NorthStar™

The facts about the HORIZON 8/16 with TurboDOS

Since North Star introduced the HORIZON 8/16 with North Star TurboDOS™ in May, it has been enthusiastically received by both HORIZON and TurboDOS users. The new product brings together the most reliable hardware and the highest performance operating system available for multi-user micros. For your information, we've included a list of the most commonly asked questions and answers that we distributed recently to our corporate sales team. we hope you find this information helpful.

North Star TurboDOS is like TSS/C in that it is a **multi-user** and **multi-tasking** operating system for CP/M applications. But in addition, it is also a **multi-processor** operating system. Unlike TSS/C (and other competing multi-user systems) which time-share a **single** Z80A processor, TurboDOS provides a dedicated microprocessor for **each** user. As a result, the system runs much faster—more than three times as fast in most applications.

And, as its name implies, the HORIZON 8/16 includes both 8-bit and 16-bit capability! There's a new set of circuit boards for its S-100 bus—8-bit Z80A's and 16-bit 8088-2's. Plus memory expansion boards that can give a 16-bit user **512 Kb** of RAM.

The HORIZON 8/16 computer differs from the existing HORIZON only in that it contains a slightly larger power supply and a back panel with extra connector slots. But the operational differences with TurboDOS are significant:

- There is minimal degradation in performance as you add users
- The HORIZON 8/16 has both 8-bit and 16-bit capability
- It can handle up to eight users simultaneously, not just five
- It has network features like record lockout and optional electronic mail

The HORIZON 8/16 is priced competitively with other multi-user computers which are time-shared such as Altos, despite the fact that each user has a dedicated processor. So North Star now offers the advantages of multi-processing at a time-shared price—truly the best price/performance available today.

Schedule

First Customer Ship of 8-bit hardware and TurboDOS is scheduled for **September 30th**

First Customer Ship of 16-bit hardware is scheduled for **November 18th**

Parts list and glossary

Part Number	*Description*	*Suggested List*
03137	HRZ-UP8, 8-Bit User Processor Board, includes Z80A, 64K RAM and HRZ-TIO	$ 599
03143	HRZ-UP16, 16-Bit User Processor Board, includes 8088-2, 128K RAM and HRZ-TIO	799
03164	HRZ-384K, 384K-RAM Expansion Board for HRZ-UP16	1,299
03148	HRZ-TIO, Terminal Interface Board	99
03153	HRZ-MIO, Modem Interface Board	99
03159	North Star TurboDOS Operating System	549
03267	HORIZON 8/16 Diode Kit (for HORIZONs prior to Serial No. 40,000)*	50
03241	TurboDOS Installation and User Manual	45
03245	HORIZON UP8/UP16 Service Guide	65

*NOTE: HORIZONs manufactured before September 1983 *may* require a Diode Kit, depending on the number of 8/16 boards to be installed. Use the following table to decide whether a kit is needed:

	HORIZON *(below S/N 40,000)*	HORIZON *with Diode Kit*	HORIZON 8/16 *(above S/N 40,000)*
Maximum Number of HRZ-UP8 User Boards:	4	8	8
Maximum Number of HRZ-UP16 User Boards:	3	5	8
Max. No. of HRZ-UP16 plus HRZ-384K RAM Board *Pairs:*	1	3	4

(Continued)

Answers to your questions on TurboDOS

Q: What makes TurboDOS so outstanding?

A: Its main feature is that it is a multi-processing operating system—i.e., it provides a dedicated Z80A or 8088-2 microprocessor for *each* user, rather than time sharing a single processor among *several* users. That alone makes it several times faster than multi-user systems such as TSS/C. There are also other multi-processing operating systems—TeleVideo's Mmmost, for example —but TurboDOS is much faster than these as well, according to our unofficial benchmark tests. We expect to have these benchmarks verified independently.

Q: Any other advantages?

A: You bet. Here are a few:
- —twice as many commands as CP/M
- —record-locking features of MP/M™ II 2.1 and MP/M-86 2.1
- —more friendly and understandable prompts and error messages than CP/M

Q: You compare TurboDOS to CP/M. But is it the same as CP/M?

A: Better, as shown above. But it is not Digital Research's CP/M; it is a CP/M compatible operating system created by Software 2000. Almost everyone who has used it prefers it to CP/M.

Q: If it's so good, why isn't it better known?

A: Actually, it's very well known in Europe, where Phillips has adopted it as its standard operating system. It is also popular with a lot of users who have become frustrated with CP/M itself. But it has not been marketed as aggressively as CP/M or MS-DOS. North Star is presently one of the largest companies marketing TurboDOS in the U.S. We are also offering it at a considerably lower price: $549 list, versus up to $1200 from other firms. That should expand the market considerably.

Q: There are a lot of applications that run on MS-DOS, and only a few that run on CP/M-86. How do we overcome that?

A: To begin with, there are NO true multi-user MS-DOS applications available at present.

Secondly, every general purpose program with wide distribution runs on both MS-DOS and CP/M-86. North Star's current CP/M applications—MicroPlan, dBASE II, and WordStar/SpellStar™/MailMerge®—all run on CP/M-86.

Q: Will we continue to sell TSS/A and TSS/C?

A: Yes, because TurboDOS does not run Total Business Solutions (TBS) applications—they require TSS/A. Additionally, there are many OEM's who have applications on TSS/C, and we will continue to support them. However, we expect TurboDOS to replace TSS/C by the end of the year.

Q: You mentioned record lockout as a TurboDOS feature. Is it the same as on TSS/C and on NorthNet™?

A: No. TurboDOS uses MP/M II and MP/M-86 conventions for record locking; all applications which use these conventions will have record locking capability on TurboDOS. (Note that if the application is designed for single-user CP/M or CP/M-86 it may have to be adapted for multi-user operation.)

TSS/C at present does not have true record lockout. North Star is planning to provide it in the future, but it will not be compatible with MP/M. NorthNet has a sector locking scheme that is used in a slightly different fashion.

Q: Why do we call it North Star TurboDOS? Is it different than TurboDOS sold by others?

A: Yes, it's different in two ways. One, it's a brand new release of TurboDOS. TurboDOS in the field today is TurboDOS 1.22. North Star TurboDOS will have a new release number.

Two, only North Star TurboDOS contains drivers for North Star floppies, hard disks and tape backup. And it has a simplified installation procedure for the HORIZON.

Q: What are the features of the new TurboDOS release?

A: Its most important feature is that it emulates 16-bit CP/M-86. TurboDOS 1.22 does not run 16-bit applications. North Star will be one of the first companies to have 16-bit TurboDOS. There are also a number of minor improvements and bug fixes over 1.22.

Hardware answers, too

Q: What's the difference between the HORIZON and the HORIZON 8/16?

A: The only hardware difference is a slightly larger power supply (16 amps + 8v instead of 9 amps), and eleven extra connector slots on the back panel.

Q: What about the printed circuit boards?

A: The same basic boards are still used: the S-100 bus mother board, the ZPB Board (Z80A), the HRAM-64 Board, and the floppy and hard disk controller boards.

The same multi-user boards are still used for TSS/A and TSS/C—one HSIO4, plus one HRAM-64 for each user. However TurboDOS requires one HRZ-UP8 or UP16 board for each user, and does not use the HSIO4 or HRAM-64.

Q: I know about HSIO4s, HRAM-32s and HRAM-64s; but what are the HRZ-UP8 and HRZ-UP16?

A: The HRZ-UP8 contains a 4MHz Z80A and 64K of RAM; the HRZ-UP16 contains an 8MHz 8088-2 and 128K of RAM.

Q: Wait a minute—a ZPB board plus an HRAM-64 board contain the same components as a UP8 board. What's the difference?

A: The ZPB plus HRAM-64 make up the TurboDOS *server*—one is required for each system (just like a NorthNet server). The server controls disk access, and the 64K HRAM is used to buffer the hard disk for faster disk access. The UP8 is a *user* board—one is required for each 8-bit user. (Incidentally, other TurboDOS board manufacturers call them *master* and *slave* boards.)

Q: Well, since the server board has an 8-bit Z80A on it, doesn't that slow down the 16-bit user boards?

A: No, because the server loads a copy of TurboDOS into each user board, where it runs on the 16-bit, 8 MHz 8088-2 processor. That's why multi-processing is fast: each user has a separate operating system in his or her private RAM and is computing with his or her private processor.

Q: So the UP8 runs 8-bit software and the UP16 runs 16-bit software just like the ADVANTAGE 8/16?

A: Not exactly. Here are the differences:

	ADV-8/16	HRZ-8/16
8-bit O.S.	Graphics CP/M 2.2	TurboDOS: CP/M 2.2 emulation plus MP/M II record locking
16-bit O.S.	Graphics MS-DOS	TurboDOS: CP/M-86 2.1 emulation plus MP/M-86 record locking
Run 8 & 16 bit O.S. intermixed?	Yes: select 8-bit or 16-bit by software	Yes: select 8-bit or 16-bit by hardware for each user
8-bit hardware	4MHz Z80A+64K RAM	4MHz Z80A per user +64K RAM per user
16-bit hardware	8MHz 8088-2 +64K RAM expandable to 256K plus Z80A coprocessor	8MHz 8088-2 per user +128K RAM per user expandable to 512K per user one Z80A per HORIZON
Disk Options	0Q, 2Q, 5Mb & 15Mb	2Q, 5Mb, 15Mb & 1 to 4 18Mb
Backup	Floppy disks	Floppies or tape
Network	NorthNet: 64 users on bus configuration	TurboDOS: 8 users on star configuration; multiple networked HORIZONs in 1984.

Q: Why do we call it North Star TurboDOS? Is it different than TurboDOS sold by others?

A: Yes, it's different in two ways. One, it's a brand new release of TurboDOS. And two, only North Star TurboDOS contains drivers for North Star floppies, hard disks and tape backup.

Q: How do the 8/16 boards fit into the HORIZON 8/16?

A: The HORIZON's S-100 bus has 12 slots. Four of these are taken up by the ZPB board, HRAM-64 board, floppy disk controller board and hard disk controller board. (Remember, just like TSS/C, multi-user TurboDOS requires a hard disk. However, a single user can use a HRZ-2Q on TurboDOS.) The other eight slots are available for up to 8 users—one user board per slot.

Q: Why did you say *up to* 8 users?

A: Because if a 16-bit user wants more than 128K of memory, the 384K RAM memory expansion board takes up one of the slots. So you can have eight 8-bit users, or eight 16-bit users with 128K of RAM each, or four 16-bit users with 512K of RAM each (128K on each UP16 board plus 384K on each RAM expansion board).

You can also put together any combination that totals eight user boards—for example, two 8-bit users, two 16-bit users with 128K RAM each, and two 16-bit users with 512K RAM each.

Q: Tell me about the TIO and MIO boards.

A: They're just like the SIO boards on the ADVANTAGE, except that there are two kinds of serial I/O boards: the TIO is a Terminal I/O board which connects a User Processor Board (UP8 or UP16) to a terminal; the MIO is a Modem I/O board which connects a User Processor Board to a Modem.

Q: Do TIO's and MIO's take up S-100 slots?

A: No; they are small boards which are attached to the I/O slots at the rear of the HORIZON.

Q: If each User Processor Board comes with one TIO, why sell them separately?

A: Each User Processor Board has *two* ports, either of which can take a TIO or an MIO. The bundled TIO is for the port which is connected to the terminal. The other port can be connected to an MIO if the user wants a modem, or to a second TIO if the user wants a printer.

Q: I thought printers were connected to the HORIZON through the two SIO's or the PIO that come with it.

A: That's right; and those three ports are still part of the HORIZON 8/16. TurboDOS spools *shared* printers to these ports; in addition, each user can have a *private* printer (or modem) by attaching a TIO or MIO to his or her User Processor Board. This is just like NorthNet, which has both shared printers on servers and private printers on workstations.

(Continued)

Comparison of Eight Multi-User Computers

	NSCI HORIZON 8/16	ALTOS 586-10	ALTOS ACS-8000-12	TELE-VIDEO 806/20	GIFFORD 321 (COMPUPRO 816/C)	IMS 5000SX	OSM ZEUS 4	MOLECULAR SUPERMICRO 8
Operating System	TurboDOS*	MP/M-86	MP/M II	Mmmost 2.11	MP/M8-16	TurboDOS*	MUSE	nSTAR*
8 Bit or 16 Bit	8 + 16*	16	8	8 + 16*	8 + 16*	8	8	8 + 16*
Multi-Processing	Yes*	No	NO	YES*	NO	YES*	YES*	YES/NO
Max. No. of Users	8*	4	8	6	7	8*	4	8*
Hard disk Storage	15 Mb*	9.6 Mb	15 Mb*	15 Mb*	21 Mb*	14 Mb*	5 Mb	15Mb*
Floppy Storage	360Kb	780Kb*	390Kb	368Kb	2400Kb*	410Kb	250Kb	512Kb
4 User Cost (8 Bit)	$8,945*		$8,990*	$9,375*	$10,595	$10,955	$7,600*	$10,795
4 User Cost (16 Bit)	$9,745*	$8,640*		$10,975	$10,595			$12,290
CPU—8 Bit Speed	Z80A 4MHZ		Z80A 4MHZ	Z80A 4MHZ	8085 6MHz	Z80A 4MHZ	Z80A 4MHZ	Z80A 4MHZ
CPU—16 Bit Speed	8088 8MHZ	8086 10MHZ		8088 5MHZ	8088 8MHZ			8086 8MHZ
Memory Per 8 Bit User	64K		52K	64K	128K	64K	64K	64K
Memory Per 16 Bit User	128K	128K		128K	128K			128K
Max. Memory Per 16 Bit User	512K	256K		256K	256K			256K

* = Computer Meets or Exceeds This Key Criterion for Group.
Televideo Prices Have Been Reduced by $3400 for 4 Bundled Terminals.

Q: What are the hardware differences between TSS/A, TSS/C and TurboDOS HORIZONs?

A: Here's the hardware needed for each operating system:

	TSS/A	TSS/C	TurboDOS
Single user:	HRZ-64K-HD	HRZ-64K-HD plus HRAM-32	HRZ-64K-2Q or HRZ-64K-HD, plus HRZ-UP8 or HRZ-UP16*
Each add'l user:	HRAM-64	HRAM-64	HRZ-UP8 or HRZ-UP16* (HD only)

*plus optional HRZ-384K

Note that the memory required for the first user is 64K on TSS/A, including the operating system; on TSS/C it's 96K; on 8-bit TurboDOS it's 128K; and on 16-bit TurboDOS it's 192K.

Q: Can I upgrade my HORIZON to a HORIZON 8/16?

A: Yes. But note the following:

1. It must be a Hard Disk HORIZON for more than one user.
2. TurboDOS will be the only operating system on the hard disk. If you have HDOS, CP/M, or TSS/C you must port your applications over to TurboDOS. If you have TSS/A, don't upgrade.
3. If you have a multi-user HORIZON, the HSIO4 board and all HRAM beyond the initial 64K will have to be removed.
4. If you have more than four HRZ-UP8 or more than three HRZ-UP16 boards you will need a power upgrade.

Q: What terminals does TurboDOS drive? What printers? What modems?

A: Approximately the same group that are handled on TSS/C, since terminals and printers are not dependent on the operating system but on the individual application. Plus about 90% of all the modems available.

Q: Can I use other manufacturers' boards with North Star TurboDOS?

A: No; the hardware and software must be configured for each other.

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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

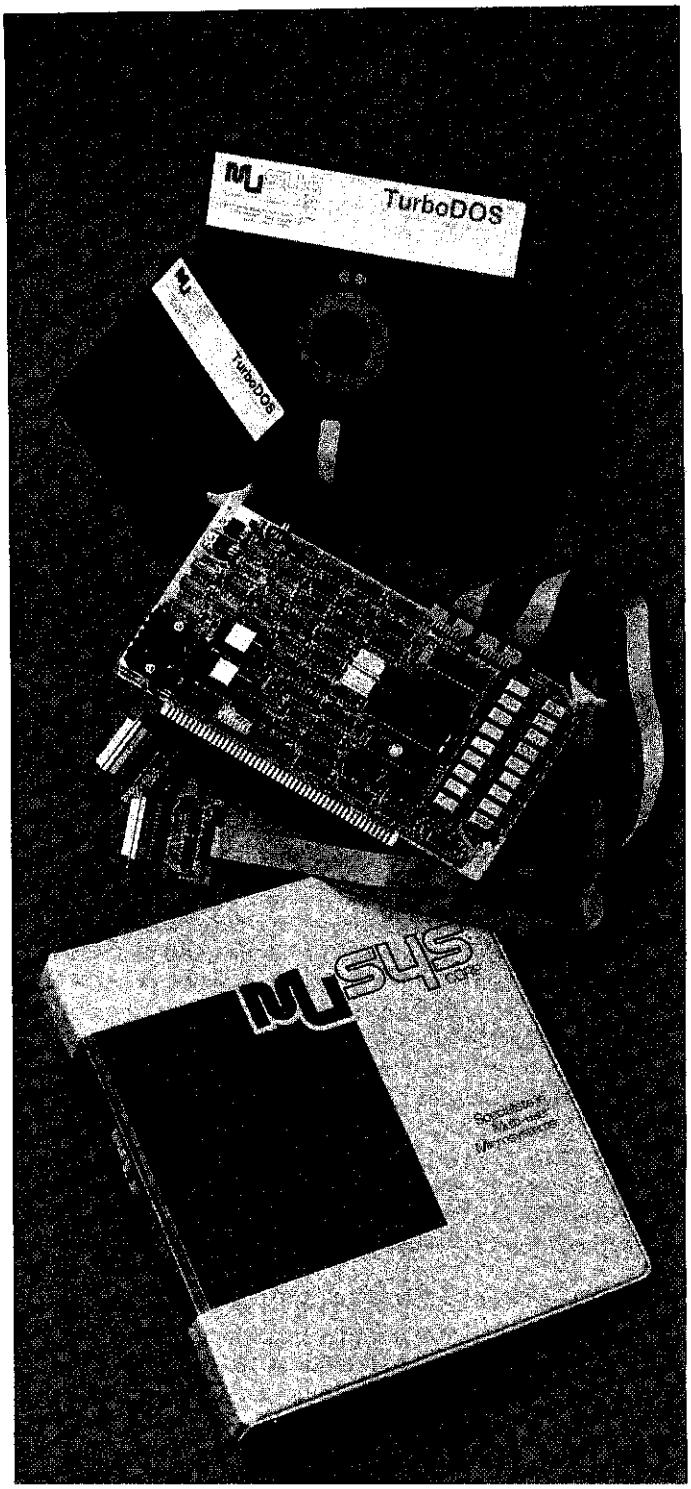
TurboDOS was written to accommodate the new generation of large capacity disk drives that are becoming available. TurboDOS provides for logical drives up to 1024 megabytes and individual files up to 134 megabytes. CP/M 2.X limits logical drives to eight megabytes. Even the new MP/M II, with its limits 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.

TurboDOS/3-82/15K-DG/Printed in USA

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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