

The Wang Model 2260B Fixed/Removable Disk Drive provides a high-capacity, high-performance, direct-access storage medium for all Wang systems except the 2200A. (However, the System 2200S and WCS/10 require Option-24, the Disk ROM, in order to support a disk.) The Model 2260B provides a full ten megabytes (10,027,008 total bytes) of on-line storage capacity, and is designed primarily for users whose data processing applications require a large on-line data base. The 2260B also is available in two smaller configurations, for applications requiring lesser data bases.

PHYSICAL CHARACTERISTICS

The Model 2260B Disk Drive unit holds a pair of disk platters, one fixed and one removable. The disk drive's total storage capacity is distributed equally between the two platters. Because the removable platter (often called a "disk cartridge") is easily unloaded, stored, and replaced, the total off-line storage capacity of the Model 2260B is virtually unlimited.

Each disk platter has two recording surfaces, which are divided into a number of concentric circular recording tracks. Every track is, in turn, subdivided into 24 "sectors". A sector is the smallest addressable unit on the disk, and can store 256 bytes of information (program text or data). The sectors on each platter are sequentially numbered, and individual sectors can be directly addressed.

STORAGE CAPACITY

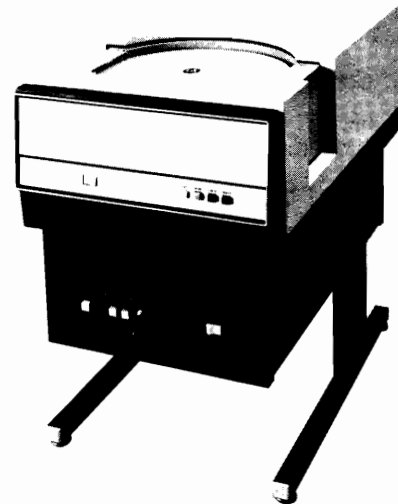
The Model 2260B provides 10,027,008 total bytes (10 megabytes) of storage, divided equally between the fixed and removable platters. Two smaller configurations also are available. The Model 2260B $\frac{1}{4}$ provides 2,457,600 total bytes (2.5 megabytes), and the Model 2260B $\frac{1}{2}$ provides 5,013,504 total bytes (5 megabytes) of on-line storage. A smaller configuration is upgradable to a larger configuration. Storage efficiency is determined by a number of factors, including the type of data being stored, and the method of storage. For example, a full-precision number (13 digits) requires nine bytes of disk storage. The PACK statement, however, can be used to reduce each number to as few as two bytes, if 13-digit accuracy is not needed. For purposes of general illustration, the Model 2260B can store about 1,100,000 full-precision (13-digit) numbers, or about 590,000 16-character alphanumeric values.

SPEED

In any external storage device, a necessary adjunct to size is speed. The capability to store large quantities of data is valueless if the data cannot be retrieved with speed and efficiency. The Model 2260B is a high-performance disk drive which offers rapid data access in both sequential and random access modes.

The procedure for accessing a particular sector on the disk has two components, a track access and a disk latency period. Only when the appropriate sector has been accessed can the actual transfer of data between the system and the disk be carried out. The total time required to read or write information on the disk must therefore include the times for the track access and disk latency period.

Track Access Time — The track access time is the time required to position the disk read/write head to a specified track on the disk platter. The average access time for the 2260B is 40 ms (.04 sec). For the 2260B $\frac{1}{4}$ and 2260B $\frac{1}{2}$, the average access times are somewhat faster.



MODEL 2260B
FIXED/REMOVABLE DISK DRIVE

Disk Latency Time — Once it is positioned over the appropriate track, the read/write head must wait for the desired sector in that track to rotate to its position. This wait is called the disk latency period. Since the platter makes one complete revolution in 25 milliseconds, the average latency time is one-half this time, or 12.5 ms (.0125 sec).

PLATTER COMPATIBILITY

Special features provided in the 2260B allow it to read disk cartridges generated on a 2230 disk drive. Model 2230 owners who wish to trade up to a 2260B need not, therefore, recreate their entire data base for the Model 2260B.

AUTOMATIC FILE MAINTENANCE

Files can be maintained on disk in one (or both) of two modes: Automatic File Cataloging mode, and Absolute Sector Addressing mode. The BASIC instructions in both of these modes are built into the disk controller itself, and do not require an additional software package.

Automatic File Cataloging — This mode includes 16 BASIC statements which provide rapid, easy access to cataloged files on the disk. Catalog mode permits the user to save and load program and data files by name, without concern for where or how the files are actually stored on the disk. The system itself automatically keeps track of the size and location of each file. The BASIC instructions available in Catalog mode are listed below.

- **SCRATCH DISK** is used to create a catalog on a specified disk platter. The catalog consists of two parts, a Catalog Index and a Catalog Area.
- **MOVE END** is used to alter the size of the catalog after it has been created with SCRATCH DISK.
- **LIST DC** enables the operator to list out the names and locations of all cataloged programs and data files.
- **SAVE DC** is used to name and save BASIC programs on the disk.
- **LOAD DC**, when executed as a command, is used to load a named program from the disk into memory. When executed in a program, LOAD DC can be used to chain or overlay programs from disk.
- **DATASAVE DC OPEN** is used to name and open a new data file on the disk (as many as seven cataloged files may be open simultaneously).
- **DATALOAD DC OPEN** is used to reopen an existing data file on disk. The file is referenced by name.
- **DATASAVE DC** is used to store a data record in a currently open file on disk. Multiple-sector records are written automatically.
- **DATALOAD DC** is used to read data from a currently open file on disk. Multiple-sector records are read automatically.
- **DATASAVE DC CLOSE** is used to close one or all currently open files on disk.
- **DSKIP** and **DBACKSPACE** enable the programmer to skip forward and backward over data records within a cataloged data file.
- **SCRATCH** is used to "scratch" program or data files which are no longer needed. The disk space occupied by a scratched file can be reused for a new file.
- **MOVE** is used to copy the entire catalog (the Catalog Index as well as the Catalog Area) from the fixed platter to the removable, or vice versa. MOVE also automatically deletes all scratched files from the catalog.
- **VERIFY** performs special validity checks on specified sectors to ensure that the data stored in them is correct. VERIFY is normally used following a MOVE or COPY to ensure that information has been copied accurately.
- **LIMITS** enables the programmer to examine the beginning, ending, and current sector addresses of a specified file, as well as the total number of sectors used in the file.

Absolute Sector Addressing — This mode consists of eight BASIC statements which permit the programmer to address specific sectors on the disk directly, thus enabling him to design his own disk operating system. Two of the eight Absolute Sector Addressing mode instructions are special statements which can be used to read or write one sector (256 bytes) of unformatted data. These special statements enable the programmer to write his own control information in individual sectors. The BASIC instructions available in Absolute Sector Addressing mode are listed and explained below.

- **SAVE DA** is used to store programs on disk in Absolute Sector Addressing mode. The starting sector location at which the program is to be stored must be specified.

- **LOAD DA**, when executed as a command, is used to load programs from disk into memory. When executed within a program, **LOAD DA** can be used to chain or overlay programs from disk. In either case, the starting sector address of the program must be specified.
- **DATASAVE DA** is used to save data records on the disk. The address of the first sector in which the record is to be stored must be specified. Multiple-sector records are written automatically.
- **DATALOAD DA** is used to read data records stored on disk. The address of the first sector in which the record is stored must be specified. Multiple-sector records are read automatically.
- **DATASAVE BA** is a special statement which writes one sector (256 bytes) of unformatted data in a specified sector on disk. (Both **DATASAVE DC** and **DATASAVE DA** automatically insert special formatting information in each record; this information is *not* automatically inserted by **DATASAVE BA**.)
- **DATALOAD BA** is a special statement which reads one sector (256 bytes) of unformatted data from a specified sector on the disk.
- **COPY** is used to copy the contents of a specified range of sectors from one platter to the corresponding sectors on the other platter.

RELIABILITY

To increase the reliability of the disk unit two different checks are made on every sector of information read from the disk. A cyclic redundancy check (CRC) and longitudinal redundancy check (LRC) are performed automatically by the system on the data in each sector when it is read from the disk. If an LRC error is detected, the system returns an error message at once; if a CRC error is detected, the system automatically rereads and rechecks the erroneous sector four times before signalling an error. In addition to the two checks performed automatically by the system, an optional read-after-write verification test can be specified by the programmer, simply by including a special parameter in the appropriate BASIC instruction.

AUTOMATIC SECTOR FORMATTING

A switch-selectable automatic sector formatting feature causes the system to format each sector on a disk platter. In addition, the formatting procedure assigns a unique address to every sector on the platter.

Each sector is formatted into four basic sections: a two-byte sector address, two bytes reserved for a CRC value, one byte reserved for a LRC value, and 256 bytes reserved for user's data. The sector address, CRC, and LRC are transparent to the user's software, and are employed by the system for data identification and verification.

AVAILABLE DISK UTILITIES

Wang supports its complete line of 2200 Series disk drives with a variety of disk utility programs. Although new utilities are always being developed, the following utilities are available at the present:

- **KFAM (Keyed File Access Method)**: A sophisticated file maintenance system which provides the user with rapid, direct access to individual records in a cataloged file. (Available in two new versions, KFAM-2 and KFAM-3).
- **Disk Sort**: Sorts records in a cataloged disk file.
- **Compression**: Reads source programs stored on disk and compresses them. The resultant compressed program can be saved back onto the disk.
- **Decompress**: Copies a cataloged program file, automatically breaking up all multi-statement lines and assigning each statement a unique line number.
- **List and Cross-Reference**: Source or compressed programs stored on disk are read into memory, decompressed, and cross-referenced. The decompressed and cross-referenced programs can be listed on a printer or displayed on the CRT screen.
- **Copy/Verify**: Copies cataloged disk files from disk to disk, verifying copied files. Extra sectors can be added to copied files.
- **Sort Disk Catalog**: Prints a catalog index listing sorted alphabetically by file name or numerically by sector address.
- **Disk Programming Aids**: A collection of utility routines which perform functions such as search catalog index for file name, open and close cataloged disk files, etc.
- **Disk Dump Utility**: Generates a list of hex codes for a program or data file stored on disk.

DATA SHEET

SPECIFICATIONS

STORAGE CAPACITY

	2260B¼	2260B½	2260B
Sectors per Platter	4,800	9,792	19,584
Total Sectors	9,600	19,584	36,168
Bytes per Platter	1,128,800	2,506,572	5,013,504
Total Bytes	2,457,600	5,013,504	10,027,008

PERFORMANCE

Rotation Speed

2400 rpm

Access Time (Position Head to Track)

Minimum (one-track)	4.5 ms
Average (across one-half available tracks)	
2260B¼	20 ms
2260B½	28 ms
2260B	40 ms
Maximum (across all tracks)	
2260B¼	40 ms
2260B½	56 ms
2260B	80 ms

Latency Time

Average (one-half revolution) 12.5 ms

Read/Write Time

One 256-byte sector including CPU/
Controller Overhead 15 ms

Move/Copy Time (Entire Disk Platter)

Approx 10 min

GENERAL SPECIFICATIONS

Physical Dimensions

Height	32½ in. (82.6 cm)
Width	17½ in. (44.5 cm)
Depth	29 in. (73 cm)

Weight

126 lb (57 kg)

Power Requirements:

Voltage:	115 or 230 VAC ± 10%
	50 or 60 Hz ± 1 cycle
Power:	800 watts start-up
	425 watts running

Cabling

10 ft (3m) cable with connector to female receptacle on the disk controller board in CPU.
8 ft (25m) to power source.

Operating Environment

50° F to 95° F (10° C to 35° C)
20% to 80% relative humidity

ORDERING SPECIFICATIONS

A disk drive unit capable of storing and retrieving information for a Wang system. The unit must be available in three configurations providing 2½, 5, or 10 megabytes of on-line storage; total storage should be divided equally between two separate platters, one of which is removable. The two platters must be addressable interchangeably. It must be possible to read or write multi-sector arguments of any length on disk, and to use entire arrays as arguments. The disk unit must also provide capability to produce backup copies of all or part of each disk platter.

The system must provide a built-in data management system as well as a number of statements which enable the programmer to design his own operating system. All of these features, as well as all interface and control electronics, must be included in the quoted price of the disk unit; none should be considered optional extras. The disk unit must be compatible with other I/O and storage devices in the system, and a single system must be capable of supporting a minimum of four disk units.

Standard Warranty Applies

Wang Laboratories reserves the right to change specifications without prior notice.



LABORATORIES, INC.

1 INDUSTRIAL AVENUE, LOWELL, MASSACHUSETTS 01851, TEL. (617) 851-4111, TWX 710 343-6769, TELEX 94-7421

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