DECISION 1

The Decision 1 is a flexible microcomputer that can be configured as a single user system running CP/M, or can be expanded to a sophisticated multi-user system running the Micronix Operating System.

The basic Decision 1 is an S-100 bus system that comes with a 14 slot motherboard, a Z80 CPU board, one parallel and three serial ports, and a 64K RAM board (main memory can be expanded to 1 Megabyte). Optional 5 1/4" floppy and hard disks come with DMA disk drive controllers.

The Decision 1 system's architecture capitalizes on the cost advantages of micro-processors, yet it has many sophisticated features typically found only on expensive main frame systems. These features include memory management on the CPU, interrupt driven I/O, and Direct Memory Access on the hard and floppy disk controllers; all features designed to maximize system throughput and reliability. Most important, the system architecture was designed around a multi-user operating system. Not just any system, but Morrow's Micronix Operating System, a UNIX like system with a CP/M emulator that allows you to have more than one user running CP/M application programs.

The Decision 1 achieves its flexibility through its bus structure which can handle 14 functionally distinct S-100 boards. Just as a component stereo can be improved and expanded, a bus structure allows the computer to grow or change as the technology is improved or functions are added. An extra advantage of the S-100 bus is the over fifty manufacturers that provide a wide assortment of peripherals. The competition between these manufacturers assures the consumer that the S-100 bus will be on the leading edge of price/performance in the microcomputer marketplace.

Morrow has been in business since the very origins of the S-100 bus and micro computing. George Morrow, along with Engineering Director Howard Fullmer, pioneered the standards while serving as chairmen of the IEEE S-100 bus committee. Their work for Morrow ensures our customers of high performance state of the art components which conform to every letter of the bus standards. No shortcuts; just sound, conservative design principles.

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STANDARD FEATURES:

Cabinet & Utilities:
- 2 switched convenience outlets
- AC power breaker
- Front panel reset - Key switch
- Rear panel connector access
- Forced air cooling
- Dimension: 19" wide, 21" deep, and 7.5" high, with steel contruction
- Weight: 40 lbs., with drives
- Rackmount option

Power Supply:
- 250 watt average output
- FCC class A operation certified
- 110/220 switch option
- Power requirements: 3.0 AMPS max. at 95-128 VAC: 1.5 AMPS max. at 190-265 VAC

BOARD SPECIFICATIONS:

Motherboard:
- 14 S-100 slots
- Programmable interrupt controller (8259)
- Real time clock (NEC 1990)
- Parallel daisy-wheel printer port (Diablo Hy-Type)
- Three serial RS 232C (8250) ports

CPU:
- Z80A CPU at 4 MHz
- 24 bit extended addressing
- Sophisticated trapping mechanism and memory management
- Memory protection hardware
- 2K bootstrap PROM/monitor, and 1K RAM

MM 64 KS: 64K Static RAM
- High speed static RAM
- 2K x 8 NMOS RAM chips (6116)
- Operating speed up to 6 MHz
- Draws only .5 AMPS of power
- Extended addressing or bank select

MM 256 KD: 256K Dynamic RAM
- High speed dynamic RAM (4164 type 150 NS RAMchips)
- Operating speed up to 6MHz
- Draws only .98 AMPS
- Extended addressing
- Supports both 8 and 16 bit access as specified by S-100 bus standards.
- 150 NS typical access time 350 NS minimum cycle time (as measured from pSTVAL)

HDC/DMA: Hard Disk Controller
- DMA bus arbitration as outlined by the IEEE 696 standards
- Controls 1 to 4 soft sectored Winchester 5 1/4" drives (ST506 compatible)
- Variable format (128, 256, 512, 1024, or 2048 byte sector lengths) under on-board software control
- Automatic error checking
- Addresses 1 to 8 heads per drive
- Addresses up to 65,000 tracks
- 24-bit address burst DMA transfers
- Maximum transfer rate of 625K BPS

DJ/DMA: Floppy Disk Controller
- DMA bus arbitration logic
- IEEE standard 24-bit memory addressing
- Resident disk driver routines
- Supports up to four 8" drives, and up to four 5 1/4" drives
- On board firmware supports soft sectored IBM compatible 8" and MICRO DECISION format 5 1/4" diskettes, as well as hard sectored NorthStar CP/M compatible 5 1/4" diskettes
- Automatically determines whether media is single or double density and calculates number of sectors per track

DRIVE SPECIFICATIONS

10 Megabyte 5 1/4" Hard Disk:
- 12.76 megabytes unformatted, 11.2 Megabytes formatted as shipped
- 2 platters, 4 read/write heads, 306 cylinders, 1224 tracks
- Average random access: 95 milliseconds
- Maximum transfer rate: 625K BPS

16 Megabyte 5 1/4" Hard Disk:
- 19 megabytes unformatted, 16 megabytes formatted as shipped
- 3 platters, 6 read/write heads, 306 cylinders, 1836 tracks
- Average random access: 95 milliseconds
- Maximum transfer rate: 625K BPS

400K 5 1/4" Floppy Disk:
- Double sided, double density 48 TPI
- 384K bytes of usable memory
- Rotational Speed 300 rpm
- Transfer rate: 125KNBPS
- Average access time: 180 milliseconds
- Format: hard sectored NorthStar CP/M compatible

BUSINESS APPLICATION SOFTWARE:

- **CP/M® 2.2** operating system
- **WordStar®** word processing
- **Correct-It®** spelling checker
- **LogicCalc®** spread sheet
- **Personal Pearl®** djta base manager
- **M BASIC 80®** & **BaZic®** programming languages

MICRONIX OPERATING SYSTEM:

With Micronix you have access to more software than anyone else in the world, because you can run both CP/M and UNIX programs simultaneously. If you are familiar with CP/M you can begin by using Micronix as a multi-user version of CP/M while you gradually learn to use its more powerful features.

The highlights include:
- **Multi-user:** Add another computing station by simply adding another terminal.
- **Multi-tasking:** Each user can run several programs at once.
- **Hierarchical file system:** Data is organized logically by subject as in an outline. No more hunting through hundreds of randomly listed file names.
- **File protection:** Data can be protected or shared. For example, reports can be opened to people in a particular department and closed to all others.
- **Versatile input and output:** The output of a program can be sent anywhere—to a screen, a printer, a file, or another program.
- **CP/M compatibility:** Micronix includes a CP/M emulator that runs CP/M application programs unchanged. Micronix can read and write CP/M floppy diskettes.
- **UNIX compatibility:** Micronix is compatible with Bell Lab's version 6 UNIX at the system call and library level. Source code written to run under UNIX will compile and run under Micronix.
- **Over 100 software tools** including most standard UNIX utilities.
- **On line reference manual** and extensive tutorials for the novice.
- **Choice of user interface:** Novices can use the friendly Menu shell, CP/M users can choose the CP/M shell, and UNIX users can run the powerful UNIX shell.

DMA controllers:
A DMA controller's speed is enhanced by t channel concept. In brief, the CPU places a s of instructions in RAM, and signals the disk controller telling it where in memory to pick up the commands. The CPU then goes on to perform other tasks. The controller picks up these instructions from memory and executes the command (a typical command might be to load sector five, track 16, drive B, into a particular address in RAM). When necessary, commands can be chained together by the CPU so the controller can execute many commands in succession. The controller can generate an interrupt telling the CPU it is finished when a particular command or a string of commands is completed.

The traditional I/O based controller needs the CPU's supervision to tell it what to do as it moves data sector by sector. By contrast a DMA controller serves as a highly efficient assistant that can be given a set of instructions and, without supervision, will report back to the CPU when the job is done. By taking care of data transfer responsibilities, the DMA controller frees the CPU for its processing functions. DMA controllers provide a CP/M system with a faster transfer rate, but they make their greatest contribution in the multi-user, multi-tasking environment of the Micronix Operating System.

Interrupts:
An interrupt driven system maximizes the program execution role of the Central Processing Unit. In a system without interrupts, the CPU is required to spend a significant portion of its time going from device to device (whether terminal, printer or disk controller) asking each device in the system whether it is ready to input or output new data. In an interrupt driven system the CPU is free to spend most of its time running programs. When a device is ready to transmit it interrupts the CPU. Upon interruption the CPU immediately executes the service routine appropriate to the device, then returns to what it was doing. This is particularly useful in a multi-user system where the large array of individual devices do not consume CPU resources until they are required.

Memory Management:
Sophisticated memory management hardware on the CPU allows multiple users to share memory space by allocating memory in 4K increments as it is needed. Under operating system controls you can specify protection attributes for each 4K segment. Memory mapping maximizes the efficient utilization of RAM, while the protection attributes prevent users from accessing memory that has not been allocated to them.

Trapping:
The hardware trap mechanism allows the operating system complete control over user operations. This offers each user protection from other users and keeps system resources (disk I/O, memory, etc.) from user corruption. Traps can be set in any configuration, or disabled in the case of one user running one task.

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