large computer. In the latter case the goal is verification, correction or print-out of those data.

The SM-6312 operator's panel assures connection of the chief operator with the system in an interactive mode. Formats and groups of recordings are assigned and monitored from the panel, the preparation of output and the output of information on magnetic tape, exchange over a direct communication channel and the print-out of reports on the state of the system are accomplished. An ASR 33 teletype can be connected to the system as an operator's panel.

An additional output device is the series-produced wide-format DZM 180 printer, which prints data groups prepared on disks, prints files from magnetic tape created

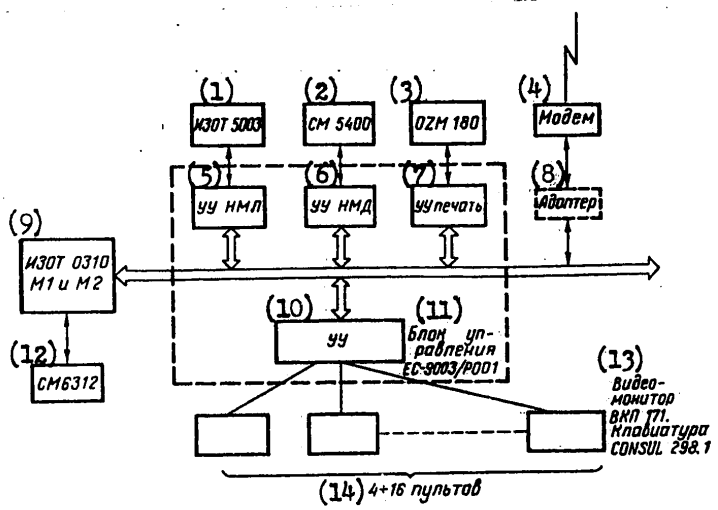

Figure 2. Structure of the YeS-9003 system.

1 -- IZOT 5003
2 -- SM-5400
3 -- DZM 180
4 -- Modem
5 -- Magnetic tape store control unit
6 -- Magnetic disk store control unit
7 -- Printer control unit
8 -- Adapter
9 -- IZOT 0310, M1 and M2
10 -- Control unit
11 -- YeS-9003/R001 control unit
12 -- SM-6312
13 -- Video monitor VKP 171, CONSUL 298.1 keyboard
14 -- 4 to 16 panels

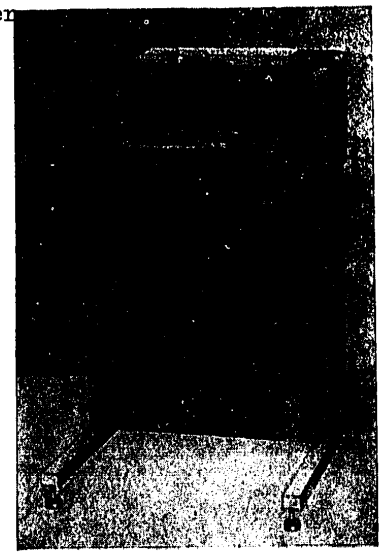

Figure 3. The SM-6312 operator's panel

in the system or other compatible equipment and prints reports for the chief operator.

The YeS-9003 adapter for telecommunication exchange, connected at the user's request, permits the system to remotely exchange information with another system or directly with a large processing computer. BSC procedure serves for the synchronous exchange at a transmission rate of up to 9600 bits/s, depending of the modem used.

Data input into the system is under the control of previously created recording formats (a total of up to 480) by means of which input information is formatted and monitored. The operator introduces data in groups; up to 1000 groups can be assigned to the system, of which up to 600 can be on the disk at one time.

For the regrouping of data during their output on magnetic tape the system offers the possibility of assigning up to 60 recombination formats.

From input panels the operators can assign and operate the following basic data processing modes: input, readout, verification, retrieval and erasure.

Besides input, direct monitoring and editing, the system permits grouping, duplication and rearrangement of output information and analysis of statistical information on the state of the system and the working capacity of the operators.

The YeS-9003 multiconsole system for preparation of data on magnetic tape offers the possibility of solving on the contemporary technical level problems in the organization and conducting of monitored data processing.

The system can be arranged for data input at the user's place. In that case, with use of the possibility of remote transmission the contemporary tendencies toward decentralization of computer capacities in systems with automated electronic data processing are being realized.

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ABSTRACTS FROM THE BOOK 'COMPUTER TECHNOLOGY OF THE SOCIALIST COUNTRIES'

Moscow VYCHISLITEL'NAYA TEKHNIKA SOTSIALISTICHESKIKH STRAN. SBORNIK STATEY. VYPUSK 7 (Computer Technology of the Socialist Countries. Collection of Articles. Issue No 7) in Russian 1980 signed to press 6 Mar 80 pp 154-155

STRUCTURE OF USER SUBSYSTEMS WORKING DURING REAL-TIME MULTITASK MONITORING

[Abstract of article by Debretseny, I.]

[Text] The article examines a multitask monitor, the RTDM (real-time disk monitor), intended for the YeS-1010, YeS-1011 and YeS-1012 computers during use of those computers to control processors or remote data processors.

Descriptions are given of the possibilities of a real-time disk monitor, its component parts and their functions in organization of the computing process--the allocation of resources among problems. A classification of requestable computer resources is given, as well as various programmed methods of referral to them.

FUNCTIONAL STRUCTURE OF THE 'KAMA' PACKAGE OF APPLIED PROGRAMS

[Abstract of article by Tsenilov, G. A.]

[Text] Components of the "Kama" package of applied programs that are accessible to various categories of users are analyzed. The analysis is made from the point of view of the possibility of using the package for the planning and realization of systems working in real time from the position of the general methodology of use of basic and applied software. The analysis is made formally with orientation toward a broad circle of users of the YeS computers.

WAREHOUSE CONTROL BY MEANS OF A MINI-COMPUTER

[Abstract of article by Shishkov, I., Boyadzhiev, Ya., Boyadzhieva, L., and Lakov, Ts.]

[Text] The article describes a computer-assisted system for control of processes in a multistoried warehouse containing various commodities.

The warehouse is controlled by operators by means of a computer complex based on a mini-computer. The technical structure of a typical computer complex for control

of a warehouse with 20,000 warehouse units. The system works in real time. The system software is described.

In the process of control the computer complex performs functions of control of flows of materials and information and monitors the condition and functioning of the equipment. The system permits displaying the condition and work of the warehouse by means of documents and responses to requests of operators.

REMOTE DATA PROCESSING SYSTEM BASED ON THE YeS-1022 COMPUTER

[Abstract of article by Palfi, M.]

[Text] A remote data processing system is described in which a YeS-1022 with a large set of peripherals is used as the central computer and a YrS-1010 computer as the terminal at the user's place. For synchronous data transmission a MPMX051 data transmission multiplexor, synchronous TAM-601 modems and a synchronous device for coupling the YeS-1010 computer with communication channels are used in the system. The subordinate YeS-1010 asynchronous network contains four YeS-7168 displays.

The article examines the software for the remote data processing hardware, the YeS-1010 computer operating mode, some experience in operating the system and also the status of the system at the present time and the prospects of its development.

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