MuSYS CORP.

Specialists in Multi-user Microsystems

TurboDOS™

DISTRIBUTED SYSTEM SOFTWARE

SINGLE USER FEATURES

Single user TurboDOS* has the following standard features:

- CP/M** compatibility for programs and data
- 3-6 times faster for system functions
- Supports larger files (134MB) and disks (1048MB)
- More reliability and versatility
- Automatic print spooling option

MULTI-USER FEATURES

Multi-user TurboDOS* adds the following features:

- Bank switched memory support
- Optional networking support
- Multi-access file and record interlocks
- Totally re-entrant file manager
- Password security and system usage log

DESCRIPTION

TurboDOS is the perfect companion for your NET/82*** based system. Or, you may customize it for any Z80-based hardware configuration. In fact, TurboDOS should be used in place of CP/M**, MP/M** or CP/NET** in any system where higher throughput, increased reliability, and extra professional features are desirable.

The modular architecture of TurboDOS allows easy adaptation to different user environments. The commonality of modules ensures compatibility between different versions of TurboDOS. A relocating, linking, loader program determines the system memory size, selects the configuration specified in a symbolic parameter file, and relocates, links, and loads the modules for the specified configuration.

TurboDOS provides a complete set of system programs, exclusive of language processors. Each utility program provided is equal to or better than the corresponding utility available with CP/M. Many features which are optional, extra cost, or not available at all in CP/M are standard with TurboDOS. For these reasons and more, TurboDOS should be your Z80 operating system.

 *TurboDOS is a trademark of Software 2000, Inc.
 **CP/M, MP/M, and CP/NET are trademarks of Digital Research, Inc.
***Net/82 is a trademark of MuSYS Corp.
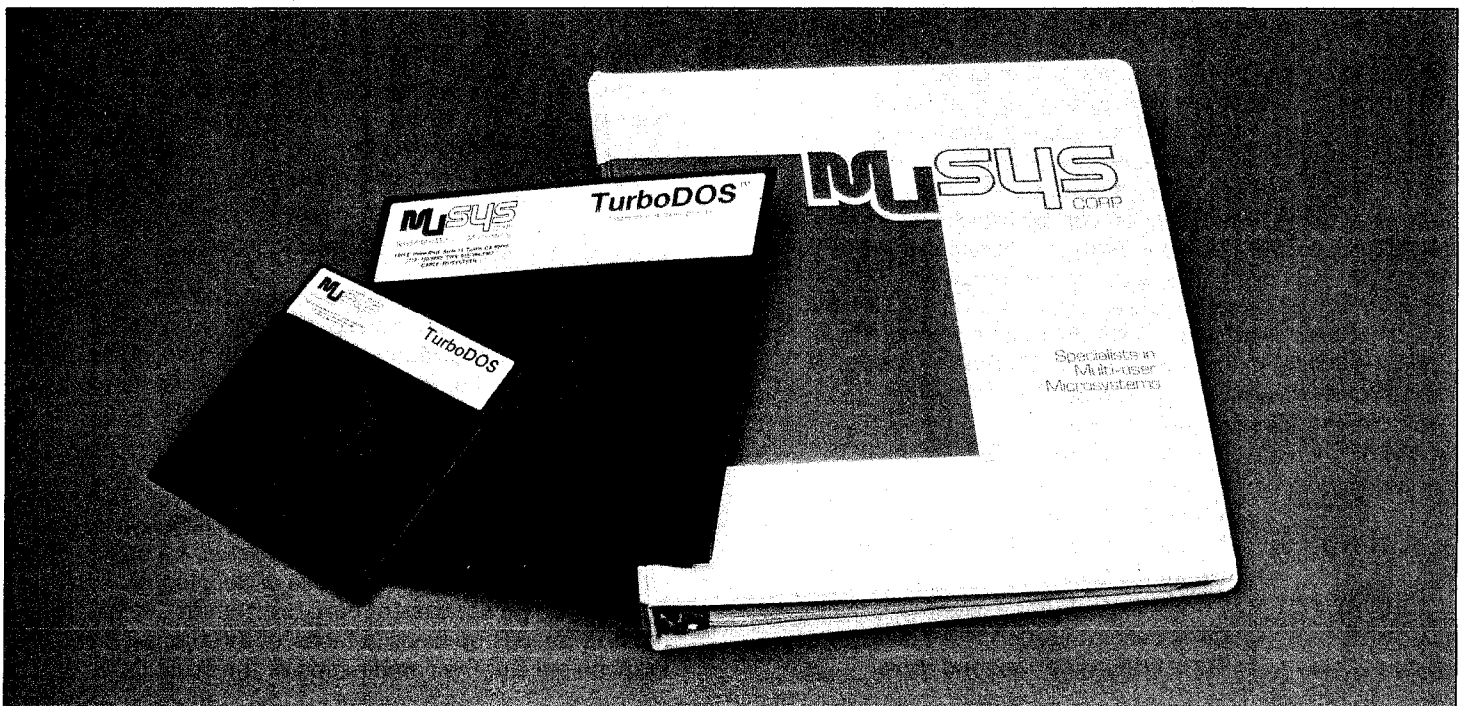
GENERATING TurboDOS

A TurboDOS functional operating system is generated via individual device-dependent modules linked to a relocatable kernel. Since all hardware-dependent drivers are relocatable modules, replacing one relocatable disk driver with the driver for the new controller is as easy as interchanging S-100 disk controllers. This simplification is accomplished through a special TurboDOS file, .GEN, which defines the modules that link together to form the functional operating system.

The following example shows a typical .GEN file:

STDSPOOL	Kernel of a single user TurboDOS with spooler.
HDWNIT	Hardware initialization module.
RTCNUL	Null driver for realtime clock.
SERIAL	Serial I/O manager module.
CON96	9600 baud console logical driver.
LSTCTS	Logical driver for clear-to-send printer.
	Order of LST modules defines the driver number (i.e. LSTCTS is the first driver and LSTPAR is the second) and defines the default logical unit order.
LSTPAR	Logical driver for parallel printer.
SPINS2	Hardware level serial/parallel driver.
DSKNSF	Driver for North Star floppy controller.
	Order of DSK modules defines the driver number vis-a-vis the LST, and defines the default order of the logical units.
DSKS33	Driver for ADES S33 Winchester drive.

SYMBOLIC PATCH FACILITY

How many times have you wanted to change the step rate of a drive or change one byte? With TurboDOS's .PAR file you no longer have to edit the source file, reassemble it and then regenerate your CP/M. In the .PAR file you can reset the value of public symbols or any other byte whose location can be expressed as an offset from a public symbol. Setting a public symbol in the .PAR file is not only easier than editing and reassembling, but gives you a permanent record of what was changed. In addition, .PAR provides a method for updating modules in the field to which the end-user does not even have source access. The following example shows a typical .PAR file:

NSFRTE = 3	Step rate for North Star floppy (mSec) Default is 5 mSec
NSFDNO = 3	Number of North Star floppy drives Default is two
LSTAST = 01,10	Printer logical unit assignment table: 01 is second unit on first driver; 10 is first unit on second driver

AUTUSR = 80   User number that the system comes up under. Setting the sign bit makes the user priviledged

SYSTEM GROWTH CAPABILITY

TurboDOS can be upgraded from single user to single user with spooler, to multi-user, to multi-processor, without regenerating a single driver. Unlike the transition from CP/M to CP/NET, existing software does not become obsolete. Most of the changes necessary are internal to the system kernel which is linked with the system's drivers. Thus, with the exception of the network driver(s), the change from a single user to a multi-processor TurboDOS is accomplished by replacing STDSINGL by STDMASTR in the .GEN file. Of course, TurboDOS executing in the slave processor must also be generated with STDSLAVE as the kernel of TurboDOS. If you use network slaves such as the NET/82™ for which drivers already exist, no new software need be written.

PRINT SPOOLING

The multi-user versions of TurboDOS provide automatic print spooling and despooling for up to 16 printers. Print handling may be controlled by an operator, permitting single-sheet fed operation, forms changing, etc. Print spooling is optionally available for single user TurboDOS.

FILE AND RECORD LOCKING

Multi-user version TurboDOS provides automatic file locking. Only one user at a time is permitted to have a shared file open for update. For situations requiring multiple user access to update a shared file, TurboDOS provides for user-invoked record level locking. Record locking is invoked by the simple addition of system function calls to lock and unlock records.

DISK ALLOCATION MAP ON DISK

TurboDOS keeps the bit map of the allocation blocks on each diskette. This allows changing of disks without requiring a warmboot to log on the new disk: a vital feature in a multi-user environment.

BUFFERED DISK I/O

TurboDOS provides a disk-buffer manager. This module performs multi-level buffering of disk I/O using sophisticated optimization techniques. This reduces the number of actual disk accesses required, providing commensurate increases in system throughput.

FAST DISK I/O

In addition to buffering disk data, TurboDOS provides faster disk transfers. This is accomplished by using either no interleaving (in the case of floppies) or less interleaving (in the case of hard disks) than CP/M. This not only speeds up loads (a factor of three to six times for floppies), but the combination of the TurboDOS

interleaving scheme and TurboDOS's disk buffering reduces the processing time for virtually any applications program without modifying the program. In addition, TurboDOS provides a program load optimizer which scans the allocation map of a program file, determines the sequentially allocated segments of the file, and loads those segments at the maximum transfer rate of the disk controller.

DISK ERROR HANDLING

The structure of TurboDOS permits the inclusion of read-after-write verification while still maintaining faster throughput than the typical CP/M implementation. If an error is detected, TurboDOS gives the user meaningful choices: retry, abort the process or accept the error and continue. The last option is particularly important since it allows the user to retrieve as much data as possible from a damaged file.

SUPPORT FOR LARGE DISK DRIVES/FILES

TurboDOS was written to accommodate the new generation of large capacity disk drives that are becoming available. TurboDOS provides for logical drives up to 1024 megabytes and individual files up to 134 megabytes. CP/M 2.X limits logical drives to eight megabytes. Even the new MP/M II, with its limits of 512 megabyte drives and 32 megabyte files, cannot match TurboDOS.

DRIVE INDEPENDENCE

CP/M requires that drive A is functional to operate. TurboDOS uses OSBOOT.COM (typically stored in a boot EPROM) that scans all of the drives for ready/not ready status. Then, starting with the first ready drive, TurboDOS scans for OSLOAD.COM. OSLOAD.COM then performs the same scan and search for OSMASTER.SYS and loads it. Thus, even in a minimal two drive system, either drive can fail and the user can continue to use the system with the remaining drive.

FLOPPY DISK FORMAT COMPATIBILITY

Since the formats recognized by TurboDOS are functions of the drivers, you may configure TurboDOS to recognize any CP/M disk format. The standard drivers recognize — and can generate — CP/M format single-sided single-density eight inch floppies which are the industry standard for software distribution. Since there is no standard for mini-floppies, each driver should be written to recognize the most common CP/M format for that particular controller. As an example, all of the standard 8" floppy drivers recognize single-sided, single-density CP/M formats.
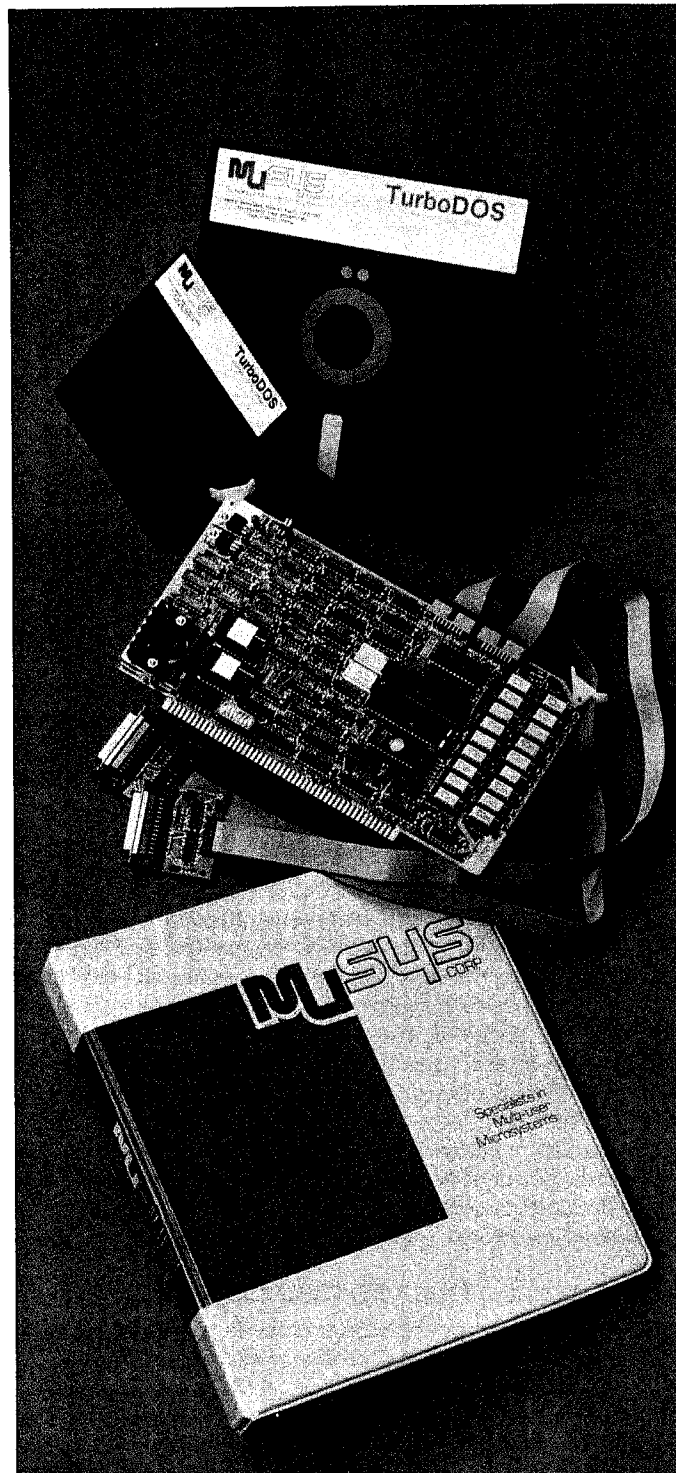
TurboDOS is ideal for use with MuSys Corp. NET/82 Network Slaves (See NET/82 Technical Data) or any Z80–based hardware configuration. TurboDOS is also the ideal replacement for CP/M, MP/M and CP/NET in any system where higher throughput, more reliability and extra professional features are desired.

MuSYS CORP.
Specialists in Multi-user Microsystems

SPECIFICATIONS

SUGGESTED HARDWARE

4MHz Z80A processor (or faster)
64KB of RAM (or more)
Interrupt capability
Serial port for the console
One or more disk subsystems (preferably DMA)
One or more printers

CP/M COMPATIBILITY

TurboDOS is fully compatible with CP/M version 2.2 as viewed from the application program. All BDOS functions and direct BIOS calls are supported by various TurboDOS modules. Disk media may be accessed by TurboDOS without conversion, although it is to your advantage to convert the disks to TurboDOS format since greater capacity and higher throughput are possible with the new format. Unlike MP/M, the multi-user and networking versions of TurboDOS retain full CP/M compatibility.

MODULAR ARCHITECTURE

There are 20-50 modules in the resident portion of TurboDOS depending on the system configuration selected. Each hardware dependent element is in a separate relocatable module. You may change or replace any of these modules easily, without massive reassemblies or system generations.

IMPROVED PERFORMANCE

Program loading under TurboDOS is up to six times faster than CP/M. File processing functions average three to five times faster. Warm start and disk log-on delays are eliminated altogether. A sophisticated buffer manager reduces manyfold the number of physical disk accesses required. The amount of buffering is a user parameter, and may be changed dynamically by the application program. A re-entrant file manager allows simultaneous accesses on different controllers, if the controller hardware supports DMA transfers. Also, higher priority tasks may interrupt long file operations. TurboDOS is written entirely in Z80 code, taking advantage of the extended capabilities of this processor.

INCREASED FILE AND DISK CAPACITY

As microcomputers become feasible for larger tasks, the CP/M limit of 8MB as the file or disk size severely constrains the application. TurboDOS uses larger physical sectors on floppy disks, thus increasing the total capacity dramatically. Also, files may be defined up to 134MB in size, and drives up to 1048MB may be declared. This makes it possible to use any of today's advanced disk systems in your application.

ENHANCED RELIABILITY AND ERROR RECOVERY

Reliability and graceful recovery from errors are critical attributes of any data processing system. TurboDOS performs read-after-write verification of each disk update operation. The extensive buffering inside TurboDOS makes this possible with little or no degradation in throughput. Any errors detected are reported with meaningful diagnostic messages which have real alternatives for their handling. In addition, the failure of any single drive will not keep the system from functioning as system bootstrap and residency is possible with any drive.

DISK CHANGE PROBLEMS ARE ELIMINATED

TurboDOS uses the big system technique of recording the allocation information on the disk, so disks may be changed any time they are not being actively updated. This eliminates the need for disk system resets or warm starts which are particularly bothersome in other multi-user implementations.

EXTENSIVE UTILITY SOFTWARE

TurboDOS includes a complete set of utility programs, including:

DIR: Full or selective alphabetized directory.

COPY, RENAME, and DELETE: These operate on single files or groups of files, with optional confirmation on a file-by-file basis.

LABEL: Establishes a label for the disk volume.

DRIVE: Displays the various disk parameters.

DUMP: Gives a combined HEX/ASCII dump of a specified file.

TYPE: Displays an ASCII file.

ASSIGN: Alters the physical device associated with the console or printer.

PRINT, PRINTER: Permit the operator to control the print spooling.

ADDITIONAL FEATURES

- Automatic disk type sensing.
- Multiple commands per line, and N level command file nesting.
- User programs may initiate commands or command files, or they may be initiated on cold or warm start.
- Read-only sharing of user 0 files for common system programs.
- Real-time-clock support for date and time functions.
- Logical to physical mapping of disks.
- Optional add-on package contains: networking, file sharing, and security codes.
- Optional, automatic, concurrent print spooling, with multiple print queues, forms types, fonts, and even hand fed single sheets.

MuSYS CORP.

Specialists in Multi-user Microsystems

March, 1982

Dear Reader:

I would like to take this opportunity to thank you for your interest in our products. We offer software as well as hardware.

Although our NET/82 board is ready now, the new NET/81 board will not be available until June, 1982. Special features of these boards include 128K and 64K bytes of RAM respectively.

I am enclosing brochures which contain detailed descriptions of all our products, along with the retail price for each. Attractive discounts are available for qualified OEMs and dealers.

Again, thank you for your interest. If I can be of further assistance, please do not hesitate to contact me.

Sincerely yours,

MuSYS CORPORATION

William A. Schultz
President

WAS:bcs

Encl.

NET/81™
NET/82™

Specialists in Multi-user Microsystems

NET/81 FEATURES

- Parallel port (Z80A-PIO)
- 64K bytes of RAM

NET/82 FEATURES

- No parallel port
- 128K of bank switched memory
- Software selectable bank boundary

COMMON FEATURES:

- Z80A (4 MHz) processor
- Two serial ports
- S-100 bus parallel interface
- EPROM for bootstrap and diagnostics
- Priority interrupt controller
- Floating point processor capability
- Memory parity checking
- Software selectable baud and clock rates

DESCRIPTION

The NET/80 series of single board computers are perfect for use with MuDOS*, CP/NET** or other distributed processing applications built around the S-100 bus. Each board contains all the elements needed for a network slave: Z80A CPU, 64K bytes of RAM, and the RS-232 serial port for a local console. Other features available include a parallel port for the NET/81 and 128K bytes of bank switched memory for the NET/82. Both the NET/81 and the NET/82 have a total of two serial ports, a priority interrupt controller, memory parity checking, and support for an optional floating point processor. Each slave board communicates with a master processor as an I/O mapped peripheral over the S-100 bus. Thus, a complete network, with hardware isolated processors, may be assembled in a single, unmodified, S-100 mainframe.

*MuDOS, NET/81 and NET/82 are trademarks of MuSYS Corp.
**CP/NET is a trademark of Digital Research.
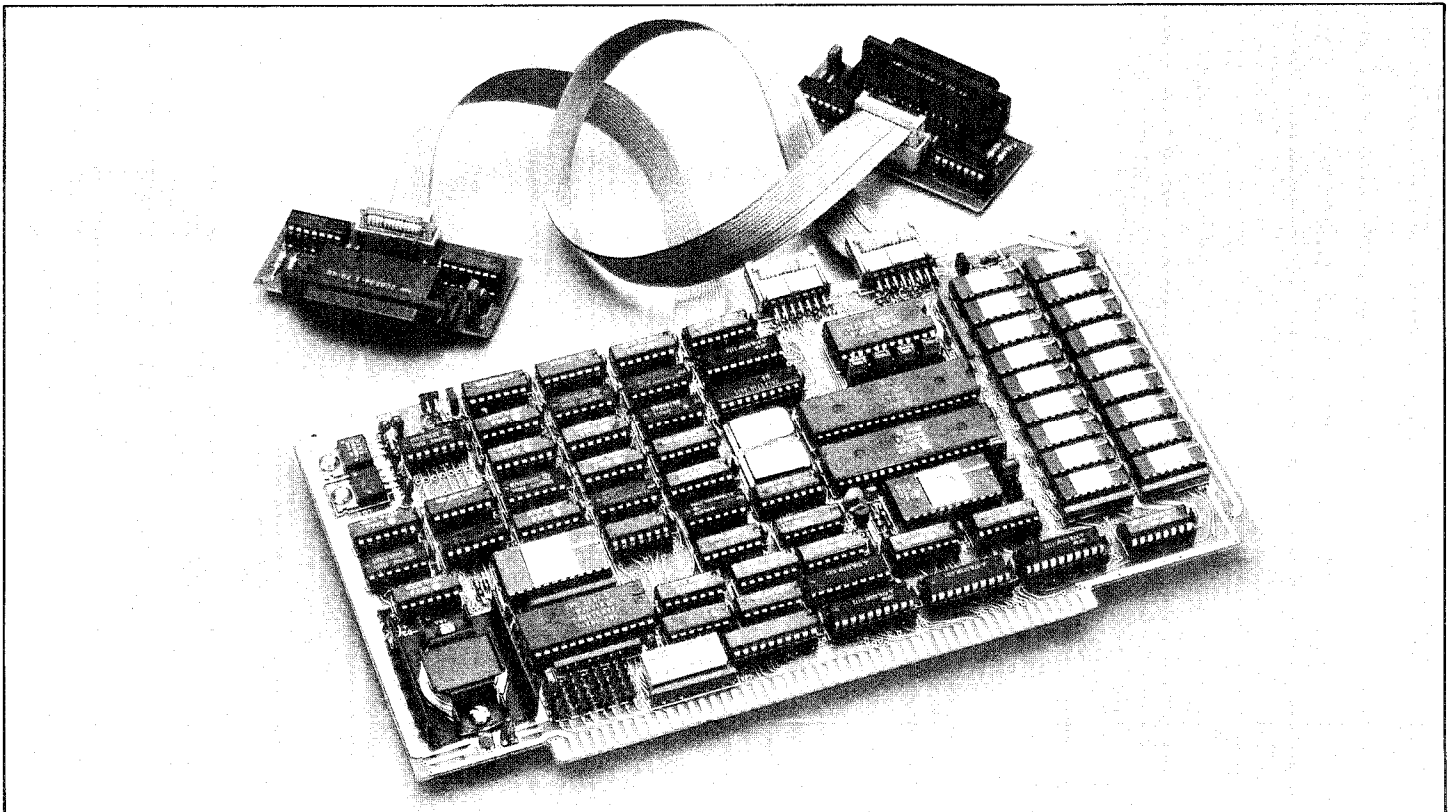
NET/81™ SPECIFICATIONS

MEMORY:
64K bytes of parity checked RAM

AVAILABLE
THIRD QUARTER
1982

PARALLEL PORT:
A Z80A-PIO parallel port controller is brought out to a 50 pin header for external connection.

NET/82™ SPECIFICATIONS

MEMORY:
128K bytes of parity checked RAM, in two banks. The software may select from 1K bytes to 16K bytes of common memory between the two banks at the top end of the memory address space.

COMMON SPECIFICATIONS

PROCESSOR: 4 MHz Z80A

MEMORY ADDRESS SPACE:

PROM Off: 0000-FFFF = RAM
PROM On:　One of the following EPROM's may
　　　　　be inserted:

EPROM	ADDRESS SPACE
2716	0000-07FF (2K bytes)
2532 or 2732	0000-0FFF (4K bytes)

The EPROM type is selected by two jumper plugs.

ON-BOARD I/O ADDRESS SPACE:

00-03 = Z80A-SIO/2
08-09 = Floating Point Processor
10-13 = 8253 Counter/Timer
18-19 = 9519A Priority Interrupt Controller
1D　　= Memory Bank Control
1E-1F = S-100 Bus Communication

CONSOLE SERIAL PORT(s):

A Z80A-SIO/2 dual channel serial interface controller provides two separate asynchronous, synchronous, or SDLC serial data ports. Each may be customized for RS-232C DTE or DCE, or for RS449 for high speed communications. Each board comes with an adapter for RS-232C DCE, which connects to nearly any standard serial terminal. The baud rate is software selectable using an 8253 counter/timer chip.

INTERRUPT CONTROLLER

Each board contains an AM9519A Priority Interrupt Controller. Standard interrupt configurations may be selected by jumper plugs, while wire wrap may be used for unique applications. The S-100 bus interrupt lines are available as interrupt sources or destinations.

S-100 BUS, SLAVE PARALLEL INTERFACE

Consists of a control/status port and a data port, switch selectable as an even/odd pair from 00 to FE. The control/status port is bit sensitive, with the following meanings:

MASTER:

Status = Request, Data Overrun, Read, Write or
　　　　4 arbitrary bits.
Command = Reset Slave, Interrupt Slave, or
　　　　　Clear Request.

SLAVE:

Status = Request, Data Overrun, Parity Error,
　　　　Sense Switch, or Modem Status
　　　　Signals.
Command = Set/Clear Request, Clear Data Overrun
　　　　　or Parity Error, turn PROM Off/On,
　　　　　Set/Clear arbitrary bits to master.

Slave access to the data port places the slave into a wait state until the master accesses the data port. Master access to the data port when the slave is not waiting causes Data Overrun status.

REAL TIME CLOCK

Provides 64Hz and 1 PPS interrupt sources, derived from the baud rate clock.

FLOATING POINT PROCESSOR (optional)

One of four types of floating point processor chips may be supported. The AMD 9511, AMD 9512, Intel 8231, or Intel 8232 processors may be supported at either 2 MHz or 4 MHz clock rates.

MuSYS CORP
Specialists in Multi-user Microsystems

These S-100 Disk Drivers are available now . . .

8" Floppy Disk Controllers

California Computer Systems 2422 (requires address PROM for North Star)

Delta Products

Micromation Doubler

Systems Group FDC 2801

Tarbell Single Density

Tarbell Double Density

Teletek FDC-2

more coming . . .

Hard Disk Controllers

ADES S10	10 Mbyte 8" Winchester subsystem
ADES G10	S10 plus streaming tape backup
ADES S33	33 Mbyte 14" Winchester subsystem
ADES G33	S33 plus streaming tape backup
ADES S34	34 Mbyte 8" Winchester subsystem
ADES G34	S34 plus streaming tape backup
ADES S66	66 Mbyte 14" Winchester subsystem

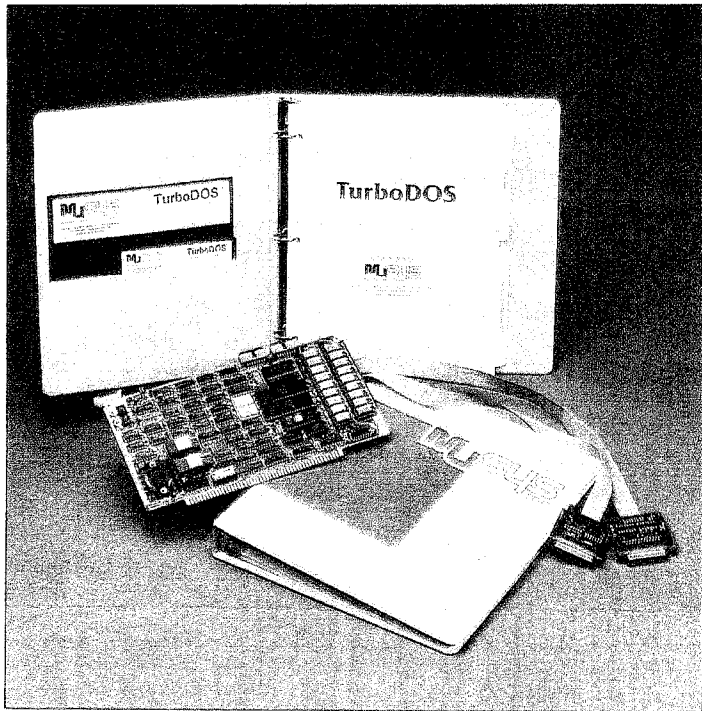|	
ADES G66	S66 plus streaming tape backup
Konan SMC-100	CDC Phoenix compatible drives
Konan David Jr.	5" Winchester drives
Morrow M10	10 Mbyte 8" subsystem
Morrow M20	20 Mbyte 8" subsystem
Morrow M26	26 Mbyte 14" subsystem
more coming . . .	

TurboDOS is a trademarked product of Software 2000, Inc.

NET/82 is a trademarked product of MuSYS Corporation.

CP/M is a trademark of Digital Research Corp.

Horizon, North Star are trademarks of North Star Computers, Inc.

Expand your
North Star Horizons™
& S-100 profits NOW
CALL OR WRITE TODAY

Specialists in Multi-user Microsystems

MuSYS CORPORATION

1451 Irvine Blvd., Suite 11, Tustin, CA 92680

(714) 730-5692. TWX: 910-595-1967

CABLE: MUSYSTSTN

<u>DEALER PRICE LIST</u>   5/1/82

NETWORK BOARDS:

Quantity	64K* NET/82™	128K* NET/82™
Retail Price	$1,195.00	$1,495.00
1-9	850.00	995.00
10-24	795.00	940.00
25-49	750.00	880.00
50-99	695.00	820.00
100-249	650.00	775.00
250-499	615.00	730.00
500-999	580.00	690.00
1000-Up	550.00	650.00

*64K includes 1 Interface Module; 128K includes 2 Interface Modules.
Extra Interface Modules = $30 - $40 each depending on type.

TurboDOS

	Single-User W/O Spooler	Single-User W/Spooler	Multi-User W/Network	MuASM & MuBUG**
Retail Price	$250.00	$300.00	$750.00	$200.00
Dealer 1-4 (15% Disc.)	212.50	255.00	637.50	120.00
Dealer 5-24 (25% Disc.)	187.50	225.00	562.50	–
Dealer 25+ (40% Disc.)	150.00	180.00	450.00	–

Updates on Software**-$50.00

Dealer pricing is based on cumulative quantities purchased during the most recent twelve month period. Dealer prices include manuals and media.

OEM pricing is available upon request from qualified manufacturers.

Domestic U.S.A. pricing only, exclusive of shipping and handling charges. Overseas orders are subject to surcharges for export documentation, air freight fees, letter-of-credit processing and any other applicable costs.

**Must supply Serial Number.