

The Wang Model 2270 Diskette Drive provides a modestly priced high-speed, direct-access external storage capability for all Wang 2200 series systems which have a disk I/O instruction set. The Model 2270 is available in three configurations, ranging in on-line storage capacity from one-quarter to three-quarters of a million bytes:

#### STORAGE CAPACITY

Model	Description	On-Line Storage
2270-1	Single Removable Diskette Drive	262,144 bytes
2270-2	Dual Removable Diskette Drive	524,288 bytes
2270-3	Triple Removable Diskette Drive	786,432 bytes

Each diskette has a storage capacity of ¼ megabyte (262,144 bytes). Total on-line storage is therefore determined by the number of diskettes which are accessible on-line in the disk unit. The Model 2270-1 holds a single diskette, the Model 2270-2 holds two diskettes, and the Model 2270-3 holds three diskettes. On the 2270-2 and 2270-3, each drive has an independently controlled read/write head. A single or dual diskette drive can be field upgraded to the maximum three drives for the price difference plus an upgrade charge, should additional on-line storage become necessary. Because the diskettes are removable, off-line storage is limited only by the number of diskettes available.

#### PHYSICAL CHARACTERISTICS OF THE "DISKETTE"

A "diskette" is a small flexible disk platter (about 7½ inches in diameter, the size of a 45 rpm phonograph record) which is coated on its recording side with a magnetic material. The recording surface is divided into 64 concentric circular recording tracks, each of which is further segmented into sixteen 256-byte sectors. Data is transferred to and from the diskette in 256-byte blocks (although multi-sector records can be read or written automatically if the argument list requires). Because the sectors are individually numbered and randomly accessible, access to records located anywhere on the disk is fast and direct.

#### THE "WRITE PROTECT" FEATURE

Valuable data stored on a diskette can be protected against accidental overwriting with the Write Protect feature. If an operator inadvertently attempts to record data on a protected diskette, the system will signal an error, and suppress the write operation.

#### OPERATIONAL CONVENIENCE FEATURES

In addition to the speed, reliability, and substantial storage capacity which are characteristic of disk storage devices in general, the Model 2270 offers simplicity and convenience of operation. Each diskette is factory sealed in a tough, flexible plastic envelope which protects it against damage from dirt buildup, scratches, and abrasion. For this reason, and because of their thin, flat design, the diskettes are easy to handle and convenient to store. The diskette is mounted simply by slipping it into a drive slot and closing the drive door. When it must be removed, a touch of the RELEASE button causes the spring-loaded release mechanism to automatically open the door and eject the diskette about halfway out of the drive, for ready removal. Their ease of handling, mounting, and storing (and their low cost) make the diskettes ideal media for storing multiple small files, or large multi-volume files, if it is not necessary to have the entire data base on-line at all times.



## MODEL 2270 DISKETTE DRIVE

## SPEED

Information can be written to and read from the disk at high speed. The total time required to access any given item of data on the disk can be broken down into two components: the track access time and the disk latency time.

- **Access Time** — The track access time is the time required to position the read/write heads to a specified track on the disk platter. The “average access time” is the time required for the read/write heads to move from track #0 to the middle track on a disk platter. On the Model 2270, the average access time is 363 ms (about .3 second). The minimum access time is 14 ms (for sequential read/write operations).
- **Disk Latency Time** — The latency time is the time required for the desired sector on a track to rotate to the read/write head. The “average latency time” is the time required for a sector which is one-half track (8 sectors) away from the read/write head to rotate to the read/write head. Since the disk platters make one complete revolution in about 170 ms, the average latency time is one-half this time or about 84 ms. The staggered arrangement of sequential sectors on a track makes it possible to read or write multi-sector records or perform disk copy operations, with significant savings in total latency time.

## AUTOMATIC FILE MAINTENANCE

Files can be maintained on a disk in one (or both) of two modes: Automatic File Cataloging mode and Absolute Sector Addressing mode. On most systems, the BASIC instructions in both of these modes are part of the standard instruction set, and do not require an additional software package. On some systems, the disk instructions may be obtained as part of an optional ROM.

**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 the System 2200. When executed in a program, LOAD DC can be used to chain or overlay programs from a 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 one diskette to another. 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 to ensure that the catalog 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 un-

formatted 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 the 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 a disk into the System 2200. When executed within a program, **LOAD DA** can be used to chain or overlay programs from a 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 a second platter.
- **VERIFY** performs a validity check on specified sectors to ensure that the data stored in them is correct. **VERIFY** is generally used following a **COPY** to ensure that all information is copied accurately.

## 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 one-button 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 three sections: a two-byte sector address, two bytes reserved for a CRC value, and 256 bytes reserved for user's data. The sector address and CRC 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.
  - **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

Model 2270-1 . . . . .	262,144 bytes
Model 2270-2 . . . . .	524,288 bytes
Model 2270-3 . . . . .	786,432 bytes

### PERFORMANCE

#### Rotation Speed

360 rpm

#### Access Time (position head to track)

Minimum (one track) . . . . .	14 ms
Average (across one-half available tracks) . . . . .	363 ms
Maximum (across all available tracks) . . . . .	726 ms

#### Latency Time (platter rotation to sector on track)

Average (one sector read/write, one-half revolution) . . . . .	84 ms
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#### Read/Write Time

One 256-byte sector (including CPU/Controller Overhead) . . . . .	21.8 ms
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#### MOVE/COPY Time (entire disk platter)

2 min (approx)

#### Physical Dimensions

Height . . . . .	19 in. (47.5 cm)
Width . . . . .	17.5 in. (43.8 cm)
Depth . . . . .	16.3 in. (40.8 cm)

#### Weight

68 lb (30.6 kg)

#### Power Requirements

Voltage: 115 or 230 VAC  $\pm$  10%  
50 or 60 Hz  $\pm$  1 cycle  
Power: 225 Watts

## SPECIFICATIONS (Cont.)

#### Cabling:

12-ft (3.7 m) cable with connector to female receptacle on the CPU.  
8-ft (2.4 m) cord to power source.

#### Operating Environment

60° F to 90° F (16° C to 32° C)  
20% to 80% Relative Humidity

#### Recommended Operating Environment

35% to 65% Relative Humidity

*Standard Warranty Applies*

## ORDERING SPECIFICATIONS

A removable diskette drive capable of storing programs and data for any Wang 2200 series system with a disk capability. The diskette drive must be available in three configurations of one, two, or three drives, ranging in on-line storage capacity from 262,144 bytes to a maximum 786,432 bytes. Smaller configurations must be field upgradable to a larger configuration. Diskettes must be easily removed and replaced in the unit, and individual diskettes must be formatted automatically by the system. The system must provide the capability to read and write multi-sector records of any length, and to use entire arrays as arguments. The system also must offer a set of built-in internal file management instructions, as well as a number of BASIC statements and commands which enable the user to design his own management system.

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



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