

Mikko 3/16

minicomputer system

MIKKO 3/16 NOKIA ELECTRONICS

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Versatile minicomputer system

The Mikko 3/16 is a minicomputer system designed for a wide range of applications. It is used in local data processing systems and in large distributed data networks.

The Mikko 3/16 incorporates multiprocessor architecture. A high speed 16-bit central processor ex-

ecutes the user application software. Microprocessors are used in separate controllers for peripheral devices and data communication.

The Mikko 3/16 is modular. Device modules can easily be added or removed according to users' requirements. At the application program level, the Mikko 3/16 is fully com-

patible with other Mikko 3 models, which allows the user flexibility in the use of different systems.

The Mikko 3/16 is housed in a single casing together with one or two floppy disk drives. It is designed for a normal office environment without special air conditioning.

Multiprocessor system architecture

High performance in serving multiuser systems was an important requirement in the design of the Mikko 3/16 architecture. The performance of the Mikko 3/16 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 3/16 CPU from routine control of peripheral devices, and thus enhances its processing capacity.

Main Bus

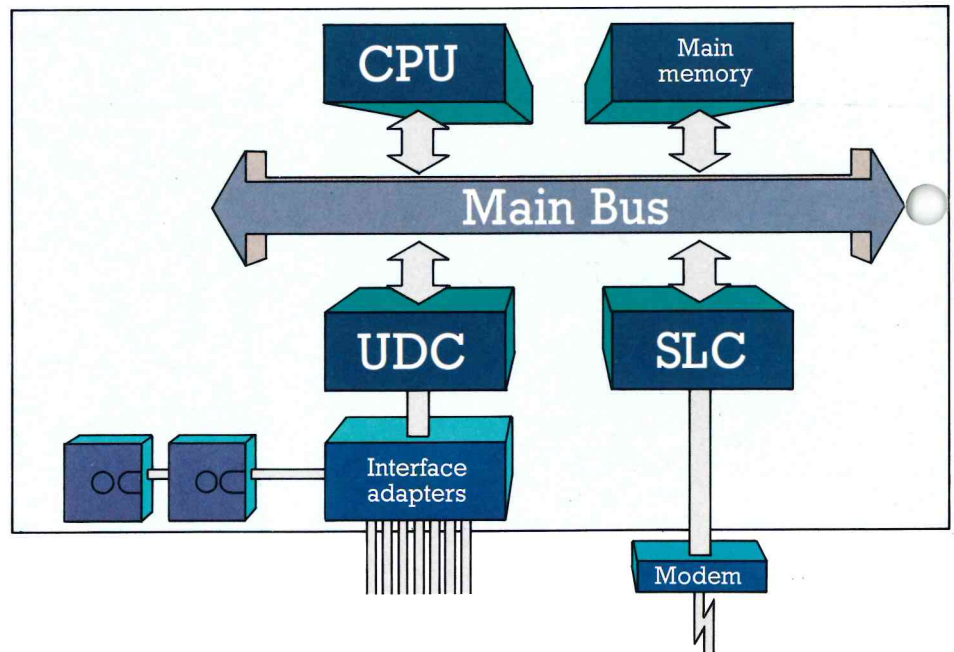
The components of the Mikko 3/16 are connected to each other by a fast bus line, the Main Bus. This bidirectional bus includes 16 parallel data lines. Being asynchronous it is compatible with devices operating at a wide variety of speeds.

In the Mikko 3/16, four circuit boards can be connected to the Main Bus: the CPU, the main memory, the UDC (Universal Device Controller) and, optionally, an SLC (Synchronous Line Controller).

The lay-out of the Mikko 3/16 is shown in the diagram.

Central Processing Unit

The Mikko 3/16 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 and 128 Kbytes.

Universal Device Controller

Peripheral device connections to the Mikko 3/16 are handled by the UDC (Universal Device Controller), a microprocessor-based, independent I/O processor, which transfers data to and from the main memory without CPU intervention.

The UDC contains an I/O bus to which separate adapters are connected to handle up to eight channels. The adapter for each channel can easily be exchanged according to the user's configuration requirements. Available adapter types include serial current-loop and EIA RS 232C interfaces and several parallel interface adapters for use with standard Mikko 3 peripheral devices. New module interfaces can be introduced by developing appropriate interface adapters.

Synchronous Line Controller

For efficient use of the Mikko 3/16 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 procedure to be used is program-selectable and new procedures are easy to install by exchanging the SLC microprograms.

Real-time oriented operating system

The software of the Mikko 3/16 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 3/16 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 3/16s 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 trans-

port to the customer.

The Mikko 3/16 is designed to withstand a high static electric potential. This is tested by means of 6 kV discharges to the casing of each Mikko 3/16 during operation.

Mikko 3/16 maintenance is based on module exchange principle. Diagnostic programs for every type of unit permit rapid error detection.

Configurations for a wide range of applications

The basic Mikko 3/16 includes the following units:

- Central Processing Unit
- 64 Kbyte memory board
- Universal Device Controller
- Floppy disk controller and drive
- Casing and power supply unit.

The memory size can be increased to 128 Kbytes.

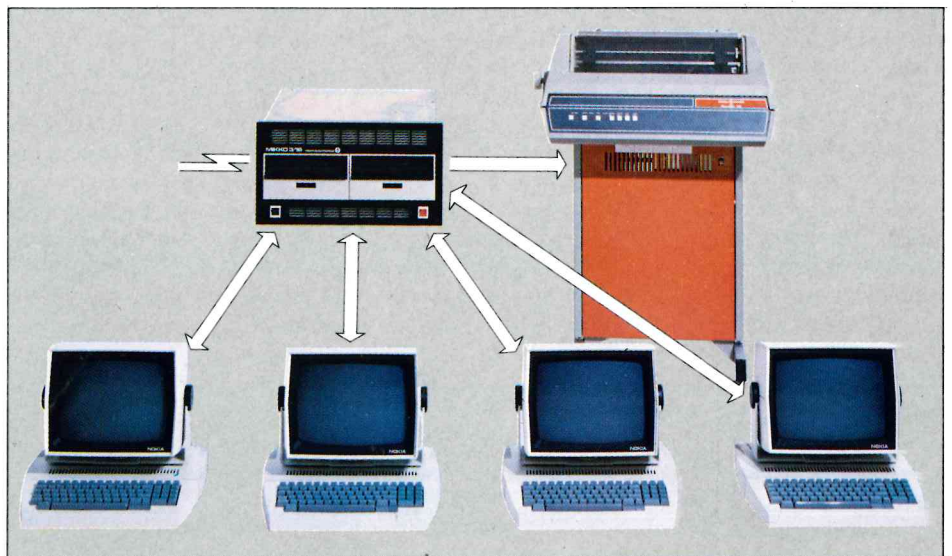
A second floppy disk drive can optionally be installed in the Mikko 3/16 casing and connected to the same controller as the first drive. For other peripheral interfaces up to seven UDC channels are freely avail-

able according to the user's configuration requirements. The UDC adapters are selected according to the configuration.

An SLC is available optionally for a synchronous communication line.

A typical Mikko 3/16 configuration is depicted in the diagram below.

Mikko 3/16 applications range from banking-terminal and sales-terminal systems to applications in industry, trade, administration, hospitals, etc. Separate brochures are available upon request for individual applications.



Mikko 3/16 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
- Connection slots for 4 circuit boards.

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
- Micro-programmed 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 or 128 Kbytes
- Read/write cycle time 500 ns
- Access time 300 ns.

Universal Device Controller

- Microprocessor-based I/O controller with local micro-program 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.

Floppy Disk Drive

- Capacity 250 Kbytes
- Number of tracks 77
- Spare tracks 2
- Sectors per track 26
- Sector size 128 bytes
- Transfer rate 31,250 byte/s
- Stepping speed 8 ms per track
- Adjacent track search 16 ms
- Read-head settling time 35 ms
- Sector-to-sector time 6 ms
- Time from sector 26 to sector 1 16 ms
- Rotation speed 360 r.p.m.
- Track life 3.5 million searches.

Casing and power supply

- Size: length 64 cm, width 48 cm, height 27 cm
- Weight: 34 kg with one diskette drive, 40 kg with two drives
- Supply voltage 220 V \pm 10 %
- Frequency 50 Hz \pm 1 Hz
- Power consumption 400 W (max)
- Earthed outlet required.

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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