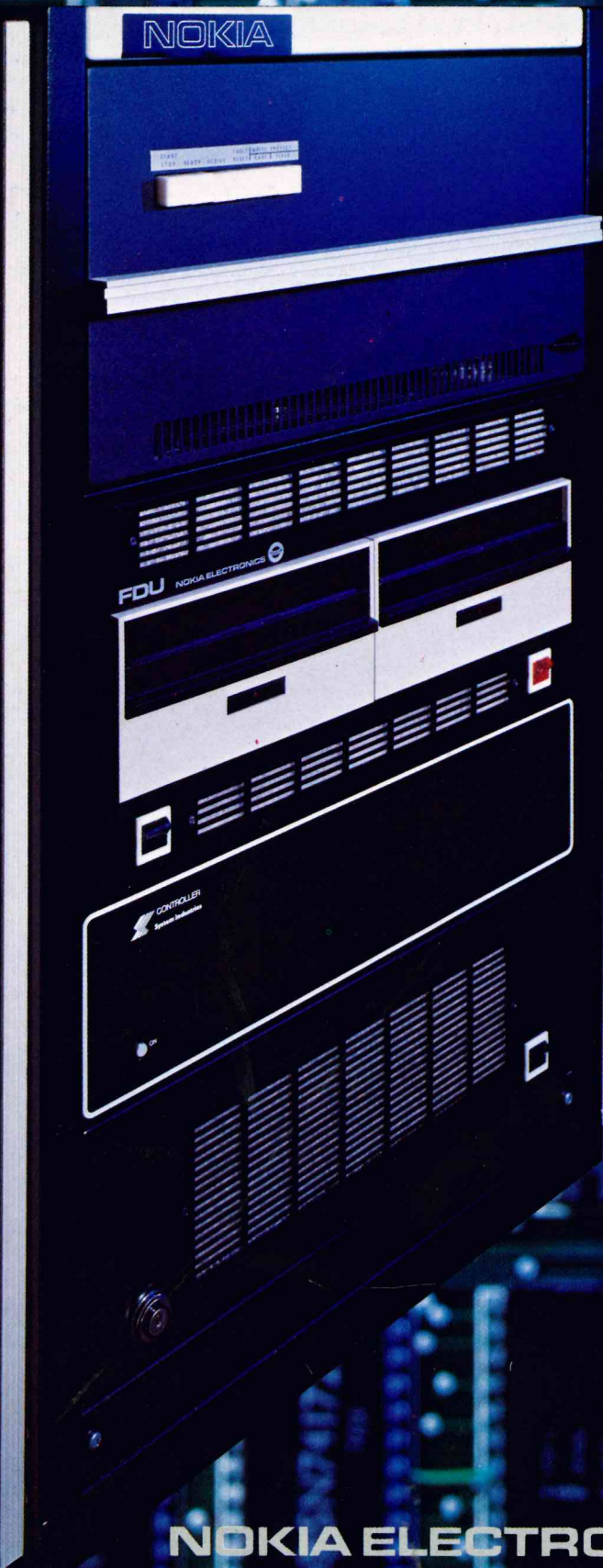


Mikko 3/36

minicomputer system



NOKIA ELECTRONICS

General-purpose minicomputer system

The Mikko 3/36 is the biggest model in the Mikko 3 minicomputer series. It is designed for a wide range of applications, and is used in local data processing systems and in large distributed data networks.

The Mikko 3/36 multiprocessor architecture is based on a high-speed central processor and on separate

microprocessor-based controllers for peripheral devices and data communication.

The modularity of the Mikko 3/36 makes it easy to add or remove device units according to the requirements of different users. At the application program level the Mikko 3/36 is fully compatible with other Mikko 3

models and allows the user flexibility in use of different systems.

The Mikko 3/36 is usually mounted in its own rack, which also houses the disk and diskette units. Mikko 3/36 is designed for a normal office environment without special air conditioning.

Multiprocessor system architecture

High performance in serving multi-user systems was an important requirement in the design of the Mikko 3/36 architecture. The performance of Mikko 3/36 is based on a high-speed bipolar central processor with TTL circuits, memory components of the latest technology, and on separate I/O processors for peripheral device interfaces. The multiprocessor feature frees the Mikko 3/36 CPU from routine control of peripheral devices and thus enhances its processing capacity.

Main Bus

A 16-bit parallel data bus, the Main Bus, connects the units of the Mikko 3/36 to each other. The transmission is asynchronous and based on the handshaking principle.

In addition to the CPU and the main memory units, up to five I/O-controller or interface boards can be connected

to the Main Bus. A UDC (Universal Device Controller) is used for most of the peripheral device connections. For a synchronous communication line an SLC (Synchronous Line Controller) is available. A Bus Interface Unit (BSI) handles the connections to the disk and magnetic tape units.

The Mikko 3/36 lay-out is shown in the diagram below.

Central Processing Unit

The Mikko 3/36 processor is a fast 16-bit CPU incorporating TTL circuits. 20-bit memory addressing is used to permit memory sizes greater than 64 Kbytes. The two basic components, the microprogram processor and the arithmetic unit, operate in parallel to achieve maximum speed. Routines to execute the machine instruction set and interrupt handling are located in a microprogram memory.

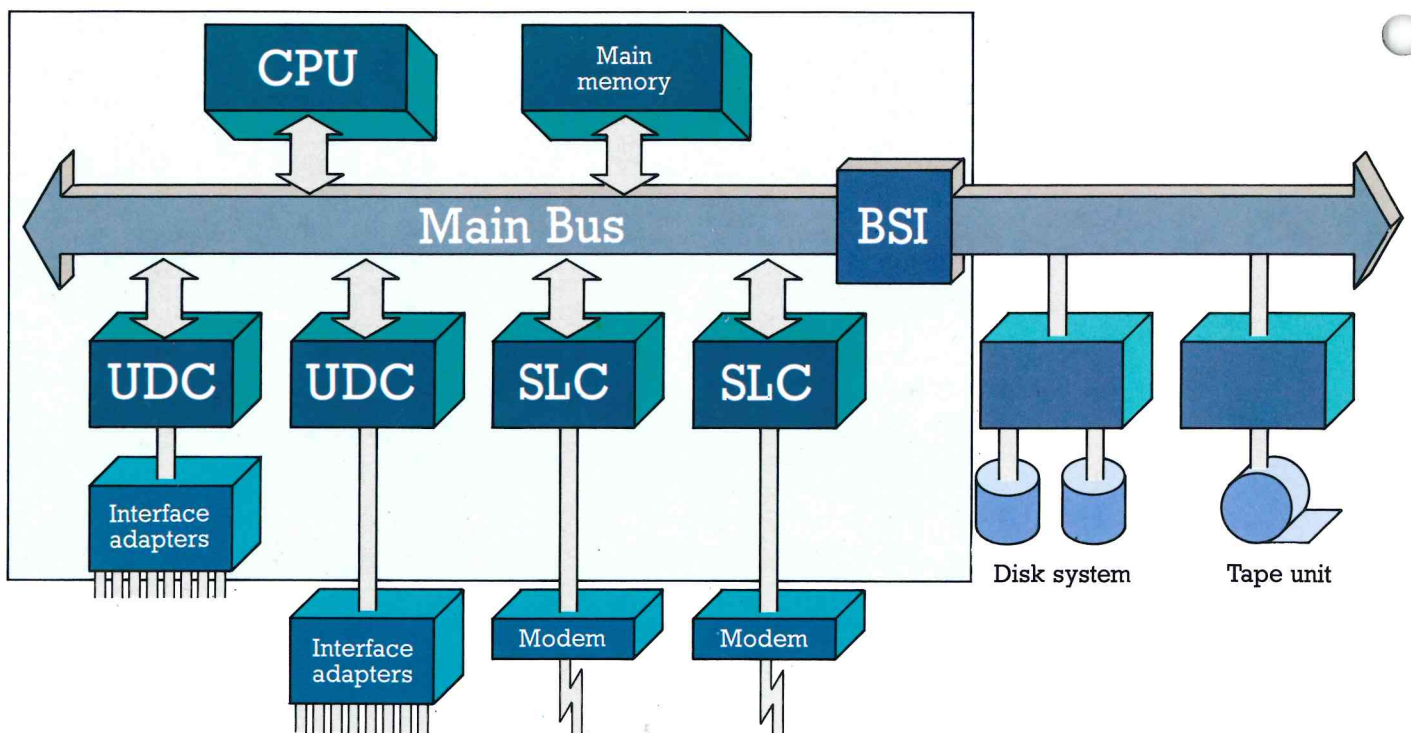
Main memory

The main memory is built onto a single circuit board using 16-Kbit MOS chips. The memory sizes available are 64, 128, 192 and 256 Kbytes.

Universal Device Controller

Most Mikko 3/36 peripheral device interfaces are handled by microprocessor-based UDCs (Universal Device Controllers). A UDC is an independent I/O processor, which transfers data to and from the main memory without CPU intervention. Up to three UDCs, each controlling up to eight channels, can be connected to the Mikko 3/36.

A UDC contains an I/O bus to which separate I/O adapters are connected. The adapter for each channel can easily be exchanged according to the user's configuration requirements. New module interfaces can be introduced by developing appropriate interface adapters.



Synchronous Line Controller

For efficient use of the Mikko 3/36 in real-time and message concentration systems, a microprocessor-based SLC (Synchronous Line Controller) is available. Based on DMA type operation it permits a transfer rate of up to 500,000 bit/s.

The SLC can handle data communication according to both bit and byte-oriented line procedures. To reduce the load on the CPU, data transmission and receiving routines for several line procedures are programmed into the microprogram memory of the SLC. The line procedures are easy to install by exchanging the SLC microprograms.

Bus Interface Unit

The Bus Interface Unit (BSI) is designed to allow wider use of mass-storage devices with the Mikko 3/36. It connects the Main Bus to the magnetic-tape and disk controllers available for the Mikko 3/36.

Real-time oriented operating system

The software of the Mikko 3/36 generally consists of two parts: the operating system and the application programs.

The basic operating system of the Mikko 3 minicomputer family is called the RTX II. Its main components are the monitor, the I/O handlers and the command language. The monitor handles the system and application processes, allocation of resources to the processes and communication and synchronization between the processes. RTX II macros enable the user to utilize operating system services.

The user controls his system by the OCL (Operator's Control Language), which includes commands for basic handling of files and for starting up utilities and subsystems for program development as well as the application programs. He can also use OCL to configure his software to fit his hardware system.

For application development PL/M3 and Cobol/M3 programming languages are available. The RTX II enables several user applications to be run simultaneously as determined at application building.

Effective testing and maintenance

Every Mikko 3/36 goes through a comprehensive testing procedure during manufacturing. Each circuit board is tested individually by a computer to assure maximum efficiency. After the unit tests, the Mikko 3/36s are pre-aged with temperature cycling for several days. Finally an impact test, made with a program running, reveals most of the defects that could otherwise be caused by transport to the customer.

The Mikko 3/36 is designed to withstand a high static electric potential. This is tested by means of 6 kV discharges to the casing of each Mikko 3/36 during operation.

Mikko 3/36 maintenance is based on module exchange principle. Diagnostic programs for every type of unit permit rapid error detection.

Versatile configurations according to user's requirements

A wide variety of configurations are possible for different applications in the Mikko 3/36. The basic system includes the following units:

- Central Processing Unit
- 64 Kbyte memory board
- Universal Device Controller
- Casing
- Power supply unit and stand-by power unit

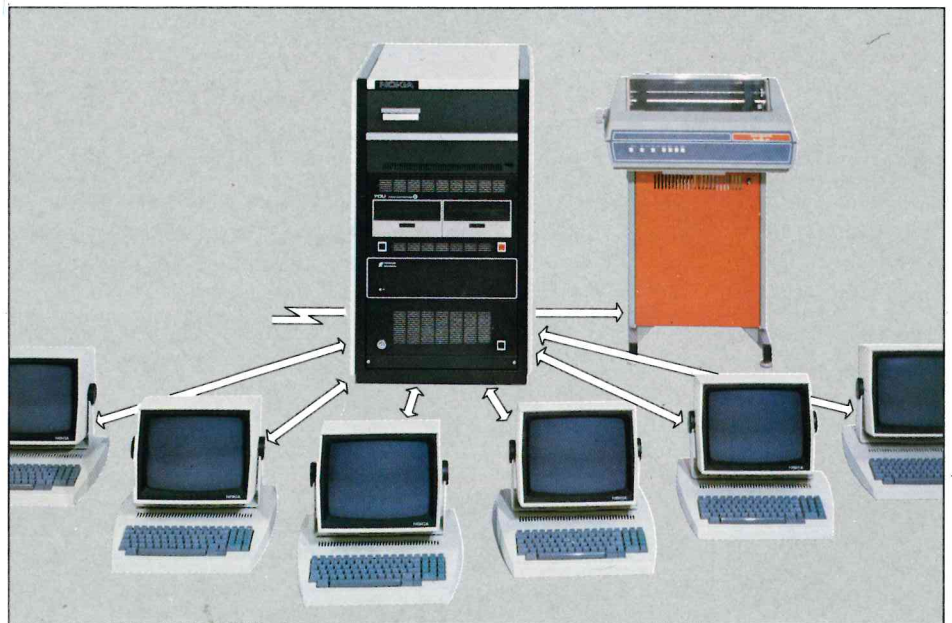
A Mikko 3/36 is normally installed in its own rack, which includes power distribution to several devices. Up to two disk units or diskette casings can be mounted in the same rack.

For peripheral-device and line connections, a Mikko 3/36 can handle up to five controllers: UDC, SLC and/or BSI. These can include up to three UDCs or three SLCs.

For each UDC, interface adapters for up to eight channels are selected according to the configuration.

A typical Mikko 3/36 configuration is shown in the diagram below.

Separate brochures are available upon request on the use of Mikko 3/36s in different applications.



Mikko 3/36 technical data

Main Bus

- Bidirectional asynchronous 3-state bus
- 16 parallel data lines
- Cycle time 400 ns
- Transfer rate up to 2.5 Mword/s.

Central Processing Unit

- Fast bipolar processor based on MSI and LSI TTL circuits
- Processor cycle time 250 ns
- Word length 16 bit
- 20-bit address mechanism
- 2 accumulators
- 2 index registers
- Program counter and 3 internal registers
- 16 address extension registers of 8 bits
- Microprogrammed instruction set of 233 machine instructions
- Vectored 3-level interrupt mechanism
- Hardware multiplication and division
- Hardware-controlled stacking operations
- ROM bootstrap loader.

Main memory

- MOS RAM, based on 16-Kbit dynamic semiconductor-integrated circuits
- Word and byte access
- 64, 128, 192 or 256 Kbytes
- Read/write cycle time 500 ns
- Access time 300 ns.

Universal Device Controller

- Microprocessor-based I/O controller with local microprogram memory
- DMA-type operation
- Transfer rate up to 150,000 byte/s
- Synchronous 8-bit I/O bus
 - cycle time 2 μ s
 - connections to 8 channels
- Separate I/O adapters:
 - Serial 20 mA current loop or EIA RS 232C, two channels per adapter
 - Floppy-disk interface adapter for one or two drives
 - Choice of parallel interfaces.

Synchronous Line Controller

- Microprocessor-based I/O controller for a synchronous line
- DMA-type operation
- Transfer rate up to 500,000 bit/s
- Program-selectable microprogrammed I/O operations for bit- and byte-oriented line procedures: HDLC, SDLC, BSC, VIP and ECMA-16-type procedures
- Recognition of two station addresses
- Double buffering for the transmitter and the receiver
- Internal test linkage between the transmitter and receiver
- EIA RS 232C interface.

Bus Interface Unit

- Connections for Mikko 3/36 magnetic-tape and disk controllers.

Casing and power supply

- Rack size: length 77 cm, width 58 cm, height 101 cm
- Weight of rack with Mikko 3/36: 70 kg
- Stand-by power-supply unit to preserve the memory contents for about half an hour in the event of a power failure
- Mains connection:
 - Supply voltage 220 V \pm 10 %
 - Frequency 50 Hz \pm 1 Hz
 - Earthed outlet required
- Mains connection unit
 - two fixed connections
 - four connections controlled by the Mikko 3/36.

Environment

- Operating temperature 10...35° C
- Relative humidity during operation 20...80 %

Our policy is one of continuous development and improvement. We reserve the right to alter technical details without notice.



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