robotron

Electronic Data Processing System EC 1055

On the basis of many years of experience, purposeful research, and high skill we like to present you the EC 1055 EDPS as a continuation of the model EC 1040 which has stood many tests.

The EC 1055 Electronic Data Processing System is an element of the Series 2 of the Unified Electronic Computer System (ESER) and a real multi-purpose equipment meeting the demands arising from science, up-to-date commercial management, and other fields requiring universal application. It is outstandingly suitable for the fast solution of comprehensive routine problems, complicated techno-scientific calculation, and for efficient application of data bank systems. Special functional units allow application of various methods of data teleprocessing and use as a master computer in hierarchic systems.

Well balanced cooperation of the robotron EC 2655 Central Processor and the continued operating system OS/E or newly developed operating system SVM/ES (system of virtual machines) with the differing peripheral units and combination with the problem-oriented software elements ensure efficient use of the EC 1055 EDPS in the solution of your specific problems. Further completion of the EC 1055 EDPS is the version EC 1055 M.

EC 1055
a system with progressive design philosophy

The EC 1055 Electronic Data Processing System is an equipment of medium performance class. Its architectural and functional principles make it a system with high use value.

The features which make the EC 1055 EDPS suitable in particular for use in combined works and enterprises, scientific institutions, design offices, state authorities and administration for the efficient use of many problems are as follows:

— The virtual store principle enlarges the store area which can be utilized by the user to 16 M bytes. This implies fundamental facilitation for the development of programs and increases efficiency of the entire system.

— Monolithic circuits are used not only for the logical and arithmetical units but also for the main store.

— Little space and power required by the central processor are due to a progressive logical principle, use of LSI modules, and higher packing density.

— The display control terminal permits all necessary communication between operation and maintenance personnel and the operating system and machine. The operator console additionally replaces the hitherto usual display and control elements on a central processor.

— The two-byte interface contains additional BUS and control lines so that two bytes can be transmitted at the same time.

— A monitor system allows the generation of interrupts during program run. The monitor program acquires, analyzes, and logs the states existing in the interrupt moment.

— Exact time information for the working cycle and for analysis is made available by a time-of-day clock (increment 1 microsecond), a clock time comparator, and the CPU timer.

— The EC 1055 EDPS can be operated in the extended control mode with utilization of operation principles of ESER series 2 as well as in the base control mode in the same way as a model of ESER series 1.

Other particulars

— Program event recording for backing the programmer during program testing

— Floating point system with closer accuracy

— Extended instruction list according to operation principles of ESER series 2

— Use of block multiplex channels with high data transfer rate

— Extension of the usual parity check by an error-correcting code in the main store

— Store safeguarding system making unauthorized read and write operations impossible

— Emulator unit for running DOS/ES programs controlled by OS/ES

robotron EC 2655 Central Processor with extended system control

The basic element for program execution in the EC 1055 EDPS is the EC 2655 Central Processor. It contains the central processing unit, the main store, and the input and output system. The central processing unit operates on the basis of microprogram control with partially loadable microprogram store. This property is predominantly utilized by the error measure system.
The main store can be supplied in two extension stages, i. e. with capacity of 1,024 or 2,048 K bytes. The store consists of logically independent modules with overlapped access. This allows matching to different fields of use.
The technical layout chosen for the store allows transition from the smaller to the bigger stage by subsequent reequipment in the user's enterprise at any time. A store safeguarding system connected to the main store protects from unauthorized read and write operations.
The robotron EC 2655 Central Processor meets especially the demands arising from interactive regime with a greater number of subscribers and common use of data stocks.
The input and output system of the robotron EC 2655 Central Processor consists of the channel administration, the channel tester, and up to five channels. The central processor in its basic equipment contains one byte multiplexer and two block multiplexers. One block multiplexer and one byte multiplexer or two block multiplexers can be integrated in addition. Use of the two-byte interface together with a block multiplexer is particularly advantageous for the increase of the data transfer rate in multicomputer systems.
Logical functions in the EC 2655 Central Processor are materialized by integrated circuits of ESER series TTL 1 and TTL 2 in dual in-line housings. They allow high processing speed and short cycle times in spite of low power requirements. The main store is a semiconductor store in MOS technique.
The use of multilayer circuit boards and the applied wiring technologies ensure high packing density of modules and connections and, thus, short signal delays.
High reliability of plug-in connections results from the use of new ESER connectors which protect the contacts from mechanical damages and of a new contact principle.

Functional extensions

New fields of use can be opened up for the EC 1055 EDPS if the functions of the robotron EC 2655 Central Processor are extended by additional functional groups.

Channel-to-channel adapter

This allows connection of two central processors through one channel controller. This unit can be added subsequently and is suitable for coupling the robotron EC 2655 Central Processor with another central processor of the ESER series 1 or 2 and for the composition of multicomputer systems.

Matrix module

It is a special processor for fast execution of those floating point operations which occur e.g. in the matrix calculus and Fourier transformations. Parallel regime of the different cycles effects a high internal computing speed which is the 10 . . . 15-fold of that of conventional program execution in accordance with the field size, population density, and connective algorithm.
The matrix module is not functionally independent but coupled with the robotron EC 2655 Central Processor. It can be integrated subsequently into existing systems.

Specification of robotron EC 2655

Central processing unit	
number of instructions	182
operation speed	450,000 operations/s
Microprogram store	
capacity	8 K instructions with 64 bits each
cycling time	380 ns
access time	140 ns
Main store	
medium	MOS element
extension stages	1,024 K bytes
	2,048 K bytes
cycling time	1,140 ns
call width	8 bytes
store protection	read and write protection in areas of 2 K bytes each
Channels	
number	up to 5
block multiplexers	up to 4
byte multiplexers	up to 2
device controllers per channel	10
Transmission speed	
block multiplexer BLMPX 1	1.65 M bytes/s (1-byte interface)
	3.3 M bytes/s (2-byte interface)
block multiplexers BLMPX 2, 3, 4	1.65 M bytes/s
byte multiplexer BYMPX	up to 40 K bytes/s in multiplex regime, 1.65 M bytes/s in intermittent regime
number of subchannels	128, 256 for 2nd BYMPX and 4th BLMPX

Well approved design solutions

The robotron EC 2655 Central Processor is accommodated in a beautifully shaped standardized container system. It consists mainly of those assemblies which have stood the test of practical use and offer excellent service conditions.

According to the main store size, the central processor consists of three or four cabinets with the following assemblies:

1st cabinet	central processing unit, channels
2nd cabinet	power supply
3rd cabinet	main store of 1,024 K bytes
4th cabinet	main store of 1,024 K bytes (for stage of 2,048 K bytes only)

The container system is subdivided as follows:

cabinet	width 1,160 mm, depth 750 mm, height 1,740 mm containing 3 frames
frame	width 850 mm, depth 220 mm, height 1,405 mm containing 6 panel blocks
panel block	width 360 mm, height 360 mm containing up to 40 plug-in unit stations and 8 flat cable stations for 4 flat cables each
plug-in unit	height 140 mm, depth 150 mm as multilayer board for logic units or height 300 mm, depth 150 mm for store plug-in units

The matrix module is arranged in an additional cabinet.

The robotron EC 2655 Central Processor has a connected load of 9.2 kVA. However, connected load for the EC 1055 EDPS depends on the configuration-dependent peripheral units.

The following power supply values must be warranted for connection:

voltage	3 x 380/22 V $\begin{smallmatrix}+10\ \%\\-15\ \%\end{smallmatrix}$
frequency	50 Hz $\pm$ 1 Hz
maximum phase deviation	5 %

robotron 7069
Operator Console
for communication
and maintenance

The robotron EC 7069 Operator Console is a device of independent design for communication between operator and operating system and between maintenance personnel and computer. It contains all technical means for operation and display as required for this communication.

A display screen with keyboard, selector pen, and special keys or displays are available for this modern device. The screen has a capacity of 25 lines with 80 characters each. Input of necessary data and selection of function are by means of a keyboard with 26 alphabetic, 10 numeric, and 25 special characters. A modification of this keys has Cyrillic characters in addition.

Great ease in operation and clear visibility are accompanied by high communication speed. This is also backed by the serial printer which can be connected for printing of informations displayed on the screen. The serial printer operates with 45 characters/s.

The robotron EC 7069 Operator Console is connected via standard interface and a special interface to the central processor. Its independent design permits arrangement wherever it is convenient for operation of the EC 1055 EDPS.

The robotron EC 7069 Operator Console is designed as a table unit. The table area carries the screen, the operation field, and the keyboard. The electronic control and power supply unit are panel blocks in the table rack. Another operator console can be connected to the central processor for special activities and on customer's request.

Technical improvements in the version EC 1055 M

On the basis of new technical and technological knowledge, the system EC 1055 has been used to generate the version EC 1055 M as a continuation.

In addition to the proven functions of the system EC 1055, new and extended functions allow a wider field of use of the system. Upward compatibility of programs is warranted.

That is the reason why the following sections specifiy only those details which are changes and extensions of the EC 1055 EDPS.

robotron EC 2655 M Central Processor

The robotron EC 2655 M Central Processor has a central processing unit with microprogram store on RAM basis.

Capacity of the microprogram store is 8 K instructions with 64 bits each.

The main store can be extended in steps and is available in the modifications of
1 M bytes,
2 M bytes, and
4 M bytes.

Application of new LSI store circuits has the effect that the entire central processor can be arranged in no more than two cabinets. One cabinet contains the central processing unit and the main store, the other the power supply unit. Power required by the robotron EC 2655 M Central Processor is 5 kVA.

robotron EC 7069 M Operator and Service Processor

The robotron EC 7069 M Operator and Service Processor is a continuation of the EC 7069 Operator Console.

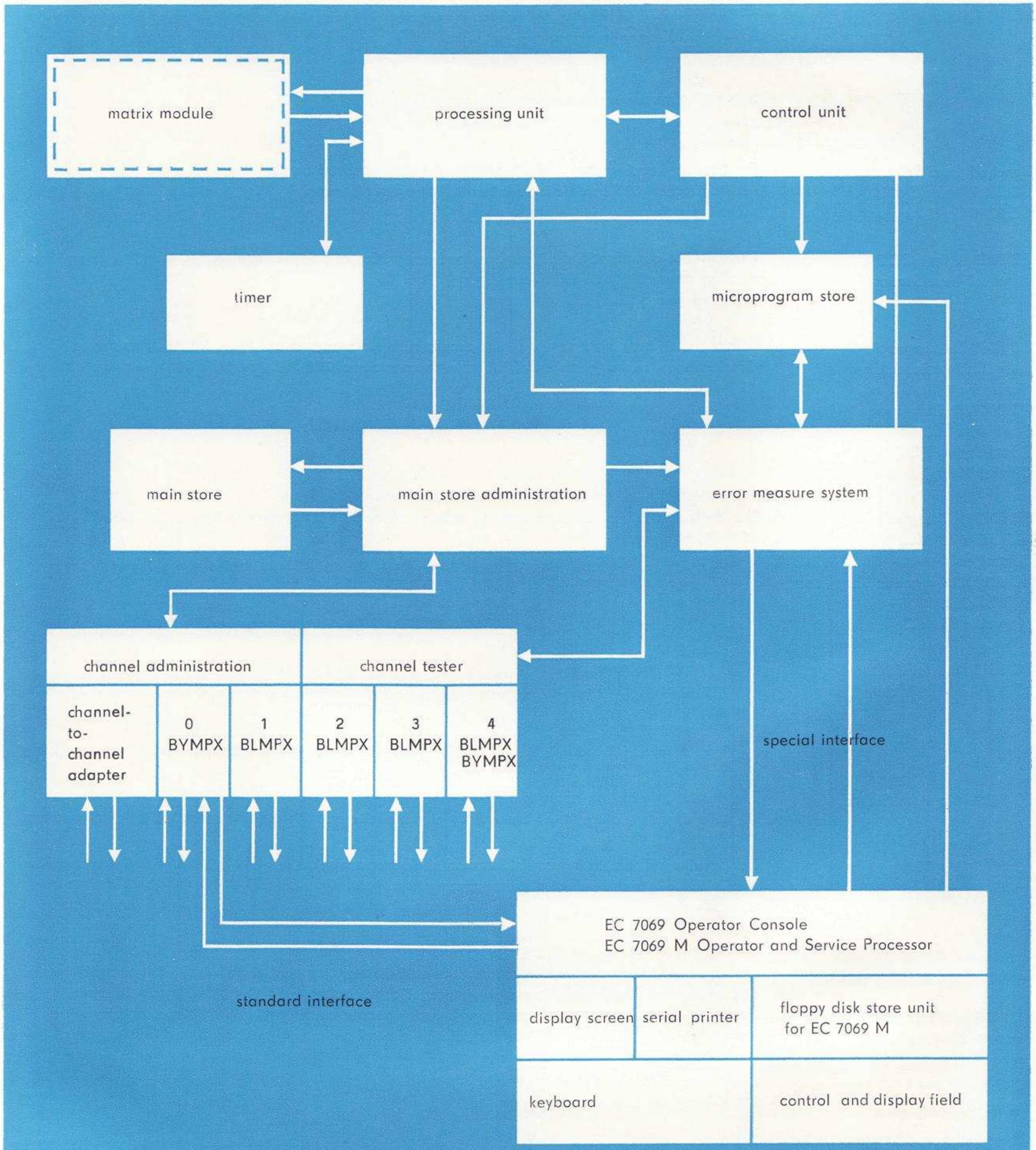
This unit is destined to warrant system operation (communication between operator and operating system) and maintenance operation (communication between maintenance staff and computer), to control initialization of the central processor, and to give essential backing in service, diagnosis, and operation of the system.

Two floppy disk units are used as loading mechanism for the microprograms of the EC 2655 M. Access to the floppy disk units is also possible via standard interface.

The robotron EC 7069 M Operator and Service Processor is equipped with two display screens with capacity of 1,920 characters each (24 lines, 80 characters per line).

The keyboard can optionally be Latin or Latin/Cyrillic. A clearly arranged operation field and maintenance field, a time-of-day clock, a robotron 1154 Serial Printer, and other facilities offer excellent operation comfort. Connection to the robotron EC 2655 and 2655 M Central Processors is via standard and special interfaces.

Blockdiagram
for EC 2655 and EC 2655 M



Survey of some selected peripheral devices

Corresponding to type and volume of problems to be solved in industry, science, and commerce, the robotron EC 2655/EC 2655 M Central Processor can be equipped with various peripheral units from the ESER.

Some of them are to be mentioned hereafter:

Punched Card Readers EC 6016 and EC 6019 EC 7014 Card Punch	For the fast reading and punching of 80-column punched cards reading rate: 1,000 cards/min serial or 1,200 cards/min serial punching rate: 58 . . . 117 cards/min
EC 7902.03 and EC 7902 M Punched Tape Stations	For variable combinations of numbers and capacities of punched tape readers and tape punches reading rates: 200 . . . 2,000 characters/s punching rates: 50 . . . 110 characters/s
EC 5061 Exchangeable Disk Store with EC 5561 Bulk Store Controller EC 5067.02 Exchangeable Disk Store with EC 5567 Bulk Store Controller and EC 5667 Control Module	Efficient disk store systems for direct access with store capacity of 29 or 100 M bytes per spindle. Connection of exchangeable disk stores with capacity of 200 M bytes per spindle is provided.
EC 5017.02 Magnetic Tape Store with EC 5517 Magnetic Tape Controller EC 5002.03 Magnetic Tape Store with EC 5525.03 Magnetic Tape Controller	The devices allow a data transmission rate of 64 or 96/189 kbytes/s and recording density of 32 or 63 bits/mm.
EC 7013 Parallel Printer EC 7039 Parallel Printer	EC 7031 with platen roller Printing rates of 900 . . . 1,800 lines/min with 64 positions/line, character fund with Latin or Cyrillic characters EC 7039 with printing chain Printing rates of 900 . . 1,500 lines/min and 48 . . . 96 positions/line, with Latin or Cyrillic characters
EC 7602 Microfilm Output Unit	The output capacity amounts to 5 fiches/min which corresponds to approx. 100,000 characters/s within a double picture field. Every fiche can be lettered with visually readable macrocharacters.
EC 7920 (M) Display System	Designed for direct data acquisition and dialog communication. The maximum data transmission rate is 380 k bytes/s in short distance arrangement and 600 . . . 4,800 bits/s in long distance arrangement. A group controller permits up to 32 terminals (display unit or serial printer) to be connected.
Devices for data teleprocessing EC 7053 and EC 7054 Drawing Devices	Use of data input and data output devices and different subscriber points for data acquisition and processing inclusive of transfer systems. Control is by the MPD 4 EC 8404 Multiplexer. The table-type and drum-type drawing devices operate on the basis of the direct principle (i. e. immediate connection to the channel of the central processor) and of the indirect principle.
EC 5075 Floppy Disk Input and Output Device	Fast input and output device with data transmission rates of 31 kbytes/s. Storing capacity of 243 K bytes per floppy disk store

The devices mentioned above are nothing but a selection of peripheral units of the system EC 1055/ EC 1055 M. Other devices are elements of the model spectrum or subject to integration.

Operating systems with new operation principles

Continued operating system OS/ES

The operating system OS/ES is a mature operating system which has stood the test of many years of practical application.
The operating system OS/ES has been extended in its functions on the basis of the new hardware facilities of the EC 1055/EC 1055 M Electronic Data Processing System.
It consists of control and processing programs which are generated in accordance with the user's problems and with the hardware configuration.

The EC 1055/EC 1055 M EDPS in base control mode can operate with the control program configurations
— MFT (multiprogram regime with a fixed number of tasks) or
— MVT (multiprogram regime with variable number of tasks).

In the extended control mode the control program configuration
— SVS (system with virtual address space) is available. This offers the system EC 1055/EC 1055 M the largest functional range and utilizes all hardware facilities.

All of the three control program configurations warrant multiprogram regime by which high utilization of the EDP system is possible.

The operating system OS/ES backs the functional properties of the model EC 1055 / EC 1055 M such as virtual store, block multiplex regime of channels, program event recording, monitor equipment, channel-to-channel adapter, matrix module, and new classes of peripheral devices.

Virtual store technique

The virtual store consists of a store hierarchy consisting of the actually existing main store and an external store with random access. A main store of 16 M bytes can be simulated by efficient combination of technical equipments and operating system functions. Utilization of the virtual store allows up to 64 job steps to be run in multiplex regime.

Utilization of the virtual store technique offers essential advantages:
— Simplification of programming by elimination of almost all store location reflections and corresponding programming manipulations
— System jobs which are hardly ever used require real store location only in case that these jobs are activated.
— Real store location which is not required by a program area can be used dynamically by another program area.
— It is possible to process job steps whose store requirement is bigger than the existing real store.
— Increased data flow rate by use of high blocking coefficients for input and output

Also those programs which do not utilize the virtual store principle can efficiently be run on the EC 1055 / EC 1055 M EDPS.

New job management

The components of job management warrant communication between user and operating system. Temporary storage of system inputs and outputs on direct access stores and use of special files effect continuous utilization of input and output devices and faster access. The new job management backs remote job input, too.

New direct access method

The newly developed generalized direct access method has very favourable effects in the framework of data administration because it backs operation with sequential, index-sequential, and direct access files.
This operating mode unites some advantages such as
— high data flow rate,
— easy usability,
— independence of the type of devices.

Extended remote access methods

Access methods for data teleprocessing are decisive for the progressive operating mode with the operating system OS/ES, and so are facilities for dialog regime and operating system backing for computer coupling.

Language translators

Language translators are available for the machine-oriented assembler language and for the problem-oriented programming languages PL/1, FORTRAN, ALGOL, COBOL, and RPG.

DOS/ES emulator

The emulator allows running of DOS/ES programs by control of the OS/ES. For DOS/ES emulation a fixture of the central processor cooperates with operating system components.
The emulator program consists of routines which compensate the differences between OS/ES and DOS/ES processing and establish connections between the two operating systems.
The DOS/ES emulator has been developed for users who have applied the operating system DOS/ES and are planning the transition to the EC 1055 EDPS.
Particular advantages of the DOS/ES emulator for the user:
— Short term resetting of DOS/ES programs not required
— Use of DOS/ES files
— No new DOS/ES generation

Efficient test methods

The test programs which are independent of the operating system contain means and methods for checking the functional reliability of the central processor, its functional groups, and the peripheral devices. At the same time they can be used for automated systematic error location.

The single types of test programs have been matched to each other for easy application and allow cumulative tests and purposeful single tests as well. This means that overall tests or detailed sample tests are possible during the intended maintenance. The display screen, keyboard, signal keys, and signal displays of the operator console permit access e.g. to all essential registers and stores inside the central processor. Informations to be put in or out are formatted in so-called pictures.

The operating system records details concerning errors in the EDP system during executing of user programs. Program-dependent information interpretation leads to a decision on the need of repairs

Use of the screen operation unit for maintenance purposes makes a maintenance field on the central processor unnecessary and leads to comprehensive and clear visual representation of internal states. Output of informations represented on the display screen by the serial printer completes the existing facilities favourably for decision and documentation purposes.

The up-to-date error diagnosis and error elimination in the EDP system EC 1055/EC 1055 M are decisive means to reduce downtimes and increase reliability of the system.

Newly developed operating system SVM/ES
(system of virtual machines)

The newly developed operating system SVM/ES backs the models EC 1055 and EC 1055 M. This operating system is based on the principle of virtual machines. Every user gets a virtual machine. Its projection to the real configuration of the EDPM, design, management, and control of parallel operation of the virtual machines are materialized by the SVM/ES. Each of the virtual machines can be utilized by the user as an independent plant with own resources and by control of an own operating system which can be chosen according to application requirements.

The following system can operate parallel in the virtual machines as operating system which are subordinate to the SVM/ES:

- Operating system OS/ES
  This operating system can be used as a system for stack processing demands without essential restriction of its functional range.

- Operating system DOS/ES
  This operating system, too, can be used as a stack processing system.
  Users who have large program packs for DOS/ES need not adapt these program systems to new operating systems.

- Programming and test system PTS
  The PTS is a subsystem of the SVM/ES. It cannot be used as a single system in the real plant.
  Main fields of use of this system are the development and testing of programs in dialog regime.
  PTS has an own command language, administers an own file system, and is characterized by high variability in use.

- File teletransmission system RFTS
  The RFTS, too, is a subsystem of the SVM/ES and can operate in a virtual machine only. The RFTS controls transmission of files between distant data stations and virtual machines and between UFTS data stations.
  The main field of use of the RFTS is the transmission of data for program development and testing within the PTS from distant display screens.

- Error analysis system PDAS
  PDAS is a component of the SVM/ES and operates in a virtual machine which has means for error analysis in addition to the PTS. PDAS is an important aid for acquisition, analysis, and management of errors of the SVM/ES and of hardware troubles.

Application solutions

Pretentious tasks which can be solved very efficiently by means of the EC 1055 / EC 1055 M EDPS are backed by branch-oriented application solutions, data bank solutions, program packs, and programming systems for mathematical methods and by auxiliary and rationalization programs as well.

This software is a system performance which — together with supply and installation of hardware, specialist training, and individual service — is utilized by our customers.

A very important item is the use of data teleprocessing by means of approved complex solutions.

Data banks

A centerpiece of any preparation for use and of efficient utilization of the high performance data processing system is the composition of a data bank. It is used e.g. in the industry, building and architecture, credit and banking business, traffic, statistics, medicine, and in information systems for science and technology.

VEB Kombinat Robotron offers the following systems:

Data bank management system /Robotron-DBS/R
This data bank management system is the software for storage, management, and retrieval of large data bulks. Application of address chains and index lists permits relations between any number of files to be stored and, thus, data for integrated analyses to be made available. Data description charts make the program software variable and dynamically adaptable for analysis.
The data bank language of DBS/R, in case of need coupled with the assembler or higher program languages such as PL/1 or COBOL, is suitable for an uncomplicated formulation of differing problems in accordance with the very applications. The teleprocessing component of DBS/R backs stack teleprocessing and conversational regime by way of participant mode.

Information retrieval system AIDOS
It is used for higher efficiency of laborious routine processes in storage, retrieval, and editing especially of textual information of differing type. Due to its wide variability, the information retrieval system is universally applicable. It allows adaptation to actual requirements of various fields of use even if these exceed the problems of information and documentation. It is also suitable for the composition of international multilingual information retrieval systems. AIDOS solves e. g. the following problems:

— Processing of informations with variable structure and length and with variable contents (e. g. on facts and/or documents)

— Administration of a thesaurus or other term lists as classification means for information storage and retrieval

— Information retrieval in stack processing or dialog between man and machine

Mathematical methods

Program packs and programming systems for mathematical methods are used for solving problems in science, technology, and commerce. They can be applied to producing and service spheres but also in research, medicine, and biology.

The program packs and programming systems mentioned hereafter have been tested for many years and are available in improved versions:

— Simplex optimization (OPSI)

— Discrete optimization inclusive of transport optimization (DISKO)

— Simulation of systems with discrete event moments (SIMDIS)

— Mathematical statistics (STATISTIK)

Use of these program packs and programming systems is backed by files with unified organization principles (EDO files).

For this purpose the program pack EDO contains programs and routines for handling EDO files on external stores.

The program packs for
— network technique and
— numerical mathematics
which have been used for many years are also offered for the EC 1055 / EC 1055 M EDPS.

Universal programming and testing aids UNI

UNI helps to make program development more efficient. This is applied to the development of problem-oriented software and to the users' own programming as well. DBS/R and AIDOS, for instance, make use of UNI components. UNI unites macros for backing programming in the assembler language, subroutines for multilingual call, auxiliary programs as extensions of operating system components, procedures and organization solutions for program tests, and technological principles for program development.

Branch-oriented application solutions

VEB Kombinat Robotron and cooperating partners from various economic branches in the GDR test special branch-oriented application solutions which are offered for immediate application and tailor-made for actual use conditions.

Traffic engineering

Automated seat reservation system for railway passenger traffic (ARS/E)

This application solution which makes use of the program packs for real time and stack processing is applied to booking of seats, beds, and couchettes and to the supply of the corresponding tickets ready for sale.

Financial affairs

Application line for computer use in monetary affairs (AWL/REG)

This application line is a man-machine system which comprises the total of hardware and application means in monetary affairs. Complete business transactions in

banking,
saving bank affairs,
insurances,
post office transfer,
postal affairs

are made possible with high efficiency by this application line.

Economic management

Information system for economic management (LIS)

The LIS contains reusable solutions for economic management organs with hierarchic structure of management levels and economic units in the following functional complexes:

— Central data bank for administration of management information and supply of programs for determination and output of aids for managerial decisions
— Display-oriented use of the data bank by means of a user language
— User programs for planning, balancing, and analysis

Some other interesting application solutions are available for further economic branches. Stress should be laid on the adaptability to different conditions of use.
Some examples from the wide field of application solutions:

Agriculture

— Computer-aided planning, preparation, and materialization of the industrialized production of animals and plants, such as recommendations for fertilizing, rotation of crops, planning of cereals harvesting

— Information store for stable capacities, insemination, veterinary service, and information supply for management decisions

— Solution of problems in accountancy and statistics

Public health	— Hospital information system with the subsystems — Medical data bank — Patient-referring input and output system — Clinico-chemical laboratory information system — Retrieval and analysis system — Management information system — Medical supporting systems such as calculations in radiology and nuclear medicine
	— Systems for research and scientific work
	— Application solutions of planning, management, and economy inclusive of patient provisions
	— Systems for centralized and territorial public health organization
Building and architecture	— Solutions of building design for civil engineering, statics and construction, interior work, technical equipment of buildings, and automatic drawing
	— Systems of technological preparation such as capacity balancing, construction scheduling, determination of performance and expenditure
	— Programs for materials planning, transport optimization, accountancy, and statistics
Chemistry	— Application solutions for backing management and planning processes
	— Program for techno-scientific calculations and modelling of technological processes
	— Systems for sales functions, calculation of manpowers, fixed assets, materials, and cost

robotron

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