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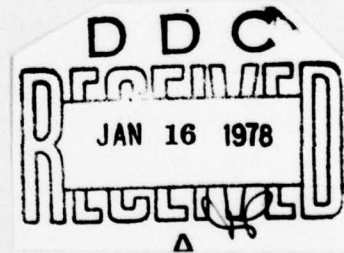
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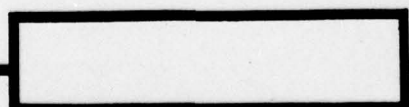
ES 1C10 - A SMALL COMPUTER OF THE ESER
(UNIFORM ELECTRONIC COMPUTER SYSTEM)

by

Werner Teichert



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ES 1010 - A Small Computer of the ESER [Uniform Electronic Computer System]

Werner Teichert, Agent for VIDEOTON AG, Berlin

In recent years ES 1010 small computers of the ESER family have been introduced in various sectors of our national economy. This development will continue in the coming years.

In the meantime numerous experiences of the first users of this EDVA [electronic data processing system] are being discussed - an example is the following article on the adoption of the ES 1010 in a branch of the Academy of Sciences of the GDR. Before such users' experiences are presented, it seems appropriate to give a brief overview of the most important characteristics, features, and applications of this system.

A model belonging to the socialist countries' uniform electronic computer system, the ES 1010 is a small third generation data processing system. It differs from the other ESER models in its logical structure and its operation. The ES 1010's compatibility with the other EDP systems of the ESER is distinguished by:

- code compatibility on external data-carrying media and data links
- compatible logical and physical organization of the external data-carrying media(e. g. magnetic tape)
- program compatibility for the higher programming languages (FORTRAN IV, COBOL)
- compatible algorithms for data transmission

Main storage consists of ferrite cores with a lithium base. It is organized in words of 16 information bits, one parity bit, and one storage protection bit.

Cycle time: 800 ns

Maximum transmission speed: 2,500 bytes/s

Fetch width: 1 word

Every byte can be addressed in main storage. The instruction operands are bytes, words, double words, and character strings. Storage protection is program-controlled and applies to words. The main storage, to which there are four ways of access, is connected to a processing unit. The latter contains combinational circuits and a unit for performing elementary arithmetical and logical operations, as well as a microprogram memory. The microprogram memory is a read-only memory based on integrated micro-circuits. The microprogram is stored in 16-bit words. Access time is 60 ns, capacity is 512, 1024, or 2048 words per operating unit. The microprograms determine whether the processing unit functions as a central unit or takes over other specific duties.

A special channel (the so-called minibus) links the processing unit with adapters. These permit connection of peripheral devices,

for whose operation the standard interface system of the ESER (SIF ESER) is necessary.

A basic feature of the central unit is the hierarchically ordered interrupt system with 31 interrupt levels.

Within 35 μ s the context of the interrupted program can be entered in main storage, and a higher-priority program can be started. An expandable and fast interrupt system is a basic requirement for real-time operation.

Operating System OS/10

Operating system OS/10 was developed in light of the modular add-on capability of equipment design and can be adapted to the special requirements of the users. The following modes of operation are possible:

- batch processing
- multi-program processing
- simultaneous operation between central unit and peripherals
- multiplex operation

Principles of organization involve batch processing and inline processing.

In disk configurations the operating system exploits the fast access time and the reliability of the fixed-head disk. The fixed-head disk serves for continuous storage of the control program, the translator, auxiliary, and service programs, and the processing programs; it is also used by modular libraries employed in program generation. A disk area is free for storage of user files (direct and sequential access).

Depending on the mode of operation, the free part of main storage consists of several areas. With systems generated exclusively for batch processing, a single program runs in the background area.

Linking of programs by control cards makes it possible to formulate complete jobs for the solution of a problem. During real-time operation with a relatively small number of independent programs, real-time control programs can be used. The foreground area can accommodate direct programs, which the interrupt system starts directly, thereby realizing fast response times. The number of direct programs is the same as the number of interrupt levels.

The background area can be used for batch processing.

The control programs for multiprogram operation supervise not only the areas mentioned, but also the middle area. Up to 128 tasks can be defined. These are resident in storage or on disks; their response time is between 20 and 100 milliseconds.

Control programs for multiprogram operation find application mainly in large configurations for teleprocessing or industrial process control.

Besides assembler language, the user can employ PL R 10, FORTRAN IV, and COBOL.

BASIC and LISP 1.5 are used for scientific and technical computations to a lesser extent and for special problems.

For processing of economic data, magnetic tape and disk file management systems are available which permit I/O programming at the logical level. The special disk file management system permits the organization of multiple-access files on the disk (during real-

time operation). Sorting can be accomplished with the magnetic tape and disk sort programs.

Operating system OS/10 also contains elements for control of computer-to-computer coupling and algorithms for servicing synchronous data transmission.

Applications of the ES 1010

Provisions for multi-purpose application of the computer are:

- modular add-on main storage (storage modules of from 4 KW to 32 KW)
- augmentation of microprogram storage with additional instructions
- fixed-head disk storage with fast access time
- connection of a unit for wired multiplication and division
- floating-point and decimal arithmetic capability
- attachment of extensive peripheral equipment

The I/O equipment varies according to the different applications of the ES 1010:

- commercial data processing
- scientific and technical computations
- process control and laboratory automation

Commercial Data Processing

The following I/O devices are typical in commercial use of the ES 1010:

- operator's typewriter
- punched-tape station
- punched-card reader

- 1 to 4 fixed-head disk storage units or 1 to 4 cartridge disk storage units
- parallel printer (80 or 132 positions) or matrix printer
- 1 to 8 magnetic tape units or 1 to 4 removable-disk storage units

Process Control and Laboratory Automation

There are three possibilities for expanding peripheral equipment for a process:

- The MINI system is connected directly to the MINIBUS and is well suited to laboratory automation.
- The CAMAC multiplexor permits connection of standard equipment according to ESONE recommendations.
- The MAXI system is distinguished by its own bus, which is connected via the process multiplexor with the minibus of the ES 1010. The MAXI system has great add-on capability and is used predominantly in industrial processes.

The ES 1010 For Teleprocessing

The hardware versatility of the ES 1010 permits its use in teleprocessing of data:

- Multiplexor for asynchronous data links CLA (2 to 64 simplex, half-duplex, and full-duplex lines. Transmission speed up to 1200 bauds, capability for connection to telephone and telex lines, V 24 or V 18 interfaces);
- Multiplexor for synchronous data links OLS (4 half-duplex or full-duplex lines, transmission speed up to 19,200 bauds, V 24 interface);

- Multiplexor for asynchronous and synchronous data links COS (up to 63 lines, telephone and telex interface, transmission speed up to 2400 bauds);

- Multiplexor for direct connection to the multiplex channel of a larger ESER system (ES 1010 as multiplexor)

- Visual display units (16 lines, 80 characters per line) which can be connected with matrix or parallel printer;

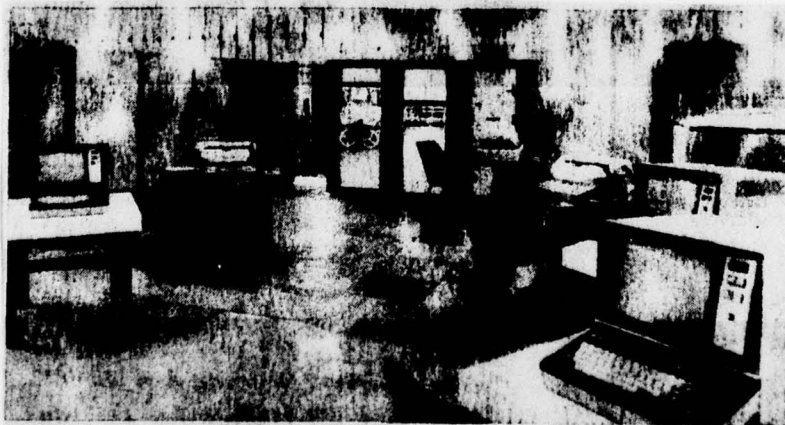
- Microprocessor-controlled synchronous/asynchronous terminal with visual display and capability for connection to printer, cassette, paper-tape reader and punch.

The Model ES 1010 will also acquire special significance in the future as a remote data station directly connected with larger computers of the ESER.

Werner Teichert

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