



**WANG**

# 2200

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**Model 2270 Series  
Diskette Drive  
User Manual**



# **2200 Model 2270 Series Diskette Drive User Manual**

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**Warning:** This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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## HOW TO USE THIS MANUAL

This manual provides information concerning the operation of the Model 2270, Model 2270A, and Model 2270A-D series Diskette Drives\*. It is intended to be used in conjunction with either the Wang BASIC Language Disk Reference Manual or the Wang BASIC-2 Language Disk Reference Manual.

Chapter 1 discusses the concept of information storage and retrieval on the diskette, including an overview of the disk hardware and the principles of disk operation. Chapter 2 provides specific operational data, including power-on and formatting procedures, etc., on the Model 2270 and Model 2270A.

Disk drive specifications and maintenance information are collected in the Appendices.

\*The Model 2270A-D series is used with the 2200MVP system. Models 2270A-1D, 2270A-2D, and 2270A-3D are identical to the Models 2270A-1, 2270A-2, and 2270A-3, respectively. All discussion on the Model 2270A is applicable to the Model 2270A-D series.

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# CHAPTER 1

## GENERAL INFORMATION

### 1.1 INTRODUCTION

Wang diskette drives are available in two versions - the Model 2270 and the Model 2270A. Both models are physically identical and provide non-volatile storage (not affected by powering the system) for programs and data on Wang computer systems.

#### Model 2270

The Model 2270 is available in three configurations: the Model 2270-1 (not shown) has a single diskette drive, the Model 2270-2 (Figure 1-1) has two diskette drives, and the Model 2270-3 (Figure 1-2) has three diskette drives. Every 2270 diskette unit, irrespective of the Model, has three drive slots. In the single and dual configurations (2270-1 and 2270-2), the unused slot(s) are concealed by panels. The Model 2270 uses Wang diskettes only.

#### Model 2270A

The Model 2270A (IBM Compatible) diskette units (unlike the Model 2270 units) have the necessary hardware and firmware to utilize both IBM 3740 and Wang diskettes. Compatibility software is needed when data is to be stored on, retrieved from, or converted to a 3740 format diskette by a Wang system. The software is not needed for normal operations with Wang diskettes. Two IBM compatible disk drives are recommended to facilitate file backup and use of the IBM compatibility feature. For more information concerning the IBM compatibility features of the 2270A, obtain the IBM 3740 Compatibility Software Package (part no. 195-1030-3) which is comprised of a software diskette (package no. 701-2212) and 3740 Diskette Compatibility Software User Manual (part no. 700-4369). A brief discussion of IBM compatibility features is included in Appendix B. Since IBM compatibility is a software function, the IBM compatibility feature can be field retrofitted in the Model 2270 diskette drives.

In both the Model 2270 and 2270A a single diskette is vertically mounted in each drive. Each drive contains a drive shaft and drive motor which rotates the diskette at a constant speed of 360 rpm. The drive also has an access assembly with an attached read/write head. The read/write head is affixed to a carriage which moves it back and forth across the recording surface of the diskette. When an appropriate command is issued from the controlling system, the access assembly carriage moves the head in or out over the surface of the spinning disk, until it is positioned at the proper location for reading or recording data.

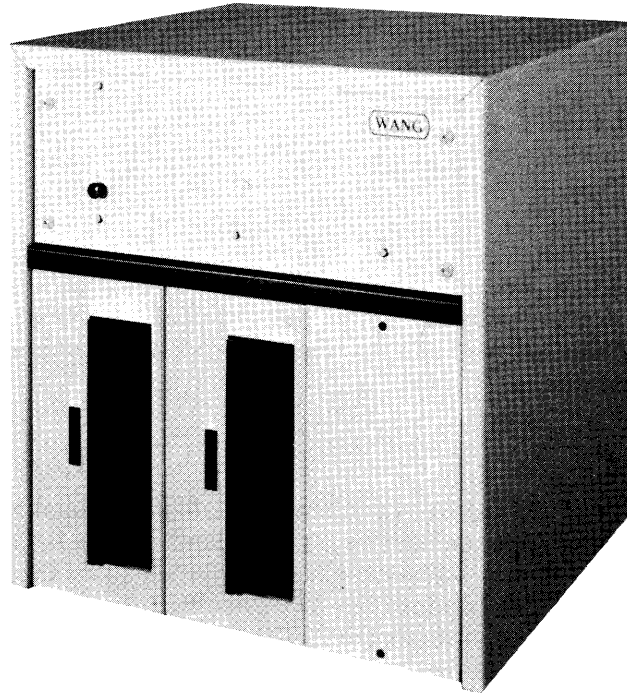


Figure 1-1. Model 2270-2 and 2270A-2 Dual Diskette Drive

Note that drive slot #3, not used, is covered by a panel. On the Model 2270-1 and the 2270A-1, drive slots #2 and #3 are covered.

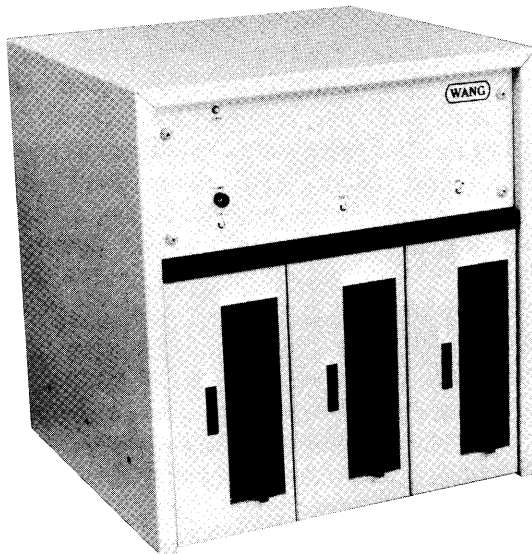


Figure 1-2. Model 2270-3 (and 2270A-3)  
Triple Diskette Drive

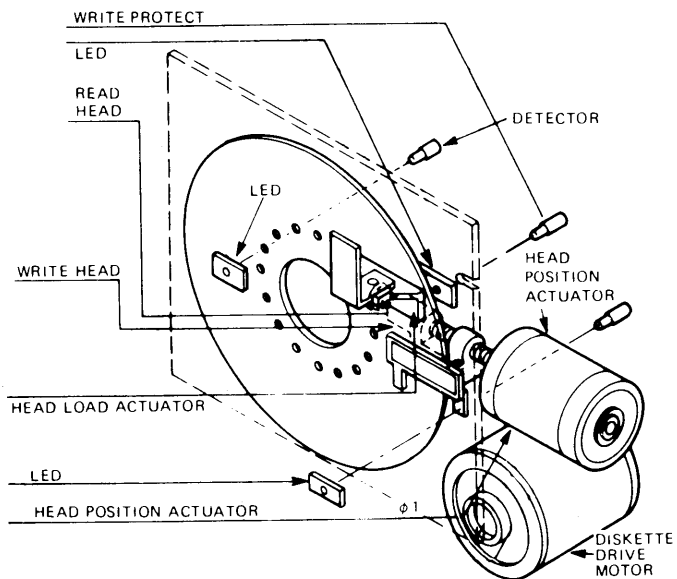


Figure 1-3. Diskette Mounted in a Diskette Drive Showing  
Access Assembly, Carriage, and Read/Write Head

## 1.2 RANDOM ACCESS DATA STORAGE

The Model 2270 and 2270A disk drives provide a high-volume of random access program and data storage with fast access speed. Each storage location on the disk has a unique identification tag or address which can be directly accessed by the system. Thus, unlike sequential-access storage devices (such as magnetic tape drives, punched tape, and card readers), the disk does not have to read sequentially through a file in order to locate a desired item of information. Instead, the disk can skip over all intervening records and directly access a specified location for data storage or retrieval. Hence random-access devices are also referred to as direct-access devices.

Random access capability is very valuable when interrogating or updating a large file, since in many cases the records are not accessed in sequential order. Even in sequential-processing operations which do not make use of its random-access capability, however, the disk is usually as fast or faster than most other external storage devices.

## 1.3 THE DISK PLATTER

The storage medium of both the Model 2270 and 2270A disk units is a flexible platter called a "diskette". The diskette is a thin, flat circular plate coated on one side with a magnetic material, usually iron oxide, and except that it has no apparent grooves, closely resembles a 45rpm phonograph record. The magnetic iron oxide on the recording surface is arranged in concentric tracks. Information is stored on a track in the form of magnetized spots of iron oxide, much the same way it is stored on magnetic tape (see Figure 1-4). The diskette's protective plastic jacket exposes only enough of the disk surface to permit electrical contact with the read/write head.

A permanent label with the name "Wang Diskette" (part no. 177-0063) identifies a Wang diskette used in Model 2270 or 2270A drives. The elongated label has arrows marked "Insert" and "Up" showing how to position a diskette for mounting; a third arrow points to the "write-protect" hole. (As indicated by instructions on the label, the write-protect hole prevents writing when uncovered, and permits writing when covered by a tab.)

A small, square, permanent label with the name "IBM diskette" (part no. 2305830 Record Length 128 Bytes) identifies the IBM 3740 diskette which can also be used in the Model 2270A diskette drive. Note that an IBM diskette does not possess a write-protect feature or arrows showing how to position the diskette for mounting.

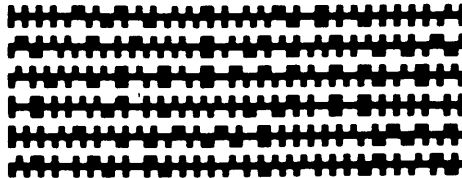
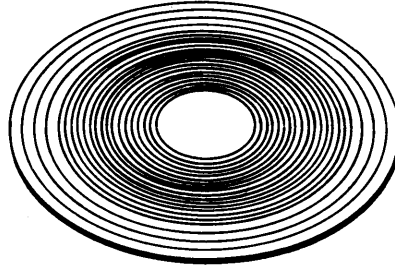


Figure 1-4. Concentric Tracks on a Disk Platter and Enlarged View of Several Tracks Showing How Information Is Stored

#### 1.4 SECTORS ON THE DISK PLATTER

In general, it is desirable to store and retrieve information in units smaller than an entire track. For this reason, each track is divided into a number of discrete segments called sectors. A sector is the smallest discrete unit of storage on the disk and has a fixed storage capacity of 256 bytes. Each sector carries its own sector address, and can be directly accessed by the system. On both the Model 2270 and 2270A diskettes, each track contains 16 sectors.

In addition to the 256 bytes in each sector reserved for data storage, the sector contains several bytes of system control information. The system control information consists of a two-byte sector address, a two-byte cyclic redundancy check (CRC) total, and a longitudinal redundancy check (LRC) total which is not stored on the disk. The sector address is, of course, needed to enable the system to uniquely identify and access each sector. The CRC and LRC totals are the results of checksum tests performed by the system to monitor the integrity of data stored in a sector. The LRC totals are recalculated after each sector is read or written. All system control information is created, interpreted and maintained solely by the disk controller, and is completely transparent and inaccessible to the user.

A different type of control information, called sector control information, or format control information, is automatically written by the system along with the user's data in the 256-byte data field of the sector. Because the format control information occupies several bytes of the 256-byte data field, the full 256 bytes are not available for data storage under normal conditions (see Figure 1-5).

Note to 2200T Users:

See Wang BASIC Language Disk Reference Manual, Chapter 4, section 4.6 for a discussion of format control bytes. A technique for writing data on disk without this format control information is described in Chapter 6, Section 6.5.

Note to 2200VP/MVP Users:

See Wang BASIC-2 Language Disk Reference Manual, Chapter 4, Section 4.6 for a discussion of format control bytes, a technique for writing dates on disk without this format control information is described in Chapter 6, Section 6.5.

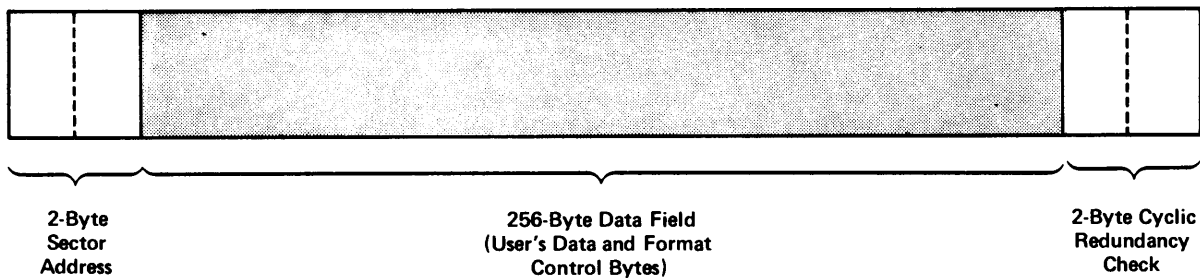


Figure 1-5. One Sector of a Track on a Diskette Platter

### 1.5 TRACK AND SECTOR NUMBERING ON THE DISKETTE

Tracks are numbered sequentially on a diskette. A diskette contains 77 tracks, numbered #0 - #76. Since a diskette has only one recording surface, the track numbering is consecutive on that surface, starting with the outermost track (designated as track #0) and proceeding to the innermost track (designated as track #76). A diskette contains 1232 sectors, numbered 0 through 1231. Tracks and sectors are numbered independently on each diskette.

**NOTE:**

When a diskette is used on the Model 2270, only 64 of the 77 tracks are available to the user. Thus, there are 1024 available sectors numbered 0 through 1023 (see Figure 1-6).

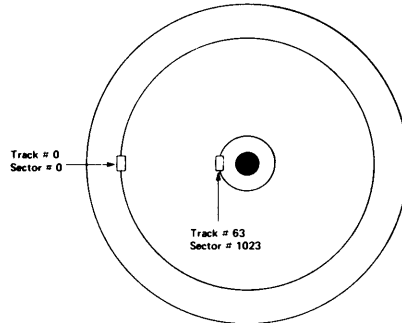


Figure 1-6. Track Numbering on a Diskette

## 1.6 DISK ACCESS TIME

When a Wang diskette is formatted, the sectors are numbered sequentially; however, when information is read-from or written-on a diskette, the sector arrangement is staggered. Although it is useful for the programmer to understand how sectors are arranged within tracks and how the tracks are identified, the system itself does not recognize tracks as independent entities. All absolute addressing of data stored on the disk is done in terms of sector addresses. When presented with a sector address, the system automatically moves to the track which contains that sector. The use of sector addresses minimizes access time for disk operations.

In order to retrieve a piece of information from the disk, the system must determine on which disk platter the information is stored and in which sector(s) on that platter the information is contained. The access arm must then move the read/write head to the appropriate track and access the appropriate sector.

There are, therefore, two distinct physical operations which must be carried out in order to access any particular sector on a disk platter:

1. The access assembly must move in or out across tracks to position the read/write head over the appropriate track on a platter. This operation is called the track access.
2. The read/write head must wait for the appropriate sector in the track to rotate beneath it as the platter revolves. This wait is known as the disk latency period.

The time required to perform the first of these operations is called the track access time. The time required to perform the second operation is called the disk latency time. The track access time is determined by the number of tracks which must be traversed by the access arm. The average track access time therefore increases somewhat with the size of the disk configuration. The disk latency time, on the other hand, is determined solely by the rotational speed of the disk unit. The time required for each operation must be included in the total time required to access a sector on a disk platter. (The latency time is normally not significant for sequential access operations; it may, however, be significant for random access operations.) Appendix A provides timing information on the Model 2270 and Appendix B provides timing information on the Model 2270A.

### 1.7 STAGGERED ARRANGEMENT OF SECTORS IN A TRACK

On a diskette, consecutively numbered sectors are located four physical sectors (one-quarter track) apart, within a track (Figure 1-7). This "staggered" arrangement of consecutive sectors in a track makes it possible for the disk drive to access several consecutive sectors in a single revolution of the disk platter during most multiple-sector read/write operations. In particular, the platter-to-platter MOVE and COPY operations are greatly accelerated by the capability to pick up multiple sectors in a single revolution. The staggered arrangement of sectors also speeds up the reading and writing of multiple-sector records.

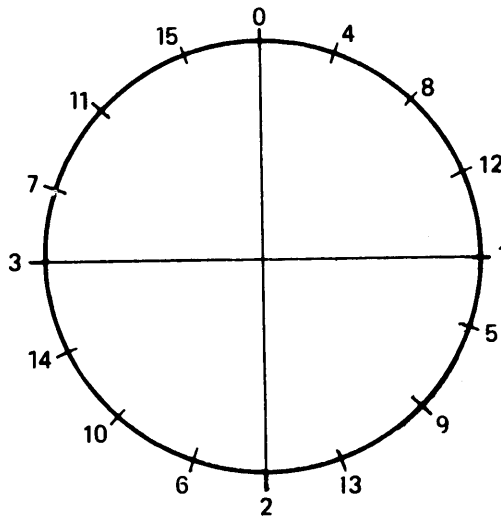


Figure 1-7. Staggered Arrangement of Sectors on the Wang Diskette Platter



## **CHAPTER 2**

### **LOADING AND FORMATTING INSTRUCTIONS**

#### **2.1 UNPACKING AND INSPECTION**

Because the diskette unit is a sensitive device, it is packed using special techniques to protect it from damage during shipment. It should be unpacked, inspected and installed only by a qualified Wang Service Representative. When the system arrives, request that this service be performed. Failure to follow this procedure will void the Wang Equipment warranty.

#### **2.2 INSTALLATION**

The Wang Service Representative will check that the disk drive has been delivered, inspect it for possible shipping damage, connect it into the system, and turn it on to verify proper operation.

The following installation procedure should be observed for the disk unit:

1. Plug the disk drive connector cord into the appropriately labelled disk controller board on the CPU chassis. After attaching the cord, secure it with lock clips or screws at the CPU connection.
2. Plug the disk drive power cord into a grounded (three-hole) wall outlet. Input power requirements for the disk are 115 VAC, 9 amps, 50/60 Hz  $\pm$  1/2 cycle (or 220 VAC, 5 amps, 50/60 Hz  $\pm$  1/2 cycle by special request).
3. Plug the System power cord and the electrical power cords of all other peripherals into grounded wall sockets.

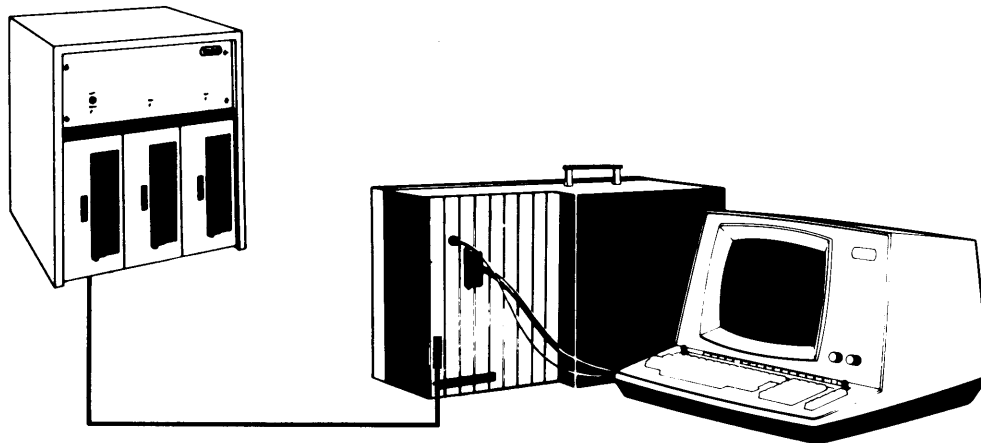


Figure 2-1. System Configuration

### 2.3 POWER-ON PROCEDURE

1. Switch ON the power switches on the diskette unit and all other peripherals. The POWER lamp illuminates on the diskette unit. The power switch is located on the rear panel in the upper left-hand corner.
2. Switch ON the main power switch of the CPU. This Master Initializes the system.
3. You can now load and format diskettes (Sections 2.4 and 2.5).

### 2.4 LOADING AND FORMATTING DISKETTES

The procedure for loading and formatting Wang diskettes is essentially the same for all versions of the Models 2270 and 2270A. Although formatting must be carried out initially in Drive #1, a formatted diskette may be accessed interchangeably in any drive, or in another 2270 or 2270A diskette unit.

#### NOTE TO MODEL 2270A USERS

The Model 2270A diskette drive can only format Wang diskettes. IBM 3740 diskettes CANNOT be formatted on the Model 2270A; they must either be purchased already formatted or be formatted on an IBM diskette drive.

For mounting and operating instructions using IBM type diskettes, see the 3740 Diskette Compatibility Software User Manual.



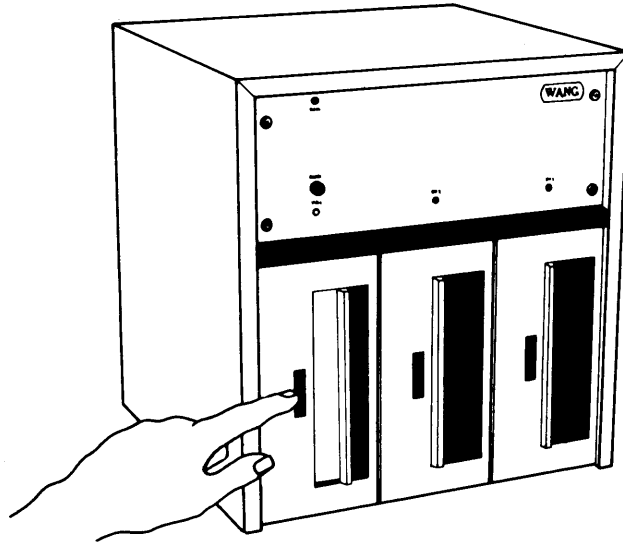


Figure 2-3. Opening the Door of Drive #1

3. Before mounting, be sure that the Mylar recording disk moves freely within its jacket. Test for freedom of movement by pushing gently against the inner edge of the disk; it should move and turn easily.

Insert the diskette into the open drive slot by pushing the diskette into the drive slot until it catches and is held in the slot. The plastic jacket in which a Wang diskette platter is sealed, is labelled with arrows indicating the proper orientation for mounting (Figure 2-4). To mount a 3740 diskette in a Model 2270A drive, the diskette is held edgewise with the IBM label on the right side, in the lower corner away from the drive door, as shown in Figure 2-5.

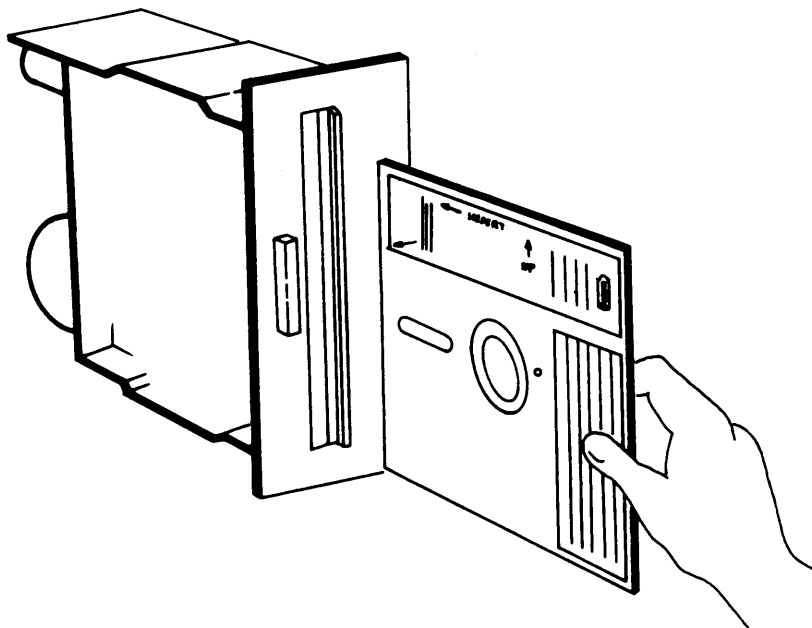


Figure 2-4. Mounting a Wang Diskette

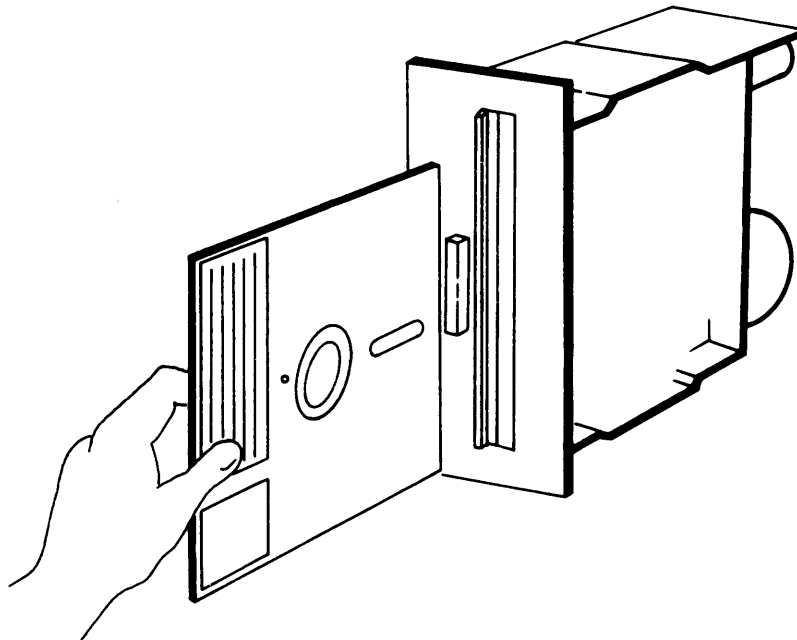


Figure 2-5. Mounting a 3740 Diskette

4. Close the drive door by sliding it to the left until it locks into place.
5. To format a Wang diskette, first key RESET on the keyboard. Next, depress the FORMAT button with a pen or pencil. The FORMAT button is located above Drive #1 on the disk control panel. (The FORMAT button is surrounded by a protective ring to prevent accidental activation of the formatting procedure, a safety feature necessitated because the formatting operation automatically erases any data stored on the diskette.) The button must be held in for about one-half of a second.

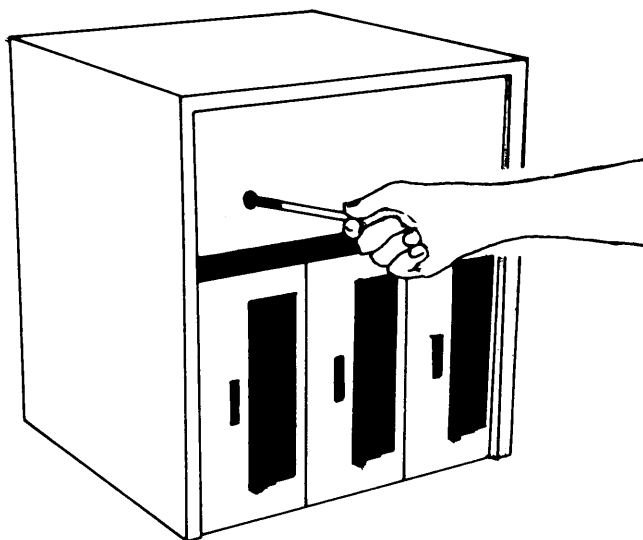


Figure 2-6. Formatting a Wang Diskette

6. The lamp remains illuminated throughout the formatting operation, which normally requires between 45 and 50 seconds. At the end of this time, the lamp should extinguish, indicating that the formatting process is complete. If the lamp remains illuminated for longer than 50 seconds, it is an indication that the system has experienced some difficulty with the format, and is attempting to reformat. If for some reason the diskette cannot be properly formatted, the lamp will start to blink (refer to Section 2.5 on Format Errors).
7. Remove the diskette from the drive by depressing the door latch. The drive door automatically slides open, and a spring-loaded release mechanism ejects the diskette about halfway out of the drive slot. Once formatted, the diskette may be loaded into any drive for recording programs and data.

## 2.5 FORMAT ERRORS

Immediately after formatting a Wang diskette, the system automatically checks the format to ensure that it is correct. If an error is detected in the format, the system signals a format error by causing the lamp for Drive #1 to blink rapidly on and off.

A diskette which cannot be properly formatted should not be used for data storage. In most cases, format errors result from one or two simple causes:

1. Drive door not tightly closed. Make sure that the door is closed tightly, and repeat the formatting procedure.
2. Write-Protect notch uncovered. Remove the diskette and check the Write-Protect hole to be sure that it is completely covered. If it is uncovered, the diskette cannot be formatted.
3. Faulty diskette. Insert a new diskette, and repeat the formatting procedure.

If the formatting operation repeatedly aborts with an error signal on several different diskettes, contact your Wang Customer Service Representative.

## 2.6 THE WRITE-PROTECT FEATURE

Important programs and data recorded on a diskette should be protected against accidental erasure through overwriting or formatting. The Write-Protect feature is provided for this purpose on all Wang diskettes.

A small notch punched along the edge of the diskette's plastic jacket controls the Write-Protect mechanism (see Figure 2-7). When this notch is uncovered, the diskette is write-protected. No information can be recorded on a protected diskette, nor can it be formatted. Information already stored on the diskette can, however, be read in the normal fashion. Any attempt to write on a protected diskette elicits an ERROR. Any attempt to format a protected diskette causes the lamp for Drive #1 to blink.



# APPENDIX A

## MODEL 2270 SPECIFICATIONS

### STORAGE CAPACITY

DISKETTE MODEL	SECTORS PER PLATTER	TOTAL SECTORS	BYTES PER PLATTER	TOTAL BYTES
2270-1	1,024	1,024	262,144	262,144
2270-2	1,024	2,048	262,144	524,288
2270-3	1,024	3,072	262,144	786,432

### LEGAL SECTOR ADDRESSES

DISKETTE MODEL	SECTORS PER PLATTER	LOWEST LEGAL ADDRESS	HIGHEST LEGAL ADDRESS
2270-1,2,3	1,024	000	1023

### PERFORMANCE

#### Rotation Speed

All configurations . . . . . 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



Read/Write Time

One 256-byte sector (including CPU/controller  
overhead) . . . . . 21.8 ms

Raw Transfer Rate . . . . . 31,000  
bytes/sec

Move/Copy Time (Entire Disk Platter) . . . . . Approx  
2 min

GENERAL SPECIFICATIONS

Physical Dimensions

Height . . . . . 19 in. (47.5 cm)

Width. . . . . 17.5 in. (43.5 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

Fuse: 4 Amp (115 or 230 VAC)

Cabling

12 ft (3.7 m) controller cable to the CPU

8 ft (2.44 m) cable to power source

Operating Environment

60°F - 90°F (16°C - 32°C)

20% - 80% Relative Humidity, allowed

35% - 65% Relative Humidity, recommended

# APPENDIX B

## MODEL 2270A SPECIFICATIONS

### STORAGE CAPACITY

DISKETTE MODEL	SECTORS PER PLATTER	TOTAL SECTORS	BYTES PER PLATTER	TOTAL BYTES
2270A-1	1,232	1,232	315,392	315,392
2270A-2	1,232	2,464	315,392	630,784
2270A-3	1,232	3,696	315,392	946,176

### LEGAL SECTOR ADDRESSES

DISKETTE MODEL	SECTORS PER PLATTER	LOWEST LEGAL ADDRESS	HIGHEST LEGAL ADDRESS
2270A-1,A-2,A-3	1,232	000	1231

### PERFORMANCE

#### Rotation Speed

All configurations . . . . . 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

#### Read/Write Time

One 256-byte sector (including CPU/controller overhead) . . . . . 21.8 ms

Raw Transfer Rate . . . . . 31,000 bytes/sec  
Move/Copy Time (Entire Disk Platter) . . . . . Approx 2 min

GENERAL SPECIFICATIONS

Physical Dimensions

Height . . . . . 19 in. (47.5 cm)  
Width. . . . . 17.5 in. (43.5 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  
Fuse: 4 Amp (115 or 230 VAC)

Cabling

12 ft (3.7 m) controller cable to the CPU  
8 ft (2.44 m) cable to power

Operating Environment

60°F - 90°F (16°C - 32°C)  
20% - 80% Relative Humidity, allowed.  
40% - 60% Relative Humidity, recommended.

## 2270A IBM COMPATIBILITY SOFTWARE

Because of the 2270A hardware, IBM 3740 diskette compatibility is possible. However, either Wang or user-written software must be run to make use of the hardware compatibility. To maintain files in IBM 3740 format, Wang recommends the use of the optionally supported disk utility programs and subroutines which allow existing 3740 diskette files to be accessed and maintained, new files to be created in 3740 format, Wang TC format files to be converted to 3740 format and vice versa, and any sector(s) of an IBM 3740 type diskette (including the catalog) to be read and displayed. The subroutines when appended to a user-written program require about 4.5K bytes. Use of the entire Wang software system requires about 12K bytes.

If the IBM compatibility feature is to be used, at least two diskette drives are recommended - one for mounting the 3740 diskette to be used for data storage and retrieval, and the other for mounting the compatibility software. Two drives are also recommended to generally facilitate file backup. Although Wang supported software includes both stand-alone utilities and operational subroutines which can be inserted into user application programs to fully support all programming and processing operations with the 3740 type diskette structure, IBM 3740 type diskettes CANNOT BE FORMATTED on the Wang system. IBM type diskettes must be purchased preformatted, or formatted on an IBM diskette drive. 2270A Compatibility Software is modularized into three main groups:

### File Maintenance Group

File Maintenance Subroutines allow existing IBM 3740 diskette data files to be accessed/maintained and new data files to be created in 3740 format. These functions are available to the user either directly through the console with operator prompts or indirectly via insertion of statements in the user's BASIC program. File Maintenance software permit the following functions:

- . Read a sector
- . Write a sector
- . Backspace n sector(s)
- . Skip n sector(s)
- . Reread the last read/written sector
- . Write-end
- . Open (an existing new file)
- . Open new (create a new file)
- . Close a file

### Diskette Utilities Group

Diskette Utility Programs allow the user to directly (via console) invoke the following utility functions:

- . Convert the data file(s) on an IBM 3740 diskette to Wang TC format data files, or vice versa. All or selected files may be copied, and input and output disk addresses are also selected.
- . List the catalog (index) of a 3740 diskette.

- . Read and display on the CRT or printer selected 3740 diskette sector(s).
- . Display on the CRT or printer sectors of a 3740 data file which has been converted via the above utility function to a Wang diskette.

#### Diskette Initialization Group

This software for program testing purposes creates an image of an initialized 3740 diskette on a Wang diskette.

## APPENDIX C

### DISK MAINTENANCE INFORMATION

In order to maintain the original high quality of diskette platters, it is important that proper care be observed in their handling and storage. This Appendix lists several recommended procedures for the operation, handling, and storage of the diskette, proper attention to which will ensure its continued dependable and efficient performance.

#### 1. General Handling Precautions

The following general precautions apply:

- a) Place diskettes in their protective envelopes when they are not installed in the disk drive to prevent unnecessary dust buildup and protect the recording surface.
- b) Keep food, beverages, tobacco, and smoking accessories off the disk unit, and away from the disk platters to prevent unnecessary contamination.
- c) Clean the equipment room daily using a vacuum cleaner or damp mop. Avoid raising dust with cleaning implements such as brooms or feather dusters.
- d) Do not expose the diskette to intense magnetic fields such as those generated by high-current bus bars, cables, and welding transformers. A field intensity of more than 50 gauss may cause loss of information.
- e) Do not store the diskette in direct sunlight, and avoid temperature or humidity extremes as this may deteriorate the recording surface.
- f) Do not touch or attempt to clean the recording surface. It is very sensitive to abrasion which may cause a loss of data stored on it.
- g) Keep an accurate service record on the disk drive, and the age of all disk media. The equipment should be serviced and recording media replaced (depending upon frequency of use and environmental conditions) before degradation of the recording surface has a chance to occur.

## 2. Carrying

When carrying diskettes, avoid bending or touching the recording surface.

## 3. Labeling

Diskettes should be marked for identification with a felt-tip pen on an adhesive label.

Use the following labeling precautions:

- a) Use only good quality adhesive labels. Inferior labels may work loose while the diskette is loaded, and cause severe damage to the read/write heads or the diskette surface, or leave a sticky residue which traps dust and dirt.
- b) Mark the label with a felt-tipped pen only before putting it on the platter . Do not use pencil or ball-point pen.
- c) Remove old labels completely. To alter a label, replace it; never use an eraser.

## 4. Operating Environment

Diskettes that are in frequent use should be stored in the equipment room or in a similar environment.

The operating requirements are:

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

## 5. Storage

A diskette properly inserted in its protective envelope forms an adequate short term storage container. Unless platters are to be stored for a long period of time, no further protection is required. Clean, dust-free cabinets made of metal or other fire resistant material are recommended for long-term storage of diskettes.

## 6. High Security Storage

Store diskettes containing vitally important data or duplicate master records in a cabinet or storeroom that provides protection against catastrophic damage. The cabinet or storeroom should be insulated to prevent the internal temperature from rising above 150°F (66°C) in case of fire.



7. Storage Environment

a) For short term requirements, the diskette can be stored in the equipment room or similar environment.

b) Long term storage:

Temperature: -40°F to 150°F (-40°C to 66°C)

Relative Humidity: 8% to 80%

8. Shipping and Receiving

Diskettes are protected in transit by packaging assemblies designed to withstand normal shipping abuse. Upon receiving a shipment of diskettes, examine the shipping container for possible damage. If you find any, have a Wang Service Representative inspect the diskette prior to using it in a diskette drive. This will eliminate the possibility of damaging the drive or further damaging the diskette.

# APPENDIX D EQUIPMENT GUARANTEE AND PREVENTIVE MAINTENANCE INFORMATION

## GUARANTEE

The equipment is guaranteed from defects in materials and workmanship for a period of ninety days (one year for State and Federal Governments).

## MAINTENANCE

It is recommended that equipment be serviced semi-annually. Wang Laboratories offers a Maintenance Agreement which automatically ensures proper servicing. If no Maintenance Agreement is purchased, all servicing must be requested by the customer. A Maintenance Agreement protects your investment and offers the following benefits:

### Preventive Maintenance:

Semi-annually, the equipment is inspected for worn parts, lubricated, cleaned, and updated with engineering changes, if any. Preventive maintenance minimizes "downtime" by anticipating repairs before they are necessary.

### Fixed Annual Cost:

When you buy a Maintenance Agreement, you issue only one purchase order for service for an entire year and receive one annual billing, or more frequent billing, if desired.

Further information regarding a Maintenance Agreement can be obtained from your local Wang Sales/Service Office.

### NOTE:

Wang Laboratories, Inc. can neither guarantee nor honor maintenance agreements for any equipment modified by the user. Damage to equipment incurred as a result of such modification becomes the financial responsibility of the user.

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