



WDS/100 USER MANUAL

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INTRODUCTION

SCOPE OF THIS MANUAL

This manual describes the installation and operation of MYARC's WDS/100 Winchester Disk and Controller for the TI 99/4* microcomputer. It is written assuming a basic knowledge of TI 99/4 operations. Where necessary, it references the TI 99/4 Operators Manual and the Peripheral Expansion System Manual for operating instructions described more fully in those documents.

The Manual is divided into six sections: Product Description, Equipment Description and Installation, Operation, WDS/100 with TI BASIC, Product Performance, and Appendices. Exhibits referenced in the manual follow the Appendices. Since operating instructions are given assuming the reader is acquainted with background information provided at strategic points in the manual, WE RECOMMEND THAT FIRST-TIME USERS READ THE ENTIRE MANUAL BEFORE ATTEMPTING INSTALLATION OR OPERATIONS.

* Throughout this manual all references to TI 99/4 or TI 99/4A apply to both the TI 99/4 and the TI 99/4A console models.

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 WINCHESTER DISK AND CONTROLLER
 USER'S MANUAL
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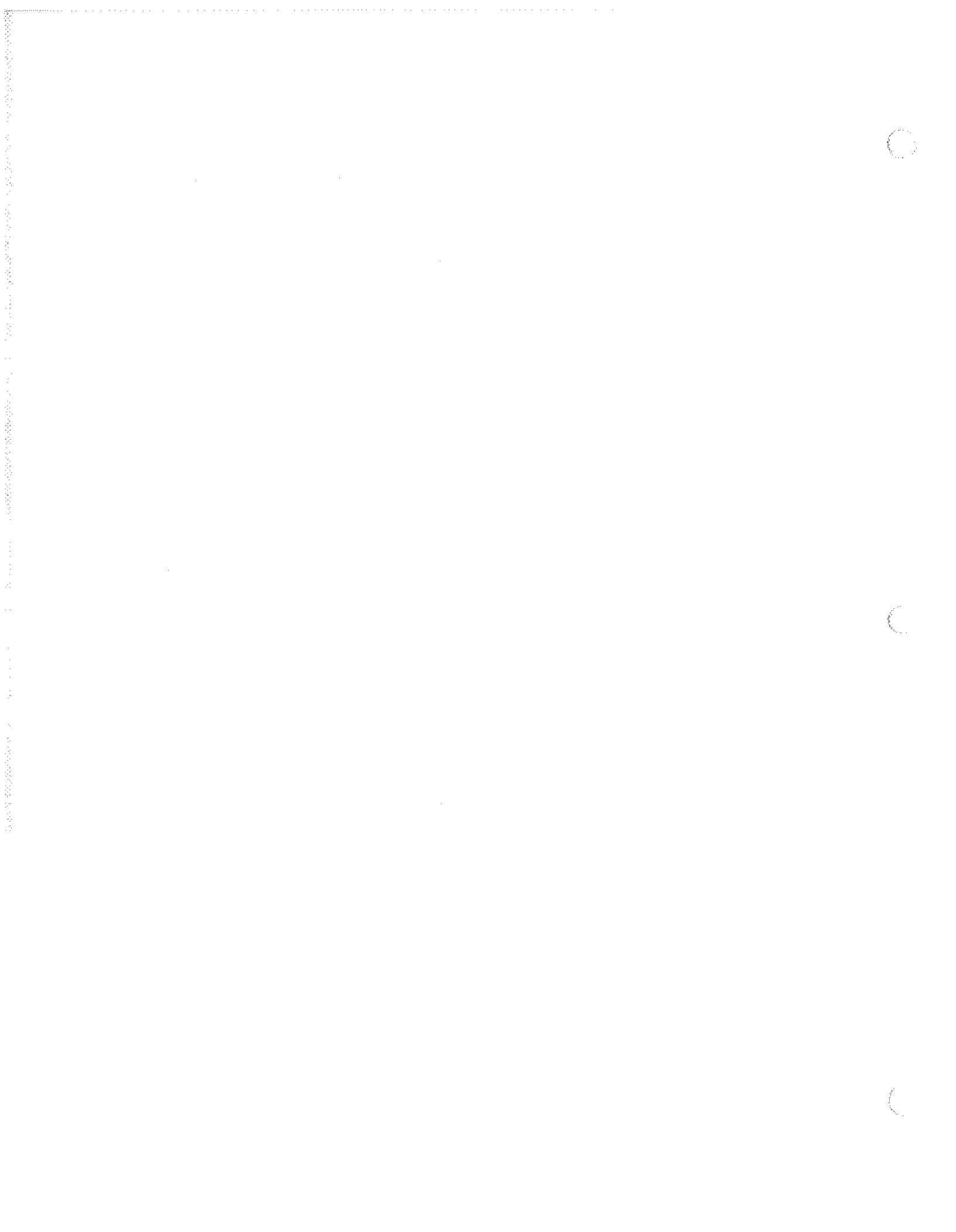
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1.0 GENERAL PRODUCT DESCRIPTION

The WDS/100 is MYARC's Winchester Disk System designed for use with TI's 99/4 microcomputer. Custom engineered, the WDS/100 hardware and software components integrate completely with TI's present 99/4 product line. MYARC's Personality Card (the Winchester Disk controller card) fits into TI's Peripheral Expansion System* accessory card slots. The WDS/100 Disk Management System provides total upward compatibility from TI's Disk Operating System.

The WDS/100 can be configured in a variety of ways. The drive itself is available in 5- or 10- Megabyte models. A "time of day" clock** is available with the system.

To operate the WDS/100, an existing TI 99/4 installation must have the following components:

1. The TI 99/4 or 99/4A Console
2. A CRT Monitor
3. A 5 1/4-inch Floppy Disk Drive
4. TI's Peripheral Expansion System
5. TI's EXTENDED BASIC
6. 32K Memory Expansion

The WDS/100 requires a three-pronged outlet for 110V, 5 amp power circuits and sufficient space to permit adequate air flow for cooling. Other than this, the WDS/100 should require no special environmental changes unless it will operate in situations exceeding stated tolerances. See Appendix A for physical specifications.

With so much more data on the Winchester Disk to manage, the WDS/100 must go beyond the file management capabilities of a floppy disk system. MYARC's unique Directory Management software does just this. It permits files to be logically grouped together into "directories." These directories, in turn, can be grouped together into larger "directories." This is analogous to storing files on a floppy disk and storing the floppy on a "larger" floppy.

MYARC Directory Management, however, provides more flexibility than this analogy implies. First, there can be up to 114 subdirectories and 127 files under any one directory (see Exhibit A). Second, there can be up to 17 different directory "levels" on any one Winchester Disk.

With this kind of flexibility, MYARC's Directory Management can be adapted to any application environment. More detail on the WDS/100 file hierarchy is given in sections 3.1, Overview of the Disk Management System and 3.3.2, Directory Management.

* Peripheral Expansion System is a trademark of Texas Instruments.

** The clock option is available when ordering the WDS/100 at additional cost.

1.0 GENERAL PRODUCT DESCRIPTION

FEATURES OF THE SYSTEM

The WDS/100 brings the advantages of high density storage and Winchester reliability to the TI 99/4. While on a 5¼-inch floppy disk, information storage limits are 92,000 characters per disk, on a 5-Megabyte Winchester, the storage capacity is almost fifty times that amount!

MYARC builds further reliability into the system with state-of-the-art error correction coding. Single-bit error detection and double-bit error correction ensures the ultimate protection of program and data files. In addition, special MYARC start-up diagnostics protect against operating under "memory failure" conditions.

MYARC's "value added" software adds almost no processing overhead to the system. All device service routines are firmware resident, which means that no memory space is required for WDS/100 operation. In addition, MYARC's WDS/100 Winchester technology packaging will provide processing speeds four to ten times those of a floppy disk system!

Presently the WDS/100 can be used with TI BASIC and TI Assembly Language. For serious software developers, this will mean greater development productivity. In TI BASIC, for example, the programmer can "OPEN" up to 12 files simultaneously without using system memory. With TI Assembly Language, the program can obtain direct I/O from CPU memory. This alone speeds memory loading time by a factor of three!

Fully upward compatible with the TI Disk Memory System,* the WDS/100 allows for easy transition to a hard disk environment. Storage and retrieval of data is accomplished through a familiar set of TI BASIC statements and commands such as "OPEN," "INPUT," "PRINT," and "CLOSE." Programs are stored and loaded using the TI BASIC "SAVE" and "LOAD" commands.

Powerful WDS/100 Disk, Directory and File Management utilities provide the tools to manage the disk and all the information on it. Disk utilities allow disk initialization, disk mapping to obtain an index of all directories and files on the disk, disk showing to obtain the status of the disk, and disk renaming. Directory utilities create, delete, rename and produce directory listing. In addition, they indicate directory status, provide the capability to back-up Winchester files to floppy disks and restore backed up files. Finally, File Management utilities delete, copy, rename and modify the protection status of files.

* TI Disk Memory System is a trademark of Texas Instruments Incorporated

2.0 EQUIPMENT DESCRIPTION AND INSTALLATION

A description of the equipment and installation procedures are detailed in this section. The equipment description covers the Winchester Disk Drive Cabinet, MYARC's Personality Card and the MYARC Utility Disk. This section also includes placement and care of the system units.

Installation procedures detail how to set up the WDS/100 for operation. System set-up is a simple process requiring no more than ten to fifteen minutes. System start-up is also a simple process. When all instructions are properly followed, the system will be operational almost immediately.

2.1 UNPACKING THE CARTON

- * Before unpacking, check to see if the carton has arrived without dents or "bruises" to the carton. Notify the transportation company of any damage immediately.
- * Carefully unpack the components making sure that the Winchester Drive Cabinet does not come into contact with anything magnetized. The following items will be found in the carton:
 1. The Winchester Disk Drive Cabinet with attached ribbon cable and connector.
 2. MYARC's Personality Card
 3. The User's Manual
 4. Two 5 1/4-inch Floppy Diskettes
 5. One Power Cord
- * KEEP THE PACKING MATERIALS AND BOX IN THE EVENT THAT FUTURE SHIPPING OR MOVING IS REQUIRED. FOLLOWING STANDARD OPERATING PROCEDURES, MAKE A BACK-UP COPY OF THE FLOPPY DISKS IMMEDIATELY.
- * RECORD THE DISK DRIVE AND PERSONALITY CARD SERIAL NUMBERS AND DATE OF PURCHASE. REFER TO THESE NUMBERS WHEN MAKING ANY INQUIRIES ABOUT THE UNITS.

The serial number for the Winchester Disk Drive Cabinet is located on the underside of the cabinet. The Personality Card number is located on the card's face label.

*Purchase
on
17-6-87*

2.2 EQUIPMENT DESCRIPTION

2.2.1 THE WINCHESTER DISK DRIVE CABINET

The Winchester Disk is housed in the Winchester Disk Drive Cabinet along with a power supply, cooling fan and controller board. The cabinet is designed to ensure maximum reliable operation of the disk drive unit. An air cooling fan draws off excess heat generated by the unit and the disk drive itself is securely bolted to the cabinet frame to protect it from handling "shocks."

2.2 EQUIPMENT DESCRIPTION

2.2.1 THE WINCHESTER DISK DRIVE CABINET

The Winchester Disk is sealed in a separate contaminant-free casing with its own filtered recirculating air system. This sealed air system protects the disk platters and read/write heads from dust and other contaminants and helps maintain even temperatures within the disk.

The WDS/100 controller board provides the interface between the Winchester Disk and MYARC's Personality Card in the accessory card compartment of the Peripheral Expansion System. A ribbon cable attached to the controller board physically connects the two devices. A separate power cord is included with the system.

The power supply provides both 5-volt and 12-volt DC to the Winchester Disk and the controller. The cooling fan is powered directly from the 115 volt AC line. Fan vents must not be blocked in order to properly vent the cabinet's heat.

CAUTION:

THE WINCHESTER DISK IS A HIGH PRECISION INSTRUMENT. ANY SHOCK CAN SEVERELY DAMAGE IT. ALWAYS HANDLE THE DISK DRIVE CABINET WITH EXTREME CARE TO AVOID DAMAGE.

For detailed specifications of the WDS/100, see the Appendix. It contains Physical Specifications, Power and Environmental Requirements.

2.2.2 MYARC'S PERSONALITY CARD

MYARC's Personality Card is designed for inserting into TI's Peripheral Expansion System. It looks like and is inserted into the accessory card compartment exactly like any TI accessory card. For instructions on inserting the card, see Section 2.5.1, "Inserting MYARC's Personality Card into the Peripheral Expansion System."

The label identifying the Personality Card is located at the top end of the card. When looking at the label, an indicator light can be seen on the left hand side of the card. This light will be facing the front of the Peripheral Expansion System when the card is inserted into its slot. The light will go on and off and fade to various intensities depending on the function that is being performed on the disk.

2.2.3 MYARC'S UTILITY DISKS

Both floppy diskettes supplied by MYARC contain all WDS/100 disk utilities. The diskette marked "Floppy Disk Based" is used when the utilities are run on the floppy disk system and when initializing the hard disk. The diskette marked "Winchester Based" is used to copy the disk utilities to the Winchester.

2.2 EQUIPMENT DESCRIPTION

2.2.4 IDENTIFYING WINCHESTER MODELS

The WDS/100 comes in a 5-Megabyte and 10-Megabyte model. The Winchester model is identified by the suffix to WDS/100 (-5 or -10). The model and serial number is located on the underside of the Disk Drive Cabinet.

Each model has a different number of disk "tracks" and "platters." To "initialize" the disk, the system will need to know how many tracks and platters your particular disk has. Section 3.3.1A, "Initializing the Disk" provides detailed instructions on disk initializing. The following chart identifies numbers of platters and tracks for each model:

<u>Model</u>	<u>Platter(s)</u>	<u>Tracks</u>
5-Megabyte	1	306
10-Megabyte	2	306

2.3 PLACEMENT AND CARE OF THE WDS/100

A. The Winchester Disk Drive Cabinet

While the Cabinet provides excellent protection for the Winchester Disk Drive and the disk itself is more durable than a floppy diskette, it can still be seriously damaged. To avoid unnecessary problems, take these simple precautions in placing and caring for your WDS/100.

1. **THE CABINET REQUIRES COOLING.** Do not place it in such a way so as to obstruct continuous air flow from the cooling fan. Allow at least a two-inch clearance around the cabinet and a six-inch clearance in back of the cabinet from walls or other devices. Keep both the front and rear air vents clear of loose papers or other objects and don't place the cabinet in boxes, drawers or a closed cabinet. Finally, do not put any device on top of the drive like another Winchester cabinet, floppy disk drive, etc. or place the Winchester on top of any device like the Peripheral Expansion System. Never operate the unit upside down or with the long direction at an incline.
2. **LIKE A FLOPPY DISK, THE WINCHESTER CAN BE ADVERSELY AFFECTED BY MAGNETIC FIELDS, STATIC ELECTRICITY AND DUST.** To protect against possible damage resulting from these, keep your Winchester in a low humidity, dust and static-free environment. Use an anti-static carpet spray or static mat if the Winchester is located in a carpeted room. Place the Cabinet as far from the monitor as possible. (The monitor creates a powerful magnetic field which could erase information on the drive). The supplied ribbon cable and connector provides ample flexibility to do this.

2.3 PLACEMENT AND CARE OF THE WDS/100

NOTE: THE WINCHESTER DISK IS SEALED TO AVOID DUST CONTAMINATION. DO NOT ATTEMPT TO OPEN THE DISK DRIVE OR THE AIR SEALS WILL BE DISTURBED. IF THE DISK DRIVE IS OPENED, THE LABEL ON THE DISK DRIVE WILL BE BROKEN AND THE WARRANTY IS VOID. THE WARRANTY IS ALSO VOID IF THE LABEL IS REMOVED.

3. THE FLAT CABLE AND CONNECTOR MUST NOT BE STRESSED. Allow for some "play" in the cable. Do not pull it taut and do not string it along the floor where people may walk or disturb it. Make sure the cable is securely fastened by checking the connector for a "snug" fit. Extra cable should be folded in an accordian fold, not rolled into a coil. If a cable is rolled into a coil during operation, it can adversely affect performance.

B. MYARC'S Personality Card

TAKE THE SAME HANDLING PRECAUTIONS AS YOU WOULD FOR ANY TI ACCESSORY CARD. REMEMBER THAT THE PERSONALITY CARD COMPONENTS CAN BE DAMAGED BY STATIC ELECTRICITY. TO AVOID ANY DAMAGE, DO NOT TOUCH THE CONNECTOR CONTACTS.

NOTE: THE PERSONALITY CARD IS SEALED TO PROTECT THE CIRCUITRY INSIDE. IF THE PERSONALITY CARD IS OPENED, THE LABEL WILL BE BROKEN AND THE WARRANTY IS VOID. THE WARRANTY IS ALSO VOID IF THE LABEL IS REMOVED.

2.4 SETTING UP THE WDS/100

Setting up the WDS/100 requires three steps. They are:

1. Inserting MYARC's Personality Card into TI's Peripheral Expansion System.
2. Connecting the Winchester Disk Drive Cabinet to MYARC's Personality Card.
3. Plugging the Winchester Disk Drive into a 115 volt power outlet.

The following sections describe these steps in detail. Please read this material completely before proceeding.

CAUTION:

BEFORE PROCEEDING, MAKE SURE THE COMPUTER CONSOLE AND ALL ATTACHED DEVICES ARE "OFF" AND POWER CORDS DISCONNECTED FROM POWER OUTLETS.

2.4 SETTING UP THE WDS/100

2.4.1. INSERTING MYARC'S PERSONALITY CARD IN TI'S PERIPHERAL EXPANSION SYSTEM

CAUTION:

THE PERSONALITY CARD ELECTRONIC COMPONENTS CAN BE DAMAGED BY STATIC ELECTRICITY. TO AVOID DAMAGE, DO NOT TOUCH THE CONNECTOR CONTACTS.

Inserting MYARC's Personality Card into TI's Peripheral Expansion entails the same procedure as inserting all other TI accessory cards. The card can occupy any slot except #1 (reserved for TI's Peripheral Expansion Card) or #8 (reserved for TI's Disk Drive Controller Card). The Peripheral Expansion System must be set up and working according to the instructions provided in TI's Peripheral Expansion System Model No. PHP1200 Owner's Manual.

To insert the Personality Card:

1. MAKE SURE THE COMPUTER CONSOLE AND ALL ATTACHED DEVICES, INCLUDING THE PERIPHERAL EXPANSION SYSTEM, ARE OFF. DISCONNECT POWER CORDS FROM POWER OUTLETS. WAIT TWO (2) MINUTES AFTER TURNING OFF ALL UNITS FOR THE POWER TO FULLY DISCHARGE BEFORE PROCEEDING. THIS IS TO ENSURE NO DAMAGE WILL BE DONE TO THE PERSONALITY CARD.
2. After waiting, remove the top of the Peripheral Expansion System. This is done by lifting the back edge of the top and pulling up. You are now ready to insert the Personality Card.
3. The Personality Card must be inserted so the small indicator light on one side of the card will be visible from the front of the Peripheral System. Hold the Personality Card so the light will be visible from the front (the arrow on the label indicates the direction the light is facing). Carefully align the card with the desired slot so that the connector extends through the opening in the back of the unit. Press the card firmly into the slot to ensure that all connections are made.

2.4 SETTING UP THE WDS/100

2.4.1. INSERTING MYARC'S PERSONALITY CARD IN TI'S PERIPHERAL EXPANSION SYSTEM

4. Replace the Peripheral Expansion System's top cover by sliding the front edge under the extension on the front of the unit and pressing down firmly on the back edge of the top. MAKE SURE THE TOP COVER IS ON. THIS IS IMPORTANT SINCE A PROPERLY FITTED TOP PIECE WILL ENSURE PROPER VENTILATION. IF THE TOP DOES NOT FIT PROPERLY, REMOVE THE CARD AND REALIGN IT AGAIN IN THE SLOT.

CAUTION

SINCE THE CABLE CONNECTING THE PERIPHERAL SYSTEM AND CONSOLE IS NOT DESIGNED TO SUPPORT THE WEIGHT OF THE UNITS, ALWAYS DISCONNECT THE PERIPHERAL EXPANSION SYSTEM BEFORE MOVING THE CONSOLE. AS A STANDARD PRACTICE, ALWAYS DISCONNECT ALL DEVICES BEFORE MOVING ANY PART OF THE HOME COMPUTER SYSTEM INCLUDING THE WINCHESTER DISK. AS RECOMMENDED IN TI'S PERIPHERAL EXPANSION SYSTEM MANUAL, REMOVE ALL ACCESSORY CARDS FROM THE PERIPHERAL EXPANSION SYSTEM WHEN MOVING LONG DISTANCES

2.4.2. CONNECTING THE PERSONALITY CARD TO THE WINCHESTER AND CONNECTING THE WINCHESTER TO 115 VOLT POWER

The final steps of set-up include connecting the Personality Card to the disk drive and connecting the Winchester Cabinet into a 115 volt power outlet. To do this:

1. Carefully place the Winchester Disk Drive Cabinet as recommended in Section 2.3, "Placement and Care of the WDS/100."
2. Uncoil the ribbon cable from the Winchester Disk Drive Cabinet. The cable is already attached to the controller board in the cabinet. The unconnected end will be attached to MYARC's Personality Card.

Plug the "Notched" connector on the unconnected end of the ribbon cable into the contact leads extending from MYARC's Personality Card. When the Personality Card is inserted correctly, these leads extend through the opening in back of the Peripheral Expansion System at the slot location where the Personality Card was plugged in.

NOTE: The notched connector allows the cable to be attached in one direction only. The connector will slide in easily when inserted according to the direction indicated by the notch.

2.4 SETTING UP THE WDS/100

2.4.2. CONNECTING THE PERSONALITY CARD TO THE WINCHESTER AND CONNECTING THE WINCHESTER TO 115 VOLT POWER

3. MAKE SURE THE ROCKER SWITCH ON THE BACK OF THE WINCHESTER CABINET IS "OFF." This is important so that the equipment is not accidentally "shorted" out.

To connect the Winchester to electrical power, do the following in the exact order given below:

1. Plug the female end of the supplied electrical power cord into the 3 pronged pin socket at the back of the WDS/100 Winchester Disk Drive Cabinet.
2. Plug the male end of the electrical power cord into a 115 volt outlet.
4. At this point, you may plug all computer components back into power circuits in preparation for starting up. DO NOT turn on any components until reading the start-up instructions detailed in the next section, "Starting the System."

2.5 STARTING THE SYSTEM

Starting the system up involves two activities:

1. Powering up and testing
2. Invoking MYARC's Disk Management System Software

Powering up and testing routines must be followed at each start-up to ensure trouble-free operation.

PLEASE READ THESE INSTRUCTIONS COMPLETELY BEFORE STARTING.

2.5.1. POWERING UP AND TESTING

~~To power up:~~

1. It is important that the entire system is turned on in this specific order.
 - * first, the TI Peripheral Expansion System
 - * next, the Winchester Disk Drive Cabinet (after turning the Winchester on, wait at least 15 seconds before turning on the console. This is to allow the disk to get up to full rotating speed).
 - * then, the floppy disk drive(s) and other peripherals
 - * the monitor
 - * finally, the console

When turning the system off, start with the console and follow this sequence in reverse order.

2.5 STARTING THE SYSTEM

2.5.1 POWERING UP AND TESTING

IMPORTANT

FOR PROPER DISK CONTROLLER INITIALIZATION AND MEMORY ALLOCATION, THE WINCHESTER DISK DRIVE MUST BE ON 15 SECONDS BEFORE THE COMPUTER CONSOLE IS SWITCHED ON. IF NOT, THE WINCHESTER WILL NOT FUNCTION PROPERLY. IF, BY ACCIDENT, THE COMPUTER CONSOLE IS SWITCHED ON BEFORE THE WINCHESTER, TURN EVERYTHING OFF AND START AGAIN FOLLOWING THE START-UP SEQUENCE DESCRIBED ABOVE.

2. The "power-on/off" rocker switch for the Winchester drive is located on the back of the cabinet. Flip the switch to the "on" position.

Check to make sure the following has happened:

1. The fan and drive will activate. The fan will rotate and a low "whirring" noise will indicate the disk drive is running.
2. When the TI 99/4 or 99/4A console is switched "on," two things will happen:
 - a) The red light on the lower left hand corner of the drive's front will illuminate. This light will always stay on except if there's a disk error message on the screen.
 - b) The Personality Card's red light (visible by looking at the Peripheral Expansion System at the slot where MYARC's Personality Card was inserted) will light up briefly and, after a moment, go off again. The light will come on again and fade to varying shades of intensity depending on the operation being performed on the disk. It is easy to not see this initial illumination of the Personality Card light since it happens very quickly.
3. Check the "Troubleshooting the Hardware," Section 5.2, if any of these phenomena do not happen.
4. During start-up, the Personality Card light should never be constantly illuminated. If this happens, refer to the "Troubleshooting the Hardware," Section 5.2.

2.5.2 INVOKING MYARC'S DISK MANAGEMENT SYSTEM SOFTWARE

IMPORTANT:

MAKE A BACK-UP COPY OF BOTH WDS/100 UTILITY DISKETTES BEFORE USING THEM FOR ANY OPERATIONS.

2.5 STARTING THE SYSTEM

2.5.2 INVOKING MYARC'S DISK MANAGEMENT SYSTEM SOFTWARE

Once the computer system is properly "powered up," the TI MASTER SCREEN will appear. To invoke MYARC's Disk Management System:

1. Insert the MYARC utility disk labeled "Floppy Disk Based" in the floppy disk drive.
2. Set up the system for TI EXTENDED BASIC operation.
 - * Insert the TI EXTENDED BASIC Command Module
 - * As the Master Screen indicates, press any key to begin
3. Choose Option No. 2 and press ENTER for TI EXTENDED BASIC. When this is completed, one of two screens will appear:
 - a) If the MYARC floppy disk was inserted into floppy disk drive No. 1, the WDS/100 System Screen will appear. A few seconds later, the MYARC MAIN MENU will appear. (If the system has a clock option, the INITIALIZE DATE/TIME Menu not the MAIN MENU will appear. See Appendix D for the clock option description and operating instructions). The screen will read:

MYARC WINCHESTER SYSTEM

MAIN MENU

DM-DISK MANAGEMENT
DR-DIRECTORY MANAGEMENT
FM-FILE MANAGEMENT
DD-DISK DIAGNOSTICS
EX-EXIT

ENTER MENU CODE:

NOTE: If the system has a clock option and the time was initialized, the MAIN MENU will have a date/time stamp and contain additional selections.

- b) If the MYARC floppy disk was not inserted in disk drive No. 1, the system will go immediately to TI EXTENDED BASIC. The screen will read:

READY

Type in "RUN.DSK.WDS.LOAD" and press ENTER. The MYARC MAIN MENU will now appear.

NOTE: If the MYARC MAIN MENU does not appear as in 3a or 3b above, check that:

1. The MYARC Utility Disk labeled "Floppy Disk Based" was inserted (a "07" TI BASIC error code will show on the screen if it wasn't).

2.5 STARTING THE SYSTEM

2.5.2. INVOKING MYARC'S DISK MANAGEMENT SYSTEM SOFTWARE

2. No other floppy disk being used by the system is named WDS. The MYARC Utility Disk is the only floppy that may be named WDS.
3. The floppy diskette media is not damaged and that the floppy disk drive is functioning properly. Also check that your back-up copy of the MYARC Utility Disk is initialized. If your system lost its power during a previous print, this could cause the same problem (a "06" TI BASIC error code will show on the screen if any of these conditions are the cause).
4. At this point, the system is set up and ready to go if the Winchester disks have been initialized. All NEW DISKS MUST BE INITIALIZED. Initialization procedures are described in Section 3.3.1A, "Initializing the Disk."

CAUTION

BEFORE READING OR WRITING DATA TO THE WINCHESTER DISK, IT MUST BE INITIALIZED.

3.0 OPERATION OF THE WDS/100 DISK MANAGEMENT SYSTEM

This section describes the operation of the WDS/100 Disk Management System. It includes a description of all Disk Management utilities, and how and when to use them.

3.1 OVERVIEW OF THE DISK MANAGEMENT SYSTEM

The WDS/100 Disk Management System provides a sophisticated file management system which aids in organizing the large amount of information stored on the Winchester Disk. By grouping files into "directories" and "directories" into larger "directories," the system allows the user to create a Unix-like file hierarchy. This is like being able to group manila file folders into one large "Pendaflex" file folder, and then grouping a number of "Pendaflex" file folders into a large filing drawer.

MYARC's Disk Management Utilities allow the user to name and keep track of directories and files on the disk. Using the file drawer analogy, this is analagous to labeling the "Pendaflex" folders, manila files and filing drawer and creating an inventory containing all the label names.

The WDS/100 uses the concept of a "pathname" to identify, label and locate disk directories and files. A pathname is simply a string of directory names with which any directory or file is linked. Again using the analogy of the file drawer, the pathname for any particular manila folder would include the name of the file drawer, the name of the Pendaflex folder containing it, and finally, the name of the actual file folder.

The WDS/100 pathname concept is similar to the file-naming convention used in the TI Disk Operating System. In TI's system, a user must identify the physical device and the file name. However, there are no "directories" in the floppy disk system, so a directory name is not part of a floppy-disk-based file pathname.

In contrast, directories are key in the WDS/100 Disk Management System. They are the "signposts" to locating specific files. Pathnames are discussed in more detail in Section 3.3.2., Directory Management.

Directories are created using the WDS/100 "Create Directory" utility. They cannot be created any other way (for example, they cannot be created using TI BASIC).

When creating a directory, it is useful to create it with a plan for its ultimate use. Some examples of directory use are listed here:

1. Files that need to be backed up on a daily (or weekly) basis can be grouped together in and backed up by directory. One command then will take care of backing up all files in that directory.
2. Multiple users sharing one 99/4 system can organize their files into their individual directories. Directories will ensure that users can keep their files separate from other user files.

* UNIX is a trademark of Bell Laboratories

3.1 OVERVIEW OF THE DISK MANAGEMENT SYSTEM

3. System developers can use "sub-directories" (directories under higher level directories) to segment their source files, object files and listing of assemblies/compilations under one "Product" directory.

Regardless of how a user decides to create and implement Directory Management, strict attention must be given to directory and file naming conventions.

Pathnames may not exceed 40 characters (any single directory or file name may not exceed 10 characters). If an application environment requires only one or two levels of directories, then directory names may go the full 10 character length. If, however, the application environment requires multiple level directories, then directory names need to be shorter so pathnames do not exceed 40 characters.

The preceding illustrates the need for initial planning before directories and files are created. These and other examples are discussed more fully in the following chapters. It is recommended that first-time users read these chapters sequentially and in their entirety before attempting operations. In this way the user will get a "feel" for the overall system and will more easily use it to its fullest advantage.

3.2 MENU SELECTION AND PROMPTING PROCEDURES

MYARC's Menu Selection and prompt procedures will be familiar to any TI 99/4 user. A two-letter mnemonic in a selection menu represents a particular program choice. The desired choice is typed into the system and the ENTER key is depressed.

This same procedure is followed when answering prompts. Indicate the appropriate response, press ENTER and either the next prompt will appear or the selected instruction sequence will be executed.

The system is programmed to process defined character strings for menu or program selections and specific numbers or letters for prompt responses. For menu or program selections, the legal codes are the two letters preceding the selections shown on the screen. For example, in the MAIN MENU, "DM" is the code for Disk Management, "DR" for Directory Management, "FM" for File Management, "DD" for Disk Diagnostics and "EX" for Exit.

If an incorrect mnemonic is ENTERed, the system will ignore it. The cursor will go back to its original position and the entry will be erased from the screen. The correct mnemonic may then be entered.

Legal responses to prompts are shown contained within parenthesis, (), following the prompt. When, for example, the system asks: IS THE ABOVE CORRECT?, the legal responses to this question are "Yes," "No" or "Abort." This is indicated as (Y/N/A-Abort) on the screen. The user simply types Y for yes, N for no or A for Abort and ENTERs the choice.

3.2 MENU SELECTION AND PROMPTING PROCEDURES

To move forward from the MAIN MENU to the program menus (sub-menus under the MAIN MENU), a mnemonic code is ENTERed into the system. To move backward from a program menu to the MAIN MENU, the mnemonic code "EX" for Exit is ENTERed. Pressing "EX" at the MAIN MENU level will bring the user back to TI EXTENDED BASIC. Once the user is in a sub-menu prompting sequence, the user can exit the prompting sequence by indicating A for "Abort" at designated points in the program.

The familiar TI functions labelled PROC, REDO and BACK are also used in MYARC's Disk Management System. These labels accomplish the identical function as in the TI Disk Memory System and are invoked the same way.

3.3 DISK MANAGEMENT SYSTEM

MYARC's Disk Management System provides all the utilities necessary to manage the large amount of data and program information stored on the Winchester Disk. These utilities extend to all levels of the Disk Management Hierarchy from managing the disk, to managing the directories on the disk, and finally to managing the files contained in the disk directories. In addition, utilities that test the disk are part of the system.

Disk Management utilities initialize the disk, index the directories and files found on the disk, and show disk utilization. Directory management utilities create, delete, rename, index directories and files found in each directory, summarize directory status and back up directories. File management utilities do for files what directory management utilities do for directories (except backup). In addition, file management utilities will copy files and allow a file protection status to be modified. Disk diagnostic utilities test the disk hardware.

After invoking the MYARC software, the MYARC MAIN MENU appears. The screen options indicate the entire range of disk management utilities available on the system. The screen reads:

MYARC WINCHESTER SYSTEM

MAIN MENU

DM-DISK MANAGEMENT
DR-DIRECTORY MANAGEMENT
FM-FILE MANAGEMENT
DD-DISK DIAGNOSTICS
EX-EXIT

ENTER MENU CODE:

At this point, the system is ready to receive a mnemonic code for any utility. Enter the appropriate mnemonic code which brings up the next menu level. The following sections describe each utility in more detail.

NOTE: REMEMBER, DO NOT ATTEMPT TO DO ANYTHING WITH THE WINCHESTER UNTIL IT HAS BEEN INITIALIZED. INITIALIZATION PROCEDURES ARE DESCRIBED IN THE NEXT SECTIONS.

FOR FIRST TIME USERS OF THE SYSTEM, WE RECOMMEND THAT YOU INITIALIZE THE DISK AND THEN "WALK" THROUGH EACH UTILITY MENU TO BECOME ACQUAINTED WITH THE FULL RANGE OF THE DISK MANAGEMENT SYSTEM. THIS WAY YOU WILL KNOW HOW TO BEST EXPLOIT THE SYSTEM'S CAPABILITIES FOR YOUR OPERATING REQUIREMENTS.

3.3 DISK MANAGEMENT SYSTEM

3.3.1 DISK MANAGEMENT

MYARC's Disk Management provides utilities to initialize a disk, change the name of a disk, create a listing of all directories and files on the disk and obtain a summary of the contents of the disk. When the Disk Management (DM) option is chosen from MYARC's MAIN MENU, the following screen information appears:

MYARC WINCHESTER SYSTEM

DISK MANAGEMENT

ID-INITIALIZE DISK
MD-MAP DISK
RD-RENAME DISK
SD-SHOW DISK STATUS
EX-EXIT

ENTER PROGRAM CODE:

Although operating in the Winchester Disk environment is generally different from operating in a floppy disk environment, these utilities perform the same functions as do similarly named utilities in the TI floppy disk system. The following sections describe the significance and operation of these utilities. A list of Disk Management System Errors will be found in Section 5.3, "Error Messages in the Disk Management System."

3.3.1A INITIALIZE DISK

Before reading or writing data onto a Winchester Disk, it (like a floppy) must be initialized. This is to "set up" the system's data handling in accordance with the actual physical properties of the disk. During the initialization process, a system prompt will actually ask that the number of "platters" and "tracks" be entered for the disk being initialized. Disk model information on platters and track numbers is presented in Section 2.2.4, "Identifying Winchester Models."

NOTE: If the system has a clock option, the date and time of disk initialization will be recorded if the clock is set prior to initialization. See Appendix D for operating instructions on the clock option.

To initialize the disk, the MYARC utility diskette labeled "Diskette Based" must be used. If the "Winchester Based" utility diskette is used, the hard disk cannot be initialized.

In the MYARC Disk Management System, each Winchester Disk has two identifying names - one is its "physical" name (Winchester Disk Drive) and the other, its "logical" name. The system assigns the "physical" name ("WDS") when the disk drive is physically hooked up to the system. The user assigns the "logical" name when the disk is initialized.

3.3 DISK MANAGEMENT SYSTEM

3.3.1A INITIALIZE DISK

Within specified limits, Winchester Disks may normally have "Bad" sectors. All WDS/100 disks are checked before leaving the factory to ensure they are within the disk manufacturers stated tolerances. The WDS/100 error handling ensures these sectors will not be written to. It is important to make a note of the number of bad sectors. This may be needed in the unlikely event of that the disk needs servicing.

The "logical" disk name is also considered the Main Directory in which all other directories and files on the disk are located. Using the file drawer analogy mentioned in the Disk Management Overview, the Main Directory is the "file drawer" in which numerous "Pendaflex" folders (directories) are kept. When searching for a particular file, you begin by locating the actual file drawer (the Main Directory), then finding the Pendaflex folder and finally, locating the actual folder. Similarly, the system, when searching for a file, will first locate the specific Winchester Disk (Main Directory), then search for the directory (or directories) containing the file, and finally locate the file itself. The names created for the Main Directory, the directories under the Main Directory and the file combine into the "pathname" which provides the search route for locating any file on the disk.

The Directory and File Management System actually can go much "deeper" than the file drawer analogy implies. For this reason, before initializing the disk, it is advisable to read Section 3.3.2 on "Directory Management" to fully understand how MYARC's Directory System is set up. This is suggested so that the Main Directory name given at disk initialization time will be consistent with the way you decide to use MYARC's Directory Management.

Ordinarily, disk initialization need be undertaken only once throughout the entire lifetime of the disk. In rare instances when all data must be erased from the disk, a disk will be reinitialized. Reinitializing the disk is accomplished using the same procedures as initializing the disk.

CAUTION:

WHEN INITIALIZING OR RE-INITIALIZING THE DISK, ALWAYS USE THE MYARC UTILITY DISKETTE LABELED "FLOPPY DISK BASED." INITIALIZING THE DISK WILL ERASE ALL INFORMATION STORED ON THE DISK. BEFORE REINITIALIZING ANY DISK WITH DATA ON IT, BACK IT UP TO AVOID LOSING THE DATA.

To initialize the disk:

1. Insert the MYARC Utility Diskette labeled "Floppy Disk Based" and go to the MAIN MENU. Select Disk Management by typing "DM" and press ENTER. The Disk Management Menu will appear.
2. Select "Initialize Disk." Type "ID" and press ENTER. The screen will say:

INITIALIZE DISK

DISK NUMBER (1-4): 1

3.3 DISK MANAGEMENT SYSTEM

3.3.1A INITIALIZE DISK

3. The Disk Number refers to the physical device number assigned to the disk. In all new installations, the system default is 1. Press ENTER. The screen will say:

-ATTENTION-

INITIALIZATION WILL ERASE
ALL DATA ON DISK # (the specified disk number)
PROCEED? (Y/N) : N

4. Since initialization will erase all data on the disk, the system asks if the user wants to proceed and assumes a default value of No (N). If the ENTER key is pressed, the system will go back to the previous menu, Disk Management, and the initialization routine is aborted.

If Yes (Y) is indicated, the "Attention Message" is erased from the screen and a new prompt asks for the disk name. This is the "logical" disk name or the Main Directory name the user now assigns. The screen will say:

INITIALIZE DISK

DISK NUMBER (1-4) : 1
DISK NAME :

5. Type in the disk name. The name may not exceed 10 characters nor may it contain periods or spaces. Press ENTER. The screen will ask:

IS ABOVE INFORMATION
CORRECT (Y/N/A ABORT)? : Y

6. If Abort (A) is chosen, the system will leave the Initialize Disk program and return to the Disk Management Menu. If No (N) is indicated, the cursor will jump back to the first prompt, "Disk Number (1-4) : 1." At this point, the correct information can be inserted. If all entries do not need to be changed, simply tab the cursor through each location by pressing ENTER. When the cursor gets to the location where corrected information must be ENTERed, type over the existing entry.

If Yes (Y) is chosen, 2 system messages will appear, one after the other. First the screen will say:

PLEASE WAIT
LOADING PROGRAM

3.3 DISK MANAGEMENT SYSTEM

3.3.1A INITIALIZE DISK

After one to two minutes, a second message will replace the first and will say:

```
***PLEASE WAIT***  
***FORMATTING***  
-----
```

7. This message indicates that formatting is in process. As initialization proceeds, incrementing numbers will appear on the screen. These numbers are actual sector numbers. The process will continue for 2 to 5 minutes. The Personality Card light will remain on throughout initialization.

8. At the completion of initialization, the screen will say:

```
DISK #X IS INITIALIZED TO:  
("logical" disk name)
```

```
# OF BAD SECTORS - Y
```

```
PRESS REDO TO RESTART  
BACK TO ABORT
```

Within specified limits, hard disks may normally have "bad" sectors. The automatic WDS/100 error handling system ensures that these bad sectors will not be written to. MAKE A NOTE OF THE NUMBER OF BAD SECTORS. This may be needed in the unlikely event that the disk needs servicing.

9. If the sector numbers do not increment or you do not get the initialization completion messages, turn to Section 5.2 on Troubleshooting the Hardware.

10. At this point, you may re-run Initialize Disk (REDO) or leave the program (BACK).

3.3.1B MAP DISK

Map Disk is used either to obtain a complete listing of the directories and files on an entire disk or to obtain a complete listing of the contents of a particular directory including all its sub-directories and files. Map Disk is not used to obtain a listing of a single file. The listing will begin at the directory level indicated by the pathname. (See Directory Management for a discussion of pathnames). If for example, your Main Directory was called "MAIN" and you input the pathname, "WDS.MAIN", then the system would list all directories and files on the entire disk. If one of the directories in the Main Directory was called "S1" (and there were Sn other directories) and you input the pathname "WDS.MAIN.S1", then the system would produce a listing of all directories and files in S1 (including T1-Tn directories and files and U1-Un directories and files), but none in the other Sn directories. Exhibit B in this manual illustrates this example.

3.3 DISK MANAGEMENT SYSTEM

3.3.1B MAP DISK

While Map Disk will show the same file and directory attributes as List Directory (this utility is explained in Section 3.3.2C), it differs from List Directory in one important way. Map Disk will show all the information starting with the highest directory level, continuing on down through all directory levels until the last level of directory and including all the files at each directory level. In contrast, List Directory will only show the directories and files immediately under the directory for which a listing is requested. If there are additional levels of directories under this first level, List Directory will not list them.

Again using Exhibit B, Map Disk will provide a listing for all directories under the Main Directory at all levels including directories labeled S1,S2,Sn,T1,Tn,U1,Un. Map Disk will also list the files at all levels. In contrast, List Directory will only provide a listing for S1,S2 and Sn directories if List Directory is requested for the Main Directory. The only files List Directory will show are those in the Main Directory which does not include files in S1 or Sn.

To obtain a listing, the directory pathname is ENTERed into the system. The correct pathnames for listing the entire disk are "WDS1" or "WDS.MAIN" for the example shown in Exhibit B.

The display format for the Map Disk listing is shown below. If the listing is also being printed or routed to another device, the commands in the lower left hand corner ("PRESS REDO TO RESTART" etc.) will not appear on the hard copy or on the listing file.

MAP DISK

DISK MAPPING FOR:

<u>NAME</u>	<u>SIZE</u>	<u>TYPE</u>	<u>P</u>
-------------	-------------	-------------	----------

PRESS REDO TO RESTART
BACK TO ABORT

The entire pathname for the required disk mapping will appear under the line that says "Disk Mapping For:." The column headings are defined as follows:

3.3 DISK MANAGEMENT SYSTEM

3.3.1B MAP DISK

- * **NAME** - This is the name of the directory or file being listed. If the WDS/100 has the clock option, the actual listing will show the creation and last modified dates and times underneath the file name. The creation date only will show underneath the directory name.
- * **SIZE** - This is the number of disk sectors occupied by a directory or file. All directories will use two sectors. File sizes depend on the user's program or data file size.
- * **TYPE** - Directories-all directories are labeled "DIRECTORY" under the TYPE column.

Files -

1. All Program files are labeled "PROGRAM" under the TYPE column.
2. Data files are labeled either "I" for Internal or "D" for Display and "FIX" for Fixed Record or "VAR" for Variable Record (see the TI Disk Management System Operators Manual for a discussion of file types). The format for the file TYPE listing is I(orD)/FIX(or VAR). If the file has a fixed or variable record length, the size of the record is shown by a number following the word FIX or VAR. The number is the length of the record measured by number of characters. This number follows the word FIX or VAR on the listing. For example, "I/FIX 255" would indicate an Internal format file with a fixed record length of 255 characters.

- * **P** - Directories-all directories are labeled "U" for unprotected.

Files -

Files can be protected (P) or unprotected (U). (See the TI Disk Operating System Manual for a definition of "protected" and "unprotected.") File protections can be modified by invoking the "Modify File Protection" utility described in Section 3.3.3D.

Map Disk will list all directories and files of the directory requested starting with the highest directory level and proceeding down through the directory hierarchy. The listings will always follow ASCII character order. Using Exhibit B as an example, the Map Disk program would Map the Main Directory as follows:

3.3 DISK MANAGEMENT SYSTEM

3.3.1B MAP DISK

1. the first part of the listing would include directories and files in the Main Directory; they are S1, S2, SN and the Main Directory files
2. next, the listing would include all directories and files in S1; they are T1, T2 and S1 files
3. next, the listing would include all directories and files in T1; they are U1, U2 and T1 files
4. next, the listing would include all directories and files in U1; there are none
5. next, the listing would include all directories and files in U2; they are U2 files
6. next, the listing would include all directories and files in T2; they are T2 files
7. next, the listing would include all directories and files in S2; they are S2 files
8. finally, the listing would include all directories and files in SN; they are SN files

At the completion of the Map Disk listing, the system will produce a summary as shown below. If the listing is also being printed or routed to another device, the commands in the lower left hand corner will not appear on the hard copy.

MAP DISK

DISK MAPPING FOR:

SUMMARY

NUMBER OF DIRECTORIES:
NUMBER OF FILES:
SIZE OF DIRECTORY:

PRESS REDO TO RESTART
BACK TO ABORT

The entire pathname for the required Disk Mapping will appear under the line that says "DISK MAPPING FOR:" The summary information will indicate how many directories and files are in the directory being mapped and how many disk sectors this directory uses. If you mapped the entire disk, the summary information will pertain to everything on the disk. If a particular directory was mapped, the summary information will pertain only to that directory. The number of directories includes the mapped directory.

3.3 DISK MANAGEMENT SYSTEM

3.3.1B MAP DISK

Listings can be output to the screen, to an RS232 device, or to another device or file available when using the TI BASIC command "OPEN." The time it takes to Map a Disk will vary depending on the number of directories and files in the directory being mapped.

To map the disk (or directory):

1. Select "Disk Management" from the MAIN MENU. Type DM and press ENTER. The Disk Management Menu will appear.
2. Select "Map Disk." Type MD and press ENTER. The screen will say:

MAP DISK
-- -- -- --

ENTER DIRECTORY'S PATHNAME
WDS

3. The cursor will flash after the S in WDS. The system is prompting for the disk name or directory pathname for which a mapping is required.

ENTER the disk or directory pathname. Remember do not end the pathname with a period but do make sure periods (.) separate all directories. The directory name(s) have to be ENTERed exactly how they were created (i.e. no abbreviations, no misspellings) otherwise the system will respond with an error message.

If the pathname exceeds 28 characters (a screen width limitation), press ENTER at the end of the first line and continue the name on the next line. When the name is complete, press ENTER.

If the pathname does not exceed one line, press ENTER twice at the end of the pathname. The screen will read:

IS ABOVE CORRECT?
(Y/N/A-Abort)

4. If No(N) is indicated, the cursor will jump back to the space following WDS. Type in correct pathname and press ENTER.

If Abort(A) is indicated, the system will exit the program and return to the Disk Management Menu.

If Yes(Y) is indicated, the "IS THE ABOVE CORRECT?" prompt will be cleared from the screen and the new screen will read:

WHERE DO YOU WANT LISTING?
1 - SCREEN
2 - OTHER
ENTER OPTION: 1

3.3 DISK MANAGEMENT SYSTEM

3.3.1B MAP DISK

5. Listings can be routed to the screen and other devices such as an RS232 device or any device or file ordinarily chosen using the TI BASIC command OPEN. For example, if DSK1.LISTDIR were ENTERed, the list would be written to the diskette in disk drive one under the file name LISTDIR.

If option #2 is selected, the listing will go to the designated device. In addition, the listing will scroll by on the screen. At any point during the listing, the user can decide to restart List Directory (REDO) or abort List Directory (BACK).

When option #2 is selected, the system will ask that the list device name be ENTERed. Once this is ENTERed, the listing will appear on the screen and will be routed to the appropriate device.

If a listing is simply to be routed to the screen, select option #1 by depressing ENTER. The listing will appear on the screen. Unlike option #2, the listing will not continually scroll by. Once the screen is filled, the listing will stop until the user signals the system to continue to the next screenload. "Continue" is accomplished by depressing the function key and PROC. At any point during the listing, the user may opt to restart (REDO) or abort (BACK) Map Disk.

Once you indicate where the listing will be routed, a system message will say:

PLEASE WAIT
LOADING PROGRAM

6. After a few seconds, the disk or directory mapping will appear on the screen in the format described above. Once the mapping is complete, the summary will appear.
7. At this point, you may re-run Map Disk (REDO) or exit the program (BACK).

3.3.1C RENAME DISK

Rename Disk renames the Main Directory. The process involved with renaming a disk is to delete the old disk name and substitute the new.

To rename the disk:

1. Select "Disk Management" from the MAIN MENU. Type DM and press ENTER. The Disk Management Menu will appear.
2. Select "Rename Disk." Type RD and press ENTER. A cursor will flash on the "1" and the screen will read:

3.3 DISK MANAGEMENT SYSTEM

3.3.1C RENAME DISK

RENAME_DISK

ENTER DISK # (1-4) : 1

3. The disk number refers to the physical device number assigned to the disk at initialization. In all new installations the default is 1. If in error an illegal entry was put in, simply press ENTER and the cursor will return to its original position. The correct information can then be ENTERed. A system message will appear saying:

PLEASE WAIT
LOADING PROGRAM

4. After a few seconds, this will disappear and the screen will say:

```
DISK #1
IS PRESENTLY NAMED:
NAME 1
DO YOU WANT TO CHANGE THIS
NAME? (Y/N/A-ABORT) : N
```

Where: * "DISK #1" is the number of the disk to be renamed
* "NAME1" is its current name

5. If Abort (A) is chosen, the system will return to the Disk Management Menu.

If No (N) is indicated, the cursor will jump back to ENTER DRIVE #(1-4) : 1. At this point, different instructions may be ENTERed.

If Yes (Y) is indicated, the screen will say:

ENTER NEW NAME : _____

6. Type in new name and press ENTER. The screen will say:

```
DO YOU WANT TO CHANGE
NAME1 TO NEW NAME
```

3.3 DISK MANAGEMENT SYSTEM

3.3.1C RENAME DISK

7. If N is indicated, the cursor will jump back to the prompt described in #4 above.

If Y is indicated, the system will rename the disk and the screen will say:

```
DISK #1 IS NOW NAMED  
NAME 2
```

```
PRESS REDO TO RESTART  
BACK TO ABORT
```

Where: "NAME2" is the new name

8. At this point you may re-run the Rename Disk Program (REDO) or exit (BACK).

3.3.1D SHOW DISK STATUS

Show Disk Status provides a summary indicating the number of sectors used on the disk and the number of sectors available on the disk. The output format is shown here:

SHOW DISK STATUS -----

```
ENTER DISK # (1-4) : X
```

```
DISK # X  
IS NAMED : ABCD  
SECTORS USED :  
SECTORS AVAILABLE :
```

```
PRESS REDO TO RESTART  
BACK TO ABORT
```

If the system has a clock option and the clock was set prior to disk initialization, the screen will also display the date and time of disk initialization. The disk number is ENTERed at the beginning of the program. Once the system has formatted the disk summary, the disk drive number will appear after "Disk #." The logical disk name (the Main Directory name) will appear after "IS NAMED:." The rest of the summary provides information on the number of used and available sectors on the disk.

To show disk status:

1. Select "Disk Management" from the MAIN MENU. Type "DM" and press ENTER.
2. Select "Show Disk Status." Type "SD" and press ENTER. A cursor will flash on the "1" and the screen will read:

3.3 DISK MANAGEMENT SYSTEM

3.3.1D SHOW DISK STATUS

SHOW DISK STATUS

ENTER DISK # (1-4) : 1

3. Enter the appropriate number. In all WDS/100 installations with one Winchester Disk, the default is "1." Press ENTER. A system message will appear at the bottom of the screen indicating that the summary is being generated. The screen will read:

PLEASE WAIT
LOADING PROGRAM

4. After a couple of seconds, the summary will appear in the format noted above. At this point you can rerun the disk summary program (REDO) or exit the program (BACK).

3.3.2 DIRECTORY MANAGEMENT

To understand how Directory Management utilities are used, further discussion of MYARC's data management approach is necessary.

DIRECTORIES AND SUBDIRECTORIES

As discussed in the "Overview of the Disk Management System," MYARC's Directory Management allows the user to build his/her own file hierarchy based on the specific application requirements. The file hierarchy can be as "deep," with up to 17 levels of directories, and/or as "wide" as necessary, with up to 127 files and 114 subdirectories under one directory.

Every directory and file hierarchy has at the highest directory level, a Main Directory. This is the directory from which all other directories and files on the disk originate. It is also the logical disk name for the Winchester, assigned at disk initialization or disk renaming (Sections 3.3.1A and 3.3.1C).

A directory may have up to 114 "subdirectories" under it. Subdirectories are the next lower level of directory along the directory hierarchy. For example, directories under the Main Directory are considered subdirectories to the Main Directory. These Main Directory subdirectories become, in turn, directories to the next lower level subdirectories under them. These directory/subdirectory relationships continue for the entire depth of the file hierarchy until the lowest level directory is reached. Exhibit A illustrates subdirectories.

3.3 DISK MANAGEMENT SYSTEM

3.3.2 DIRECTORY MANAGEMENT

Up to 127 files can go into any directory. That means the MAIN and any other directory can contain 127 files. This is in addition to the 114 subdirectories any directory can accommodate.

PATHNAMES

To locate anything on the disk, the system must know which directories and subdirectories a specific file is located under. It gets this information from the directory or file "pathname" which provides a search route through the file hierarchy.

The pathname always starts with "WDS" to indicate that the desired directory or file can be found on a Winchester Disk. From this point, there are two legal ways to complete a file (or directory) pathname. The first way is to indicate the disk drive number, list subdirectories under the Main Directory, and finally name the file. The second alternative is to indicate the Main Directory, subdirectories and finally the file name. Periods must separate the directories from the device name, the directories from subdirectories, and directories and subdirectories from files. A pathname never ends with a period.

Take for example, the following. Assume:

- * the program file CALCULATE is in the subdirectory DEMO
- * the subdirectory DEMO is in the MAIN directory SALES
- * the MAIN directory SALES is on WINCHESTER DISK #1

If you want to locate the file CALCULATE, the correct pathnames are either:

1. WDS1.DEMO.CALCULATE
2. WDS.SALES.DEMO.CALCULATE

Where alternative #1 indicates a Winchester device and its number (WDS1) the subdirectory under the Main Directory (DEMO) and finally the program file (CALCULATE). Alternative #2 indicates a Winchester device (WDS), the Main Directory (SALES), the subdirectory (DEMO), and finally the program file (CALCULATE).

These pathname examples each conform to the five syntactical rules for directory and file naming and creating pathnames. They are:

1. Periods and spaces are not permitted in a directory or file name. For example: "Directory1" is a legal Directory name.
"Dir.T0 r" is an illegal Directory name.
2. Directory or file names cannot exceed 10 characters.

3.3 DISK MANAGEMENT SYSTEM

3.3.2 DIRECTORY MANAGEMENT

3. Periods (.) must separate directories from other directories and directories from files. For example:
WDS.SALES.DEMO.CALCULATE is correct.
WDS.SALESDEMO.CALCULATE is incorrect if the pathname is supposed to depict a Main Directory called "SALES," a subdirectory called "DEMO" and a file called "CALCULATE."
4. Pathnames cannot exceed 40 characters. The 40-character limitation includes the periods as well as the directory and file names in the pathname.
5. The last device, directory or file name in a pathname never ends with a period.

The pathname length maximum puts some limitation on how "deep" the directory structure can go. The "depth" however is strictly determined by the user and how he/she wants to structure the directory hierarchy. If, for example, each directory in one pathname was 10 characters long, then there could only be three levels of subdirectories and a file name could not exceed two characters ("WDS1." must be part of the pathname and periods separating the directories count in the 40 characters. In this example, we're starting the pathname with WDS1.). If, for another example, the directory name was only one character in length, there could be up to 17 directory levels with a file or files under the last directory (in the example we're starting the pathname with WDS1.).

In summary, MYARC's Directory Management provides a great deal of flexibility for the user since it can easily be adapted to a variety of applications. The system will just as easily accommodate a multi-level directory application as it will one requiring a "flat" filing structure. The only restrictions limiting an "infinitely" complex hierarchy filing system is the 40-character pathname limitation, the upward limit of 127 files per directory, and the upward limit of 114 "sub"directories per directory.

A DIRECTORY/FILE HIERARCHY EXAMPLE

When the Directory Management (DR) option is chosen from MYARC's MAIN MENU, the following screen information appears:

MYARC WINCHESTER SYSTEM

DIRECTORY MANAGEMENT

CD-CREATE DIRECTORY
DD-DELETE DIRECTORY
LD-LIST DIRECTORY
RD-RENAME DIRECTORY
BD-BACK UP DIRECTORY
RE-RESTORE DIRECTORY
EX-EXIT

ENTER PROGRAM CODE:

3.3 DISK MANAGEMENT SYSTEM

3.3.2 DIRECTORY MANAGEMENT

The following is an example of how a Directory and File Hierarchy can be set up and how MYARC's Directory Management utilities can be used.

EXAMPLE

We will take a simple example of maintaining an inventory for a small drug store. The inventory programs and data take up an entire 5-Megabyte Disk and they will be stored on Winchester Disk Drive #1.

To set this up, a Main Directory is created at disk initialization or when a disk is renamed. In this case, the Main Directory will be called INVENTORY.

Next, directories are created using the CREATE DIRECTORY utility in the Directory Management facility. These directories will identify different categories of inventory and will contain programs for determining economic ordering quantities. In this case, we will create seven directories: six for product categories and one as a program directory. The directories include: PHARMACY, OTCDRUGS, COSMETICS, HYGIENE, FIRTAID, SUNDRIES, AND EORQUAN (for Economic Order Quantity).

If after creating the directories, we determine that "SUNDRIES" should be changed to "CANDY," the "RENAME DIRECTORY" utility would accomplish this. Likewise, if the store discontinued its line of Hygiene products, the "Delete Directory" utility would eliminate this directory (and all the subdirectories and files in it). For this example, the "SUNDRIES" and "HYGIENE" categories are okay as they presently are.

In this application, further subdivisions of the generic product categories are necessary. Subdirectories under "OTCDRUGS" (over-the-counter drugs) for example, would include ASPIRIN, COLDCAPS, VITAMINS, etc. Here again, "CREATE DIRECTORY" would create these subdirectories.

The final breakdown of the inventory categories would be to identify brand names with products. In the case of "WDS.INVENTORY.OTCDRUGS.ASPRIN," we will create a file called "BAYER." Creating a file is discussed in Section 4.0 on using TI BASIC with MYARC's Disk Management System.

In order for the Economic Order Quantity program to OPEN the BAYER Aspirin file, the file's pathname must be included in the OPEN statement. The BAYER Aspirin pathname would be WDS.INVENTORY.OTCDRUGS.ASPRIN.BAYER. Alternatively, the pathname could also be WDS1.OCTDRUGS.ASPRIN.BAYER. Either one of these pathnames must be used whenever accessing the file no matter what TI BASIC COMMAND is used.

3.3 DISK MANAGEMENT SYSTEM

3.3.2 DIRECTORY MANAGEMENT

Similar to the TI Floppy Disk Management System, a listing of all directories and files either on the entire disk or in one directory can be obtained. "Map Disk," a Disk Management utility, will catalog all directories and files contained on the disk or in a directory and will summarize the used disk sectors. If the clock option is part of the system, Map Disk will also indicate creation and last revision dates for all directories and files. "List Directory," a Directory Management utility will provide a similar but more abbreviated listing than Map Disk. These utilities are described in greater detail in Sections 3.3.1B (Map Disk) and 3.3.2C (List Directory).

The following sections describe the operation of the Directory Management utilities in more detail.

3.3.2A CREATE DIRECTORY

When a disk is initialized (or renamed), the user assigns it a logical name. The name is referred to as the "Main Directory" name for that disk.

To name any other directories on the disk, the Create Directory utility is used.

Unlike files, directories cannot be protected and therefore the system will not stop you from deleting a directory. If however, the directory contains a protected file, the system will always preserve the directories needed to maintain a pathname to the file. See Section 3.3.2B on "Delete Directory" for more detail on this.

To Create Directory:

1. Select Directory Management from the MAIN MENU. Type DR and press ENTER. The Directory Management Menu will appear.
2. Select Create Directory from the Directory Management Menu. Type CD and press ENTER. The following prompt will appear:

CREATE DIRECTORY

ENTER EXISTING DIRECTORY
PATHNAME :
WDS

3. The cursor will flash after the S in WDS. The system is prompting for the directory pathname in which a new subdirectory will be created. (See Section 3.3.2 for a discussion on pathnames.) The system needs the entire pathname for the existing directory under which the new subdirectory will be created.

3.3 DISK MANAGEMENT SYSTEM

3.3.2A CREATE DIRECTORY

Take the example presented in the Directory Management overview. If creating the subdirectory named "ASPIRIN" under the directory OCTDRUGS, the pathname ENTERed has to contain the entire pathname of directories preceding "ASPIRIN." This is so the system knows where, on the directory hierarchy, to place the new subdirectory. In this case, the full pathname WDS.INVENTORY.OTCDRUGS should be ENTERed. If only WDS.INVENTORY is ENTERed, the system would create a new subdirectory under INVENTORY, not under OTCDRUGS.

Enter the directory pathname including all periods (.) between directories. The directory names have to be ENTERed exactly as they were created (i.e. no abbreviations, no misspellings) otherwise the system will not find the correct directory pathname and an error message will appear. Remember there are two correct pathnames in this example since the system sees the physical device name and the Main Directory name as one in the same. They are: WDS.INVENTORY.OTCDRUGS or WDS1.OTCDRUGS.

If the pathname exceeds 28 characters (a screen width limitation), press ENTER and continue the name on the next line. When the name is complete, press ENTER.

If the pathname does not exceed one line, press ENTER twice.

The screen will say:

ENTER NEW DIRECTORY NAME :

4. A directory name cannot exceed 10 characters nor can it contain periods or spaces. Remember, any particular pathname cannot exceed 40 characters so limit directory and file name sizes if multiple directory levels are anticipated.

Type in the new directory name and press ENTER. A prompt will ask:

"IS ABOVE CORRECT?"
(Y/N/A-Abort) : Y

5. If no (N) is indicated, the cursor will jump back to the space following the S in WDS. You can type over the pathname and press ENTER or simply press ENTER if no changes are to be made to the pathname. The cursor will jump to the Enter New Name prompt and then the corrected new name can be typed in and ENTERed or the new name field can be skipped by pressing ENTER.

If Abort (A) is indicated, the system will exit the Create Directory program and return to the Directory Management Menu.

If Yes (Y) is indicated, a system message will appear indicating that a new directory is being created. The screen will read:

3.3 DISK MANAGEMENT SYSTEM

3.3.2A CREATE DIRECTORY

PLEASE WAIT
LOADING PROGRAM

6. After a couple of seconds, the directory will be created and the screen will read:

DIRECTORY (New Directory)
CREATED ON DISK #X

Where New Directory is the name of the directory you created and disk #X is the physical disk number where the directory was created.

7. At this point, you may re-run the Create Directory program (REDO) or exit the program (ABORT).

3.3.2B DELETE DIRECTORY

The "Delete Directory" program is used to erase an entire directory and the files in that directory. "Delete Directory" will delete everything, including files and directories up to the highest directory level indicated. If for example, (see Exhibit B for a picture of this example) Subdirectory #1 under the Main Directory must be deleted, this directory pathname would be ENTERed: WDS.MAIN.SUB1. This would erase everything in subdirectory #1 and would leave subdirectory #2 through subdirectory #N in the Main Directory intact. If the pathname WDS.MAIN were ENTERed to be deleted, everything in all the subdirectories of the Main Directory including subdirectory #1, subdirectory #2, through subdirectory #N would be deleted.

Since directories may not be protected, the system will not stop you from deleting a directory. The system does however force you to reconsider your decision to delete before actually executing the delete command. If a file in a directory is protected, the system will not delete it if you've issued a Delete Directory command. In addition, it will preserve the pathname needed to access that file. As an example, using Exhibit B, if a file in subdirectory U2 was protected then the system would preserve the S1 directory, T1 directory, U2 directory and the U2 file if the Delete Directory Command was issued to delete S1. The system would delete S1 files, the T2 directory and files, T1 files, the U1 directory and any U2 files that are unprotected.

To delete a directory:

1. Select Directory Management from the MAIN MENU. Type DR and press ENTER. The Directory Management Menu will appear.
2. Choose Delete Directory from the Directory Management Menu. Type DD and press ENTER. The screen will say:

DELETE DIRECTORY

ENTER PATHNAME OF DIRECTORY
TO BE DELETED:
WDS

3.3 DISK MANAGEMENT SYSTEM

3.3.2B DELETE DIRECTORY

3. The cursor will flash after the S in WDS. At this point, the system is looking for the pathname. The directory pathname is the directory branching path the system follows to reach a specific point in the directory network. The system traces this path directory by directory until it comes to the lowest subdirectory on that particular branch. The system knows it has come to a new directory path when it encounters a period (.). ENTER the directory pathname making sure to ENTER periods between each directory name. Be sure to include the names of all subdirectories along the path. Include all subdirectory names down to, and including, the directory to be deleted.

If the pathname exceeds 28 characters (a screen width limitation), press ENTER at the end of the first line and continue typing in the name. When the name is complete, press ENTER.

If the pathname does not exceed one line, press ENTER twice. The screen will say:

```
ATTENTION-DELETING
DIRECTORY WILL ERASE
UNPROTECTED FILES IN
DIRECTORY
```

```
IS THE ABOVE CORRECT?
(Y/N/A-Abort:: Y
```

4. If No(N) is indicated, the cursor will jump back to the space after the S in WDS in #1 above. The correct pathname can now be ENTERed.

If Abort(A) is indicated, the system will return to the Directory Management Menu.

If Yes(Y) is indicated, the system will ask you where you want the listing. The listing options are to the screen or to an RS232 device.

Once you choose the listing location, the screen will say:

```
***PLEASE WAIT***
***LOADING PROGRAM***
```

After a few moments, the Delete Directory program will begin and the screen will say:

```
DELETING DIRECTORY:
WDS.pathname
(listing of files)
```

```
COMMAND COMPLETE
```

The system will list all files and directories deleted in the directory plus all files and directories "Delete Protected" in the directory.

5. At this point, you may re-run Delete Directory (REDO) or exit the program (BACK).

3.3 DISK MANAGEMENT SYSTEM

3.3.2C LIST DIRECTORY

While the Map Disk utility (Section 3.3.1B) will list either all directories and files on one entire disk or all sub-directories and files in one directory, List Directory will only show those sub-directories or files at a particular directory node. For example, in Exhibit B, List Directory for the directory S1 will produce a listing of the files in S1 and the sub-directories T1 and T2. Map Disk for the directory S1 will produce a listing of the files in S1 and all the sub-directories and files in T1, T2.U1,U2.

To obtain a listing, the directory pathname is ENTERed into the system. The correct pathnames for the example shown above are "WDS.MAIN.S1" or "WDS1.S1."

List Directory is generally used to locate a directory or file and/or to get a relatively quick listing of the files and directories found in a specific directory. Similiar to "Map Disk," the listings will detail directory and file names, sector size, and protection status. Listings will also indicate file types (fixed, variable or program), data types found in the file (internal or display) and record size.

The format for the List Directory display listing is shown below. If the listing is also being printed or routed to another device, the commands in the lower left hand corner ("PRESS REDO TO RESTART," etc.) will not appear on the hard copy.

LIST DIRECTORY

DIRECTORY LISTING FOR:

<u>NAME</u>	<u>SIZE</u>	<u>TYPE</u>	<u>P</u>
-------------	-------------	-------------	----------

PRESS REDO TO RESTART
BACK TO ABORT
PRGC TO CONTINUE

The entire pathname for the required directory listing will appear under the line that says "DIRECTORY LISTING FOR:." The column headings are defined as follows:

- * NAME - This is the name of the directory or file being listed. If the WDS/100 has the clock option, the actual listing will show the creation and last modified dates and times underneath the file name. Creation date only will show underneath the directory name.
- * SIZE - This is the number of disk sectors occupied by a directory or file. All directories will use two sectors. File sizes depend on the user's program or data file size.

3.3 DISK MANAGEMENT SYSTEM

3.3.2C LIST DIRECTORY

* TYPE - Directories-all directories are labeled "DIRECTORY" under the TYPE column.

Files -

1. All Program files are labeled "PROGRAM" under the TYPE column.
2. Data files are labeled either "I" for Internal or "D" for Display and "FIX" for Fixed Record or "VAR" for Variable Record (see the TI Disk Management System Operators Manual for a discussion of file types). The format for the file TYPE listing is I(or D)/FIX (or VAR). If the file has a fixed or variable record length, the size of the record is shown by a number following the word FIX or VAR on the listing. The number is the length of the record measured by number of characters. This number follows the word FIX or VAR on the listing. For example, "I/FIX 255" would indicate an Internal format file with a fixed record length of 255 characters.

* P - Directories-all directories are labeled "U" for unprotected.

Files - files can be protected (P) or unprotected (U). (see the TI Disk Operating System Manual for a definition of "protected" and "unprotected.") File protections can be modified by invoking the "Modify File Protection" utility described in Section 3.3.3D.

At the completion of the Listing Directory listing, the system will produce a summary as shown below. If the listing is also being printed or routed to another device, the commands in the lower left hand corner will not appear on the hard copy.

LIST DIRECTORY

DIRECTORY LISTING FOR:

SUMMARY

NUMBER OF DIRECTORIES -
NUMBER OF FILES -
SIZE OF DIRECTORY -

PRESS REDO TO RESTART
BACK TO ABORT

The entire pathname for the required directory listing will appear under the line that says "DIRECTORY LISTING FOR:." The summary information will indicate how many directories and files are in the directory being listed and how many disk sectors this directory uses. The number of directories includes the directory being listed.

3.3 DISK MANAGEMENT SYSTEM

3.3.2C LIST DIRECTORY

The user has the option of printing the listing to the screen, to a RS232 device or to other devices or files s/he may choose when using the TI BASIC command OPEN.

To list a directory:

1. Select Directory Management from the Main Menu. Type DR and press ENTER. The Directory Management Menu will appear.
2. Select List Directory. Type LD and press ENTER. The screen will say:

LIST DIRECTORY

ENTER DIRECTORY'S PATHNAME
WDS

3. The cursor will flash after the S in WDS. The system is prompting for the directory pathname for which a listing is required.

Enter the directory pathname including all periods (.) between directories. The directory names have to be ENTERed exactly how they were created (i.e. no abbreviations, no misspellings) otherwise the system will not find the correct directory pathname and an error message will appear.

If the pathname exceeds 28 characters (a screen width limitation), press ENTER at the end of the first line and continue the name on the next line. When the name is complete, press ENTER.

If the pathname does not exceed one line, press ENTER twice at the end of the pathname. The screen will read:

IS ABOVE CORRECT?
(Y/N/A-Abort)

4. If No (N) is indicated, the cursor will jump back to the space following WDS. Type in the correct pathname and press ENTER.

If Abort (A) is indicated, the system will exit the program and return to the Directory Management Menu.

If Yes (Y) is indicated, the "IS ABOVE CORRECT?" prompt will be cleared from the screen and the new screen will read:

WHERE DO YOU WANT LISTING?
1 - Screen
2 - Other
ENTER OPTION : 1

3.3 DISK MANAGEMENT SYSTEM

3.3.2C LIST DIRECTORY

5. Listings can be routed to the screen and other devices such as a RS232 device or any device or file ordinarily chosen using the TI BASIC command OPEN. For example, if DSK1.LISTDIR were ENTERed, the list would be written to the diskette in disk drive one under the file name LISTDIR.

If option #2 is selected, the listing will go to the designated device. In addition, the listing will scroll by on the screen. At any point during the listing, the user can decide to restart List Directory (press the function key and REDO) or abort List Directory (press the function key and BACK).

When option #2 is selected, the system will ask that the list device name be ENTERed. Once this is ENTERed, the listing will appear on the screen and will be routed to the appropriate device.

If a listing is simply to be routed to the screen, select option #1 by depressing ENTER. The listing will appear on the screen. Unlike the option #2, the listing will not continually scroll by on the screen. Once the screen is filled, the listing will stop until the user signals the system to continue to the next screenload. "Continue" is accomplished by depressing the function key and PROC. At any point during the listing, the user may opt to restart List Directory or abort it.

Once you indicate where the listing will be routed, a system message will say:

PLEASE WAIT
LOADING PROGRAM

6. After a few seconds the directory listing will appear on the screen in the format described above. All directories will be listed first. Once directories are done, all files will be listed. At the completion of the listing, the List Directory summary will appear.
7. At this point, you may re-run List Directory (REDO) or exit the program (BACK).

3.3.2D RENAME DIRECTORY

The Rename Directory utility is used to change the name of a directory. The procedure to rename a directory involves deleting the old directory name and substituting the new.

To rename a directory:

1. Select Directory Management from the MAIN MENU. Type DR and press ENTER. The Directory Management Menu will appear.

3.3 DISK MANAGEMENT SYSTEM

3.3.2D RENAME DIRECTORY

2. Select "Rename Directory." Type RD and press ENTER. A flashing cursor will appear after "WDS" and the screen will say:

RENAME DIRECTORY

ENTER PATHNAME OF DIRECTORY
TO BE RENAMED
WDS

3. At this point, the directory pathname is ENTERed. Include all directories and sub-directories up to and including the directory you want to rename. Make sure to include all periods which separate directory names. If the pathname exceeds 28 characters, press ENTER and continue typing on the next line. Press ENTER when the pathname is completed. If the pathname does not exceed one line, press ENTER twice. A new screen prompt will say:

ENTER NEW DIRECTORY NAME

4. ENTER the new directory name and press ENTER. The screen will ask:

IS THE ABOVE CORRECT?
(Y/N/A-Abort) Y

5. If No (N) is indicated, the cursor will jump back to WDS.

If ABORT (A) is indicated, the program will return to the Directory Management Menu.

If Yes (Y) is indicated, a system message will appear indicating that the directory is being renamed. The screen will read:

PLEASE WAIT
LOADING PROGRAM

6. After a couple of seconds, the directory will be renamed and the screen will read:

DIRECTORY NEW NAME
EXISTS
ON DISK # X

Where: * New Name is the new name for the directory
* X is the disk number where directory is located

7. At this point, you may re-run (REDO) the program or exit (BACK).

3.3 DISK MANAGEMENT SYSTEM

3.3.2E BACK-UP DIRECTORY

Similar to Map Disk, Back-up is done starting from a directory and continuing on down through the lowest level in that directory. This would include all files in that directory as well as all files in the sub-directories located in that directory. Using Exhibit B as an example, if you were to back-up the S1 directory, the system will back-up the S1 directory files, the T1 directory files, and U1 directory files (none exist in this example), the U2 directory files and the T2 directory files. As the system is backing up, a message on the display will indicate which file is currently being backed up. As the system moves through the directory hierarchy, the pathname for the file currently being backed up will appear on the screen. Like Map Disk or List Directory, you may choose to obtain a printed listing of all backed up files.

Back-up is done to an initialized floppy diskette. The diskette must have been initialized before attempting back-up since the WDS/100 software does not initialize the diskette.

In many cases, the size of the directory files will exceed the storage capacity of the floppy. The WDS/100 software will keep track of the floppy storage available as back-up proceeds and will signal you to insert a new floppy when the current floppy is out of space. For greater back-up efficiency, we recommend back-up is done to a "clean" floppy to minimize disk swapping.

The WDS/100 will also "count" the number of floppies required in the back-up and assign a sequential number to the floppy. The first back-up floppy disk will be assigned the number 1, the second #2 and so on. When the first floppy (#1) is out of space, the system will signal you to insert a second floppy and will assign the number "2" to the second floppy.

The system will also ask you to give the back-up procedure a name. This is not the diskette name that you gave a disk initialization but rather a back-up name you're giving to the back-up file on the diskette. Although these names can be the same, the back-up name is "logically" different than the floppy disk name. The name must be one to seven characters long and it may contain any letters and/or numbers but no periods or spaces. Also, it cannot end with an underline character.

In restoring backed up files, the system follows the same order of the original back-up. For example, from Exhibit B, assume that you backed up the entire disk and the back-up required 4 floppy diskettes where:

floppy disk #1	contained the Main Directory files
floppy disk #2	contained the S1 files and part of the T1 files
floppy disk #3	contained the rest of the T1 files, the U2 files and part of the T2 files
floppy disk #4	contained the rest of the T2 files, the S2 files, and the SN files

3.3 DISK MANAGEMENT SYSTEM

3.3.2E BACK-UP DIRECTORY

To restore the files, the system would require you to write back the files in the same order as you backed them up. Floppy disk #1 would be the first to be restored, floppy disk #2 would be the next, floppy disk #3 would follow #2 and floppy disk #4 would be the last. In order for you to know which diskette is inserted at a particular point in the restore process, you need to know the order of the original back-up. Physically labeling the diskette is the most efficient method for keeping track of this.

To minimize a later "Restore" procedure, we recommend that you physically label the floppy diskettes as follows:

LABEL FORMAT

PATHNAME :(WDS.pathname for the directory being backed up)
BACK-UP NAME :(1-7 character name you gave to the back-up file)
DATE :(date of back-up)
:(sequential number the system assigns at back-up time)

The back-up utility will maintain the directory structure for all files that have been backed up. For this reason, it is good practice to have at least one back-up of the entire hard disk so the directory structure leading up to all subdirectories does not have to be re-created when restoring backed up files. Additionally, when creating new directories and files, make sure that they are backed up. Otherwise, in the unlikely event of a disk head crash, the data and pathnames pointing to the files will be lost.

In order to restore a directory, the system must know the exact directory pathname used at back-up time. If the pathname "WDS1.S1.T1" was used at back-up time, then the same pathname must be used when restoring backed up files. "WDS.MAIN.S1.T1" would not be the correct pathname. For this reason, make sure the actual back-up pathname is written on the diskette label. Remember to make a new back-up if you have renamed a directory or file.

If there are protected files being backed up, obtain a Map Disk listing for the directory and keep it with the back-up diskettes. Since all restored files (even the files that were originally protected) will be "unprotected" during restore, the Map Disk listing will be the only record of the protection status of "protected" files. The Modify File Protection Utility can be used to protect the files after they have been restored.

Since back-up of 5 and 10 Megabytes can be a time consuming process, we recommend that frequently revised files requiring frequent back-up be located if possible, together in the same lower-level directory. That way, back-up can be done to those critical files without also having to back-up less frequently revised files. This procedure will cut back-up time considerably.

3.3 DISK MANAGEMENT SYSTEM

3.3.2E BACK-UP DIRECTORY

Again referring to Exhibit B, let's assume a software developer is making frequent changes to a specific file while other program and data files remain fairly static. One possible location for back-up purposes of the program under development would be in the U2 sub-directory. More static program and data files requiring infrequent back-up could be located in higher level directories such as the T1 or S1 directories.

CAUTION:

BACK-UP IS A CRITICAL ASPECT OF A RELIABLE FILE SYSTEM. WE RECOMMEND MAINTAINING TWO SETS OF BACK-UP SO THAT IN THE UNLIKELY EVENT OF A DISK HEAD CRASH, DATA AND PROGRAM FILES ARE NOT PERMANENTLY LOST.

Before backing up a directory, obtain a Map Disk listing if the directory contains protected files.

To back up a directory:

1. Select Directory Management from the MAIN MENU. Type DR and press ENTER. The Directory Management Menu will appear.
2. Choose Back-up Directory from the Directory Management Menu. Type BD and press ENTER. The screen will say:

BACKUP DIRECTORY -----

ENTER DIRECTORY'S PATHNAME:
WDS

3. The cursor will flash after the S in WDS. The system is prompting for the directory pathname for which back-up is required.

ENTER the directory pathname including all periods(.) between directories with no misspellings or abbreviations.

If the pathname exceeds 28 characters, press ENTER at the end of the first line and continue the name on the next line. When the name is complete, press ENTER.

If the pathname does not exceed one line, press ENTER twice at the end of the pathname. The screen will read:

TO DISKETTE DRIVE # (1-3) :1

4. ENTER the number of the diskette drive you will be backing up to. If you have one floppy disk drive or you want the back-up to go to disk drive #1, simply press ENTER. Otherwise, ENTER the appropriate number. The system will then prompt for a back-up file name. The screen will say:

BACKUP NAME : -----

3.3 DISK MANAGEMENT SYSTEM

3.3.2E BACK-UP DIRECTORY

ENTER a 1-7 character long name. The name cannot contain periods or spaces nor can it end in an underline.

Once the name is ENTERed, the screen will say:

IS ABOVE CORRECT?
(Y/N/A-Abort)

5. If No(N) is indicated, the cursor will jump back to the space following WDS. Type in the correct entries and press ENTER.

If Abort(A) is indicated, the cursor will exit the program and return to the Directory Management Menu.

If Yes(Y) is indicated, the system asks:

WHERE DO YOU WANT LISTING:
1 - SCREEN
2 - OTHER
ENTER OPTION : 1

6. Listings can be routed to the screen or other devices such as an RS232 device. If option #2 is selected, the screen prompts:

ENTER LIST DEVICE

and you ENTER the name of device where the output should go.

If you want the listing to go to the screen, simply press ENTER. The screen will say:

PLEASE WAIT
LOADING PROGRAM

After a few moments the screen will clear and a new message will say:

INSERT DISKETTE NUMBER (system assigned number)
IN DRIVE # _____ AND PRESS PROC

7. If you are working with one floppy diskette drive, take out the MYARC Utility Diskette and insert an initialized diskette. Otherwise, simply insert the initialized back-up diskette in another drive. This first diskette is assigned the number #1 by the system.

As back-up proceeds, the system keeps track of the amount of storage available on each floppy. If the directory files are larger than the available floppy disk space, the system will proceed with backing up the files and then signal you when a new diskette must be inserted. Each time a new diskette is inserted, the system increments the diskette number by one. Since in Restore, the floppy diskettes must be accessed in the same exact order they were backed up in, we suggest you physically label and number the floppy diskettes as discussed earlier in the back-up introduction.

3.3 DISK MANAGEMENT SYSTEM

3.3.2E BACK-UP DIRECTORY

During back-up, the system informs you about what is being backed up. The screen says:

```
BACKING UP DIRECTORY : (name of directory being backed up)
TO DISKETTE DRIVE NUMBER : (indicated disk drive number)
BACK UP NUMBER : (1-7 character back-up file)
```

8. The name of the directory being backed up is the directory you identified to be backed up. The back-up name is the 1-7 character file name you gave the directory and file group being backed up. As back-up proceeds, the system will either stop and tell you to insert another back-up diskette or it will show that back-up is complete by indicating the name of the last file in the backed up directory. It will say:

```
BACKED UP:
WDS.(file pathname of last file backed up in directory)
COMMAND COMPLETE
(actual number of) FILES BACKED UP
RE-INSERT UTILITY DISK
PRESS REDO TO RESTART
      BACK TO ABORT
```

If you are working with one floppy diskette drive, re-insert the MYARC Utility diskette in the drive and re-run back-up (REDO) or exit (BACK) the program. Otherwise simply initiate REDO or BACK.

If you had chosen to obtain a listing of the back-up, the system actually prints out the pathnames of all backed up files. The format is:

```
BACKING UP DIRECTORY:
WDS.(directory pathname)
BACKED UP :(pathname of first file backed up)
      |
      |
      |
BACKED UP :(pathname of last file backed up)
COMMAND COMPLETE
(actual number of) FILES BACKED UP
```

3.3.2F RESTORE DIRECTORY

There are two situations when Restoring files to the Winchester disk is necessary. One is if you need to restore archived files. An example of this is restoring year end data from last year to compare to this year's year-to-date activity.

The other situation is if you've experience a disk head crash or other serious problem where the disk had to be serviced. In this case, before restoring backed up files, you must re-initialize the entire disk. See Section 3.3.1A for instructions on how to re-initialize the disk. Remember to name the disk the same "logical" name if you used the logical disk name in back-up pathnames. Also remember to note how many "bad" disk sectors were encountered during disk initialization.

3.3 DISK MANAGEMENT SYSTEM

3.3.2F RESTORE DIRECTORY

You do not re-initialize the disk if you did not experience a serious hardware problem and you are simply restoring archived files. If you are restoring the files to a directory that currently exists, the restored files will write over all unprotected files in that directory. Any protected files will not be written over.

Several conditions must exist to restore files. They are:

- * The directory structure leading up to and including the backed up directory must exist.

If, from Exhibit B, directory T1 is being backed up, the S1 and T1 directories must exist. If they don't, create both the S1 and T1 sub-directories (with the same original names) before attempting to restore T1

- * When restoring files, the same back-up directory pathname must be used.

If the pathname "WDS.MAIN.S1.T1" was given at the time of back-up, then "WDS.MAIN.S1.T1" is the only permissible restore pathname. "WDS1.S1.T1" would be incorrect. If you renamed a directory or file and did not do an updated back-up, then the correct pathname includes the old directory and file name.

- * The order of restoring backed up files must follow the same exact sequence as the original back-up.

The floppy diskette back-up files must be written back to the Winchester Disk in the same sequential order they were originally backed up. The diskette number assigned to the floppy (and noted on the diskette label) indicates the correct restore sequence.

The Restore operation follows the same general operating pattern as Back-up. The system will ask for the pathname of the directory to be restored, the diskette drive containing the back-up floppy and the back-up file name. It offers an option of listing the restored files to an RS232 device or to the screen.

As the restore process proceeds, the system will signal the number of the floppy diskette to be inserted. The system will continue restoring until either another back-up diskette must be inserted or the restore is complete. At the end of restore, the system will indicate how many files were restored and the pathname of the last restored file.

To restore backed up files:

1. If you're restoring files after a serious hardware problem has been fixed, re-initialize the disk. If you're simply restoring archived files (not as a result of a hardware problem), you do not re-initialize the disk. Remember, if you're restoring files to a directory with already existing files, the restored files will be written over any unprotected files in that directory.

3.3 DISK MANAGEMENT SYSTEM

3.3.2F RESTORE DIRECTORY

2. Make sure the directory structure leading up to and including the backed up files exists. Use Create Directory to create any necessary directories and name them what they were called at the time of the latest back-up. After restoring the files, you may use the Rename Disk or Rename Directory Utilities to change the disk or directory names.
3. Select Directory Management from the MAIN MENU. Type DR and press ENTER. The Directory Management Menu will appear.
4. Choose Restore Directory from the Directory Management Menu. Type RE and press ENTER. The screen will say:

RESTORE DIRECTORY

ENTER DIRECTORY'S PATHNAME:
WDS

5. The cursor will flash after the S in WDS. The system is prompting for the directory pathname for which restore is required.

ENTER the directory pathname including all periods(.) between directories with no misspellings or abbreviations.

If the pathname exceeds 28 characters, press ENTER at the end of the first line and continue the name on the next line. When the name is complete, press ENTER.

If the pathname does not exceed one line, press ENTER twice at the end of the pathname. The screen will read:

TO DISKETTE DRIVE # (1-3) :1

6. ENTER the number of the diskette drive you will be restoring from. If you have one floppy disk drive or you want restore to initiate from disk drive #1, simply press ENTER. Otherwise, ENTER the appropriate number. The system will then prompt for a backed up file name. The screen will say:

BACKUP NAME : _ _ _ _ _

ENTER a 1-7 character long name. The name cannot contain periods or spaces nor can it end in an underline.

Once the name is ENTERed, the screen will say:

IS ABOVE CORRECT? :
(Y/N/A-Abort)

7. If No(N) is indicated, the cursor will jump back to the space following WDS. Type in the correct entries and press ENTER.

If Abort(A) is indicated, the cursor will exit the program and return to the Directory Management Menu.

3.3 DISK MANAGEMENT SYSTEM

3.3.2F RESTORE DIRECTORY

If Yes(Y) is indicated, the system asks:

WHERE DO YOU WANT LISTING:

1 - SCREEN

2 - OTHER

ENTER OPTION : 1

8. Listings can be routed to the screen or other devices such as an RS232 device. If option #2 is selected, the screen prompts:

ENTER LIST DEVICE

and you ENTER the name of device where the output should go.

If you want the listing to go to the screen, simply press ENTER. The screen will say:

PLEASE WAIT
LOADING PROGRAM

After a few moments the screen will clear and a new message will say:

INSERT DISKETTE NUMBER (system assigned number)
IN DRIVE # ____ AND PRESS PROC

9. If you are working with one floppy diskette drive, take out the MYARC Utility Diskette and insert the first backed up diskette to be restored. Otherwise, simply insert the first back-up diskette to be restored in another drive. This first diskette is the one labeled #1 by the system at back-up time.

As restore proceeds, the system keeps track of where it is. When it has completed restoring the backed up files on floppy diskette #1, it will signal you to insert floppy diskette back-up #2. The number "2" will appear after "INSERT DISKETTE NUMBER." A disk drive number will appear after "IN DRIVE #." This is the disk drive number from where restore initiates.

During restore, the system informs you about what is being restored. The screen says:

FROM ~~X~~ RESTORING DIRECTORY : (name of directory being restored)
DISKETTE DRIVE NUMBER : (indicated disk drive number)
BACK UP NAME : (1-7 character back-up file)

10. The name of the directory being restored is the directory you identified to be restored. The back-up name is the 1-7 character file name you gave the directory and file group at back-up time that is now being restored. As restore proceeds, the system will either stop and tell you to insert the next sequential backed up diskette or it will show that restore is complete by indicating the name of the last file in the restored directory. It will say:

3.3 DISK MANAGEMENT SYSTEM

3.3.2F RESTORE DIRECTORY

```
RESTORED:  
WDS.(file pathname of last file restored in directory)  
COMMAND COMPLETE  
(actual number of) FILES RESTORED  
RE-INSERT UTILITY DISK  
PRESS REDO TO RESTART  
BACK TO ABORT
```

If you are working with one floppy diskette drive, re-insert the MYARC Utility Diskette in the drive and re-run Restore (REDO) or exit (BACK) the program.

11. If you had chosen to obtain a listing of the restored files, the system actually prints out the pathnames of all restored files. The format is:

```
RESTORED DIRECTORY:  
WDS.(directory pathname)  
RESTORED :(pathname of first file restored)  
:  
:  
RESTORED :(pathname of last file restored)  
COMMAND COMPLETE  
(actual number of) FILES RESTORED:
```

3.3 DISK MANAGEMENT SYSTEM

3.3.3 FILE MANAGEMENT

MYARC's File Management provides utilities which delete, rename, copy and modify file protection status. When the File Management (FM) option is chosen from MYARC's MAIN MENU, the following screen information appears:

MYARC WINCHESTER SYSTEM

FILE MANAGEMENT

DF-DELETE FILE
RF-RENAME FILE
CF-COPY FILE
MF-MODIFY FILE PROTECTION
EX-EXIT

ENTER PROGRAM CODE:

The following sections describe the significance and operation of these utilities.

3.3.3A DELETE FILE

The Delete File option is chosen when the contents of a file must be erased. The utility provides the capability of deleting multiple files without switching in and out of the Delete File program. If a file is protected, the system will not delete the file and a message saying "FILE PROTECTED:CANNOT DELETE" will appear on the screen. To delete a protected file, you must modify the file's protection status. This is described in Section 3.3.3D.

To delete a file:

1. Select File Management from the MAIN MENU. Type FM and press ENTER. The File Management Menu will appear.
2. Select "Delete File." Type DF and press ENTER. A flashing cursor will appear after "WDS" and the screen will read:

DELETE FILE

ENTER PATHNAME OF FILE TO
BE DELETED:
WDS

3. At this point, the file pathname is ENTERed. The name includes all directory and sub-directories under which the file is located.

3.3 DISK MANAGEMENT SYSTEM

3.3.3A DELETE FILE

Continue typing in the complete name making sure periods (.) separate directories and file names. If the pathname exceeds 28 characters, press ENTER and continue typing it on the second line. Press ENTER when finished.

If the pathname does not exceed one line, press ENTER twice. A screen message will say:

```
ATTENTION-DELETING A FILE
WILL ERASE ALL CONTENTS
OF FILE.
```

```
IS THE ABOVE CORRECT?
(Y/N/A-Abort)
```

4. If No (N) is indicated, the cursor will jump back to the space after WDS and the corrected name can be input. Type over what has already been ENTERed.

If Abort (A) is indicated, the system will return to the File Management Menu.

If Yes (Y) is chosen, the screen will say:

```
***PLEASE WAIT***
***LOADING PROGRAM***
```

After a few seconds, the screen will say:

```
FILE
WDS.DIRECTORY.FILE
DELETED
```

Where "WDS.Directory.File" is the pathname of the file that has just been deleted.

5. At this point, you may re-run Delete File (REDO) or exit (BACK).

3.3.3B RENAME FILE

The Rename File utility is used when an existing file (or files) must be renamed. The utility provides the capability of renaming multiple files without switching in and out of the Rename File program.

To rename a file:

3.3 DISK MANAGEMENT SYSTEM

3.3.3B RENAME FILE

1. Select File Management from the MAIN MENU. Type FM and press ENTER. The File Management Menu will appear.
2. Select Rename File. Type RF and press ENTER. The cursor will flash after "WDS" and the screen will read:

RENAME FILE

ENTER PATHNAME OF FILE
TO BE RENAMED
WDS

3. At this point the file pathname is ENTERed. Once the name is ENTERed, the screen will read:

ENTER NEW FILE NAME

4. ENTER the new file name. The name cannot exceed 10 characters nor contain spaces or periods. A prompt will now ask:

IS THE ABOVE CORRECT?
(Y/N/A-Abort) Y

5. If No (N) is indicated, the cursor will jump back to the space after WDS. The corrected name can be input by typing over what is already there. If no corrections need to be made to this line, press ENTER. The cursor will jump to the space after ENTER NEW FILE NAME. Input the correct new name and press ENTER. If no corrections need to be made to this line, simply press ENTER.

If Abort (A) is indicated, the system will go back to the File Management Menu.

If Yes (Y) is indicated, a system message will appear indicating the file is being renamed, the screen will read:

PLEASE WAIT
LOADING PROGRAM

6. After a couple of seconds, the file will be renamed and the screen will read:

FILE NEW NAME EXISTS
ON DISK # X

3.3 DISK MANAGEMENT SYSTEM

3.3.3B RENAME FILE

Where: * New Name is the new name of the file
* Disk #X is the disk where the file is stored

7. At this point, you may re-run the program (REDO) or exit (ABORT).

3.3.3C COPY FILE

The Copy File Utility is used to copy files between a floppy diskette and the Winchester Disk and to copy files between directories on the Winchester Disk. Most often, it will be used to copy floppy disk files to the Winchester although there may be instances where files must be copied from the Winchester to the floppy.

To copy a file:

1. Select File Management from the MAIN MENU. Type FM and press ENTER. The File Management Menu will appear.
2. Select Copy File. Type CF and press ENTER. The cursor will flash after "FROM" and the screen will read:

ENTER FILE PATHNAME TO COPY
FROM:

TO:

3. At this point, the file being copied is indicated.

If the file is going from a floppy diskette to the Winchester, ENTER DSK(number).(file name).

If the file is going from the Winchester to a floppy diskette or to another directory on the Winchester, ENTER the entire pathname, WDS.(pathname).

Once the pathname is ENTERed, the cursor will jump to "TO."

4. At this point, the location where the file is being sent is indicated.

If the file is being copied to the Winchester, ENTER the entire pathname for the file including all directories and sub-directories, WDS.(pathname).

If the file is being copied to a floppy diskette, ENTER DSK(number).(file name).

Once you ENTER this, the screen will say:

IS THE ABOVE CORRECT?
(Y/N/A-Abort)

3.3 DISK MANAGEMENT SYSTEM

3.3.3C COPY FILE

5. If No(N) is indicated, the cursor will jump back to "FROM." The corrected file name or pathname may be input by typing over what is there.

If Abort(A) is indicated, the system will go back to the File Management Menu.

If Yes(Y) is indicated, the system will indicate it is copying, the screen will say:

FILE COPY IN PROGRESS

6. Once the copy is completed, the screen will say:

COPY SUCCESSFUL

At this point, you may re-run Copy File (REDO) or exit the program (BACK).

3.3.3D MODIFY FILE PROTECTION

MYARC's Disk Management System offers a "Modify File Protection" Utility which provides the option of "protecting" or "unprotecting" a file. Protecting a file prevents it from being accidentally erased or changed. This means another file cannot be copied over it and the file itself cannot be changed or renamed. If the file is "unprotected," the "Modify Protection" program can "protect" it. Similarly, if the file is "protected," the program can "unprotect" it.

To modify file protection:

1. Select File Management from the MAIN MENU. Type FM and press ENTER. The File Management Menu will appear.
2. Select Modify File Protection. Type MF and press ENTER. A cursor will flash after "WDS" and the screen will read:

MODIFY PROTECTION

ENTER FILE'S PATHNAME:
WDS

3. At this point, the file's pathname is ENTERed. Depress the ENTER key twice if the pathname does not exceed one line. Remember to include all directories and subdirectories in the pathname separated by periods. A prompt will ask:

IS ABOVE CORRECT?
(Y/N/A-Abort)

4. If No(N) is indicated, the cursor will jump back to WDS. The correct name can be typed over the existing name and ENTERed.

3.3 DISK MANAGEMENT SYSTEM

3.3.3D MODIFY FILE PROTECTION

If Abort(A) is indicated, the system goes out of "Modify File Protection" and returns to the File Management Menu.

If Yes(Y) is indicated, a message will say:

PLEASE WAIT
LOADING PROGRAM

After a few seconds, the screen will then say:

PROTECT STATUS: (U OR P)

DO YOU WANT TO CHANGE
PROTECT STATUS?
(Y/N/A-Abort)

The "U" or "P" in the Protect Status field identifies the present (U)nprotected or (P)rotected state of the file.

5. If No(N) is indicated, the system will go back to

If Abort(A) is indicated, the system goes out of Modify File Protection and returns to the File Management Menu.

If Yes(Y) is indicated, a prompt will say:

U=UNPROTECT P=PROTECT

ENTER PROTECT STATUS:

ENTER "P" to assign a "Protect" status.
ENTER "U" to unassign a "Protect" status.

6. The screen will indicate that the file protection status has been modified:

FILE PROTECTION CHANGED
PRESS REDO TO RESTART
BACK TO ABORT

3.3.4 DISK DIAGNOSTICS

Disk Diagnostics determine if a disk sector has become unusable since the time the disk was initialized. If it has, the diagnostics will identify if the disk going bad is the result of a "fatal" disk problem. The probability of a major disk problem occurring is extremely low and in most installations, the need to run Disk Diagnostics will never occur.

Disk Diagnostics are run only if a read data error occurs. This means there's a known error in the data, an "X6" (X=0-9) in TI BASIC or TI Assembly Language message appeared, or a disk error condition is experienced in the MYARC Disk Management software.

There are two types of disk tests, non-destructive and destructive. The non-destructive, a test that can be run without destroying data on the disk, reads through all the disk sectors and flags those that are unusable. The non-destructive test is always run before initiating a destructive test. In contrast, the destructive, a more extensive test, will destroy all data on the disk. The destructive test is only run under certain conditions and then, only after the entire disk has been backed up.

CAUTION:

DISK DIAGNOSTICS ARE RUN ONLY IF A READ ERROR OCCURS. IN MOST INSTALLATIONS, DISK DIAGNOSTICS WILL NEVER BE RUN. A NON-DESTRUCTIVE TEST WILL NOT ERASE THE DATA ON THE DISK WHILE A DESTRUCTIVE TEST WILL DESTROY ALL DATA ON THE DISK. BEFORE INITIATING A DESTRUCTIVE TEST, THE ENTIRE DISK MUST BE BACKED UP.

3.3.4A NON-DESTRUCTIVE TEST

During a non-destructive test, the system actually reads every sector on the disk, flags those that are defective and determines if the defect represents a "fatal" condition. If the system detects a "fatal" error, the non-destructive diagnostic will immediately terminate and you proceed with the "destructive" test described in the next Section, 3.3.4B. If the diagnostic detects no fatal error, the diagnostic will proceed until all sectors have been read (19584 sectors on a 5 Megabyte disk and 39168 sectors on a 10 Megabyte disk) a process lasting from 5 to 10 minutes. Sector numbers will increment on the screen as the diagnostic proceeds and if the system finds a non-fatal, correctable sector error, it prints the defective sector location to the screen.

Assuming the system diagnoses no fatal errors and therefore completes reading all disk sectors, the diagnostic program will finish with a summary of the total number of "bad" sectors found. It is the nature of Winchester media that "bad" sectors within certain manufacturer stated tolerances exist and can be "blocked out" so no data is written to it. If the non-destructive diagnostic shows the number of bad sectors is less than, equal to or not more than 10 bad sectors greater than the number of "bad sectors" found at disk initialization, then the disk is experiencing no major problem and further diagnostic evaluation is unnecessary. If the number of bad disk sectors found is greater than the number found at disk initialization plus 10, this may signal a media defect and you proceed with the destructive test.

3.3.4 DISK DIAGNOSTICS

3.3.4A NON-DESTRUCTIVE TEST

It is more likely that the outcome of the non-destructive diagnostic will be less than 10 additional bad sectors than were found at disk initialization. This means that the probable cause of the "read" error you experienced is that an isolated sector(s) has gone "bad" but has affected nothing else on the disk. At this point, corrective action should be taken to block off the sector(s) that has gone "bad." One of two alternative procedures should be followed.

- * The preferred procedure is to copy the file where the "bad" sector is located (the file in which a "read" error is experienced), delete the original file with the read error, and re-run the non-destructive diagnostic. Deleting the file frees up the "bad" bit and re-running the non-destructive diagnostic marks the sector unusable. Marking the sector unusable prevents data from being written to it in the future.

The file will only be copied up to the point where the "bad" bit is located in the file. You will have to re-ENTER the data which follows the bad bit in the original file.

NOTE: This procedure can only be used if the bad bit is located in a data file. If the bad bit is located in a program file, the contents of the file are permanently unretrievable. You should delete the file and re-run the non-destructive diagnostic. Alternatively, you could back-up the entire disk, re-initialize and restore the backed up files.

- * The alternative procedure is initiated when it is not known which file contains the bad sector. In this case, back-up the entire disk, re-initialize the disk and restore the backed up files. Re-initializing the disk also marks the bad sector unusable which prevents data from being written to it in the future.

3.3.4B DESTRUCTIVE TEST

A destructive test is a comprehensive diagnostic which will destroy all the data on the disk. Because of this, it is run after performing a non-destructive test which indicated one of the following.

- * a "fatal" error
- * an excessive amount of bad sectors
(more than 10 bad sectors greater than the number found at disk initialization)

BEFORE RUNNING A DESTRUCTIVE TEST, BACK-UP THE ENTIRE DISK

The purpose of a destructive test is to determine if the disk is usable or if some problem has occurred to make it unusable. The test automatically steps through four phases of diagnostics. Depending on the size of the disk, the entire test takes between 15 to 30 minutes.

3.3.4 DISK DIAGNOSTICS

3.3.4B DESTRUCTIVE TEST

Similar to the non-destructive test, the test will terminate if it detects a "fatal" error. If this occurs, the system will print an error message to the screen describing the nature of the problem. It is important to make a note of the error message (or obtain a listing) as this information is used when a MYARC field support representative diagnoses the problem.

First phase of the destructive test:

The first phase of the test checks the status of the disk and controller. If a fatal error is detected in either, the diagnostic will terminate and an error message will appear. Make a note of the error message and communicate the problem to MYARC.

Second phase of the destructive test:

The second phase of the test writes formatting marks to all disk tracks, cylinders and sectors. If during this phase, the system locates an unformatable track, it will print that information to the screen and continue with the testing. Improper format markings are "correctable" errors and therefore, the system will proceed with the diagnostic program. These errors will be "corrected" when the disk is re-initialized after the diagnostic procedures are completed.

Third phase of the destructive test:

During the third phase, all disk sectors are read and if unusable, marked off (this is exactly what happens during disk initialization). Additionally, the most difficult bit pattern for the disk to store (the one with the most magnetic flux reversals) is written to and read back from every sector. If the system finds a bad sector, it will mark it unusable and list it to the screen. These errors are correctable and will be corrected when the disk is re-initialized after the diagnostic procedures are completed. However, if the diagnostic identifies more than 100 bad sectors, this may indicate a disk problem. Call MYARC if this happens.

Fourth phase of the destructive test:

The last phase of the test is a test for "seek" errors. What happens here is the head of the disk goes to every cylinder in a random pattern to determine if there is a problem with locating the data. A "seek" error is not "fatal" but if more than 1 seek error is found, the disk is "suspect." Call MYARC if this happens.

4.0 WDS/100 DISK OPERATIONS WITH TI BASIC

TI BASIC can be used with the WDS/100. Since the WDS/100 is designed to be totally compatible with the floppy disk system and it is fully integrated with the TI operating system, all TI BASIC commands are the same in the WDS/100 hard disk system as they are in the floppy disk system.

MYARC's unique WDS/100 hard disk system does not require any working space in main memory. In contrast to the floppy disk system which uses 2088 bytes of RAM to accommodate three simultaneously opened files, the WDS/100 can support up to twelve open files without using main memory. (Please note that in the floppy disk system, the CALL FILES statement can be used to change the number of "open" files. In the Winchester environment, the number of open files is permanently preset to 12. An error condition will result if the CALL FILES statement is used since it has no relevance to the WDS/100 system).

4.1 TI BASIC STATEMENTS

The following sections detail the use of the WDS/100 with TI BASIC. They cover the "saving and loading of programs" and "file processing" in TI BASIC.

4.1.1 SAVING AND LOADING PROGRAMS

The WDS/100 stores and retrieves TI BASIC programs quickly and efficiently through the SAVE (store) and OLD (retrieve) commands. Depending on the length of the program, this can be anywhere from four to ten times faster than the floppy disk system.

The SAVE command is used to store a program to the disk. The SAVE format is:

SAVE device.file pathname

The device is a Winchester Disk (WDS) and the program file pathname includes the directories and subdirectories under which the program file is to be located. There are two ways to state the file pathname as explained in the following paragraphs.

In order to Save the program to the correct file, the system must know the type of device and its number and the file pathname. Alternatively, the system must know the type of device, the Main Directory and the file pathname.

As an example, to store a program called CALCULATE, we will assume the following:

- * the program file CALCULATE is in the subdirectory DEMO
- * the subdirectory DEMO is in the MAIN directory SALES
- * the MAIN Directory SALES is on Winchester Disk #1

4.1 TI BASIC STATEMENTS

4.1.1 SAVING AND LOADING PROGRAMS

There are two ways to format the SAVE command. They are:

1. SAVE WDS1.DEMO.CALCULATE
2. SAVE WDS.SALES.DEMO.CALCULATE

NOTE: PERIODS MUST SEPARATE DEVICE, DIRECTORY AND FILE NAMES.

In the first alternative, the computer searches for the first disk drive (#1), finds the subdirectory DEMO, and saves the program CALCULATE under it. In the second alternative, the computer searches for a Main Directory called SALES which it knows will be on a Winchester Disk (WDS), finds the appropriate subdirectory, DEMO, and saves the program file under it.

The OLD command is used to retrieve a program from the disk. The OLD format is the same as the SAVE format:

OLD device.file pathname

When the OLD command is ENTERed, the designated program is read into the computer's memory. The program can then be RUN, LISTed or EDITed.

4.1.2 FILE PROCESSING USING TI BASIC

There are seven main TI BASIC statements used to access files on the disk. They are OPEN, CLOSE, INPUT, PRINT, EOF, RESTORE and DELETE. Each are discussed below.

The only TI BASIC statement that can be used to access a directory is OPEN. Directory access is limited to READING the subdirectory and file pathnames of the particular directory. The statement format is shown below.

1. OPEN - The OPEN statement prepares a TI BASIC program to use data files stored on the disk. It links a file number used in a program to a file on the disk and describes a file's attributes so the program can create or process the file. If the file already exists, the description given in the program must match the actual file characteristics.

The OPEN statement format is:

1. FOR A DIRECTORY: OPEN #file number:"device.directory pathname.",
INPUT, RELATIVE, INTERNAL

The device and directory pathname must be included in the OPEN statement for a directory. The open mode is always INPUT since a directory can only be read in TI BASIC.

2. FOR A FILE: OPEN #file number:"device.file pathname"
(,file-organization) (,file-type) (,open-mode) (,record-type)

4.1 TI BASIC STATEMENTS

4.1.2 FILE PROCESSING USING TI BASIC

The file number and device.file pathname must be included in the OPEN statement for a file. The other information, enclosed in parenthesis, may be in any order and are optional entries. If the entries are not made, the computer assigns certain defaults described below.

- * file-number - The file number is assigned to a file by the OPEN statement. Assign a unique number (1-255) to each file. The file number is ENTERed as a number sign (#) followed by an integer from 1 to 255. The only restriction is that the number assigned cannot be the same number as another open file.
- * "device.file-pathname" - For any file located on a Winchester Disk, the device is always "WDS." See the above explanation in "SAVE" for the two acceptable "device.file pathname" entries.
- * file-organization - TI BASIC file organization is the same on the WDS/100 as it is on the floppy disk system. Files can be organized either sequentially, where they are read or written one after the other, or randomly, where they can be read or written in any order including sequentially. A sequential file is indicated by ENTERing SEQUENTIAL. A random file is designated by ENTERing RELATIVE. The user may optionally specify the initial number of records on a file by following the word SEQUENTIAL or RELATIVE with a numeric expression (See Section 5.1 on Maximizing System Performance for further discussion of this). If no file organization is specified, the default is SEQUENTIAL.
- * file-type - Files can be stored on the Winchester Disk in two ways. They can be stored as ASCII characters or as machine-readable binary code. If the information will be printed or displayed for people to use, the files should be stored in ASCII format. If the information will only be processed, not displayed or printed, the files should be stored in the compact and more quickly processed binary form.

To specify a binary file, ENTER INTERNAL. To indicate an ASCII file, either ENTER DISPLAY or leave "file type" blank.

The system defaults to ASCII file types (NOTE: THE LENGTH OF AN ASCII TYPE FILE IS LIMITED TO 150 BYTES).

- * open-mode - There are four open modes in TI BASIC: UPDATE, INPUT, OUTPUT and APPEND. The system assumes a default value of UPDATE if no mode is specified. Each mode means the following:
 - * UPDATE, the file may be both read and written to.
 - * INPUT, the file may only be read.
 - * OUTPUT, the file may only be written to.
 - * APPEND, the file may only be added to.

4.1 TI BASIC STATEMENTS

4.1.2 FILE PROCESSING USING TI BASIC

A "protected" file (see below) may only be read (INPUT). A file can only be APPENDED if it contains VARIABLE length records.

Note: If an unprotected file already exists on a disk, specifying an open-mode of OUTPUT to the same file name writes over the existing file with the new file. This can be prevented by reading all the existing records which, moves you to the end of the file. Alternatively, use the RESTORE statement (see below) with the proper record.

- * record-type - File records may be all the same length (FIXED) or may vary in length (VARIABLE). Fixed records have a maximum file length of 255 bytes and are processed faster than variable records. Variable records also have a maximum of 255 bytes.

File lengths are specified by following FIXED or VARIABLE with a numeric expression. If no record length is specified, the default is 80 bytes. Please note:

- * RELATIVE files must have FIXED length records.
- * SEQUENTIAL files may be either FIXED or VARIABLE. If no record type is specified, the default is VARIABLE for a SEQUENTIAL FILE.
- * A FIXED LENGTH FILE may be reopened for either SEQUENTIAL or RELATIVE access regardless of previous file organization assignments.

The following are examples of OPEN statements:

OPEN #1: "WDS1.DEMO.SALES" Creates or reopens a file on Winchester Drive 1 named SALES. The SALES file is located in the subdirectory DEMO. The file is SEQUENTIAL, kept in DISPLAY format, in UPDATE mode with VARIABLE length records with a maximum length of 80 bytes. (These are all the defaults).

OPEN #10: "WDS.MAIN.DEMO.SALES", RELATIVE 100, FIXED 80

Creates or reopens a file named SALES in the subdirectory DEMO. DEMO is in the Main Directory MAIN which is on a Winchester Disk (WDS). The system knows which Winchester Disk number from the Main Directory name. The SALES file is RELATIVE with 100 records made available for the file. Record size is FIXED at a length of 80 bytes.

4.1 TI BASIC STATEMENTS

4.1.2 FILE PROCESSING USING TI BASIC

2. CLOSE - The CLOSE statement discontinues the association between a file and a program. After the CLOSE statement is performed, the file is not available until it is reopened again using an OPEN statement. Files may also be deleted by adding: DELETE to the end of the CLOSE statement.

The CLOSE statement format is:

```
CLOSE #file number (:DELETE)
```

The file-number is the same number used in the OPEN statement.

It is important to CLOSE a file otherwise data may be lost. Editing a program automatically closes any open files; but if a program ends due to a BREAK statement, an error, or pressing SHIFT C (CLEAR), files may not be closed even if there is a CLOSE statement in the program. To prevent data loss in these cases, ENTER NEW to close the file properly. Alternatively ENTER BYE to close the file and to leave TI BASIC. NOTE: DATA MAY BE LOST IF SHIFT Q (QUIT) IS PRESSED INSTEAD OF ENTERING BYE. WHEN PROCESSING FILES, ALWAYS USE BYE TO LEAVE TI BASIC.

3. INPUT - The INPUT statement, used with the WDS/100 system, allows data to be read from the files. It can only be used with files opened in INPUT or UPDATE mode. The INPUT statement is the only allowable TI BASIC file access statement that can be used for directories. When INPUTing a Directory, the user will see an actual listing of the Directory contents.

The INPUT statement has this format:

1. FOR DIRECTORIES: INPUT # file-number: variable-list
2. FOR FILES: INPUT # file-number (,REC record-number): variable-list

The file-number and a variable-list must be included in the INPUT statement. The record-number may optionally be included when reading random access files.

- * file-number - The file number is the number assigned to a file by the OPEN statement. The file number is ENTERed as a number sign (#) followed by an integer from 1-255 and is the number of the file that is open.
- * record-number - The record-number refers to the file record to be read. The record number can only be specified for RELATIVE files since SEQUENTIAL files are read in sequential order.
- * variable-list - The variable-list is a list of variables into which the data from the file is to be read. It consists of a string of numeric variables separated by commas.

4.1 TI BASIC STATEMENTS

4.1.2 FILE PROCESSING USING TI BASIC

The following shows examples of INPUT statements:

- INPUT#5:X\$ Puts the next value available in the file opened as #5 into X\$.
- INPUT#30:X,A,LL\$ Puts the next three values available in the file opened as #30 into X,A and LL\$.
- INPUT#15,REC 32:RESULTS Puts the first value of record number 32 in the file opened as #15 into RESULTS.
- INPUT#2:A,B,C, Puts into A, B and C the next three values from the file opened as #2. The comma after C creates a pending input condition. When the next INPUT statement using this file is performed, one of the following actions occurs:
- If the next INPUT statement has no REC clause, the computer uses the data beginning where the previous INPUT statement stopped.
- If the next INPUT statement includes a REC clause, the computer terminates the pending input conditions and reads the specified record.

4. PRINT - The PRINT statement allows data to be written onto files on the disk. It can only be used with files opened in OUTPUT, UPDATE or APPEND mode.

The PRINT statement has this format:

PRINT # file-number (,REC record-number) (:print-list)

- * file-number - The file number is the number assigned to a file by the OPEN statement. The file number is ENTERed as a number sign (#) followed by an integer from 1-255 and is the number of the file that has been opened. The file-number must be included in the PRINT statement.
- * record-number - The record-number refers to the file record to be written on. The record-numbers can only be specified for RELATIVE files since SEQUENTIAL files are written on in sequential order.
- * print-list - The print list is the list of values to be put on the file. It consists of a string of numeric variables or constants separated by commas, colons and semicolons.

4.1 TI BASIC STATEMENTS

4.1.2 FILE PROCESSING USING TI BASIC

The following shows PRINT statement examples:

PRINT #5:X\$	Puts the value in X\$ into the next position of the file opened as #5.
PRINT #10:A, B; "RESULTS"	Puts the values of A, B, and "RESULTS" into the next record in the file opened as #10.
PRINT #15, REC 20: "TAX"	Puts the string constant "TAX" into record number 20 of the file opened as #15.
PRINT #20: A, B, C,	Puts the values of A, B and C into the next three positions in the file opened as #20. The comma after C creates a pending print condition. When the next PRINT statement is performed, one of the following actions occur:

If the next PRINT statement has no REC clause, then the computer places the data immediately following the previous data.

If the next PRINT statement has a REC clause, then the computer writes the pending print record onto the file at the position indicated counter and performs the new PRINT REC statement as usual.

5. EOF - End-of-file (EOF) indicates whether there is another record to be read from a file. The EOF format is:

EOF (file-number)

The file-number is the same as the number of the OPEN file.

The EOF function assumes that the next record is going to be read sequentially even if the file is RELATIVE.

The EOF function will return a value which indicates where you are in the file. If you are at the end of a file, the function returns a value of 1. If you are not at the end of the file, the value is 0. If the diskette is full and you are at the end of the file, the value is -1.

The following examples illustrate how the EOF function can be used:

PRINT EOF(2)	Prints a value of 0, 1, or -1 depending on where you are in the file opened as #2.
IF EOF(30)<>0 THEN 870	If you are at the end of the file opened as #30, then control goes to line 870.

4.1 TI BASIC STATEMENTS

4.1.2 FILE PROCESSING USING TI BASIC

The way to keep track of the last record in a RELATIVE file is to create a "dummy" record as the first record in the file. Since the first record contains the number of records in the file, it must be updated each time the file length is changed.

6. RESTORE - The RESTORE statement positions the file at a specified file record. The RESTORE statement format is:

RESTORE # file-number (,REC record-number)

The file-number must be used with the RESTORE statement while record-number is optional.

- * file-number - This is the number assigned to the file by the OPEN statement. The file-number is ENTERed as a # followed by the number of the open file.
- * record-number - The record-number refers to the record where the file is to be positioned.

The following examples show how the RESTORE statement is used.

RESTORE #5 The next record read from or written to the file opened as #5 will be the first record on the file.

RESTORE #14, REC 12 The next record read from or written to the file opened as #14 will be the thirteenth record on the file (remember that the first record is number zero).

With RELATIVE files, RESTORE is only used to position the file to use the EOF function. This is because the record that will be read or written to can be specified in the INPUT or PRINT statements.

7. DELETE - the DELETE statement erases files. The DELETE statement format is:

DELETE # file-number

The file-number must be included in the DELETE statement. This number is assigned to the file by the OPEN statement. It is ENTERed as a "#" followed by the number of the open file.

Note: Protected files cannot be deleted.

4.2 ERROR CODES IN TI BASIC WITH THE WDS/100

The normal TI 99/4 error codes are given in the TI 99/4 User's Reference Guide. TI BASIC error codes for the floppy disk system can be found in TI's Disk Memory System Reference book. The following codes relate specifically to TI BASIC error codes when using the WDS/100 hard disk system.

4.2

ERROR CODES IN TI BASIC WITH THE WDS/100

NOTE: ALL WINCHESTER DISK OPERATING SYSTEM ERRORS ARE "HARD CODED" AND WILL BE INDICATED IN PLAIN TEXT ON THE SCREEN. SEE SECTION 5.3 ON ERROR MESSAGES IN THE DISK MANAGEMENT SYSTEM.

TI BASIC errors on the WDS/100 have the same two-digit format as the TI floppy disk system. Generally, the codes have the same meaning with minor variations. The first digit indicates the command or statement involved in the error and the second digit indicates the type of error.

<u>FIRST DIGIT</u>	<u>COMMAND OR STATEMENT</u>
0	OPEN
1	CLOSE
2	INPUT
3	PRINT
4	RESTORE
5	OLD
6	SAVE
7	DELETE
9	EOF

<u>SECOND DIGIT</u>	<u>TYPE OF ERROR</u>
0	The disk drive specified could not be found.
1	The FILE is WRITE PROTECTED-unprotect the file via the "MODIFY FILE PROTECTION" utility in the WDS/100 File Management application.
2	BAD OPEN ATTRIBUTE - one or more OPEN options were illegal or did not match the directory's or file's attributes.
3	ILLEGAL OPERATION - should not be generated by the disk system. It could be caused however, by attempting to perform some illegal file operation, such as requesting INPUT from the Thermal Printer.
4	OUT OF SPACE - There are three conditions that would cause this error: the Winchester Disk is full; the user is attempting to create more than 127 files under one directory; the user is trying to open more files than the 12 allowed by the system.

SECOND DIGITTYPE OF ERROR

(NOTE: A FILE IS OPEN WHEN IT IS BEING DELETED, SAVED, LOADED, ETC. IF THERE ARE 12 OPEN FILES AND DELETE IS ATTEMPTED ON A 13TH FILE THIS ERROR CODE WILL APPEAR).

5

ATTEMPT TO READ PAST END OF FILE.

6

DEVICE ERROR - may occur if:

1. The disk is not initialized - initialize the disk.
2. The system had its power disconnected during a previous print.
3. The disk is damaged.
4. The disk unit is not functioning properly.

7

FILE ERROR - the indicated file or disk does not exist or a directory in the file pathname does not exist.

5.0 PRODUCT PERFORMANCE

5.1 MAXIMIZING SYSTEM PERFORMANCE

For system developers, here are some suggestions for maximizing WDS/100 system performance.

1. FILE HIERARCHY IMPLEMENTATION

The file system's depth (number of directory levels) and/or breadth (number of directories and/or files at a particular level) have no effect on the speed at which the system stores and retrieves data. The only time file system organization affects speed is when initially opening a file. In this case, breadth is, on average, slightly faster than depth.

2. CREATE DATA FILES TO BE THEIR APPROXIMATE FINAL SIZE

If, for storing data, the fastest possible performance is desired from the disk system, all files should be created as the approximate final size. This will generally make the file more contiguous which reduces the amount of time and distance the disk heads need to travel to store data. This will also allow all the disk sectors for data to be allocated to the file when opening the file, not when storing data. This further speeds processing time.

The following example illustrates how to create the file:

```
OPEN #1:"WDS1.DIR1.FILE",RELATIVE 1000,FIXED 255,UPDATE
```

3. PERFORMING I/O TO THE DISK FROM ASSEMBLY LANGUAGE (This does not apply when using TI EXTENDED BASIC).

In performing I/O to the disk from assembly language, data can be transferred directly to CPU Memory Expansion without having to go through VDP RAM. See Appendix C for details.

4. OPENING MORE THAN SIX FILES

Even though the WDS/100 system allows more than six files to be OPENed at one time, there is some degradation in system performance if seven or more files are simultaneously OPENed. This is due to overlapping requirements of the data buffers.

5. USE OF THE WDS/100 SYSTEM WITH OTHER TI CARTRIDGES

The WDS/100 System should perform satisfactorily with TI cartridges that can accept user-entered pathnames. The WDS/100 will not function properly with cartridges that have hard-wired device names - for example Terminal Emulator II.

5.0 PRODUCT PERFORMANCE

5.2 TROUBLESHOOTING THE HARDWARE

Whenever the Winchester Disk system is completely powered up, three things will happen. First, when the switch at the back of the Winchester Disk Drive Cabinet is pressed to "ON," the fan and disk drive will activate. Later, when the 99/4 console is switched on, the red indicator at the left hand front corner of the drive cabinet will light up and the MYARC Personality Card light will briefly illuminate. If any of these do not happen, follow the Troubleshooting procedures outlined below.

FIRST STEP FOR HARDWARE MALFUNCTIONS

1. Ensure all cables are properly connected and that the Peripheral Expansion System, the WDS/100, the 99/4 console, monitor and floppy disk are plugged in and all units are turned on. For the Winchester Disk, make sure the power switch is ON and the electrical power cord is connected to both the disk drive and the wall socket. The power cord should have a snug fit and be firmly in place in both the unit and wall outlet. Check that all components are installed according to the directions outlined in Section 2.4.2. Also determine if the Peripheral Expansion System is plugged in and properly connected to the console.
2. Power down the entire system by switching off the components in this exact order.
 - * first, the 99/4 console
 - * second, the monitor
 - * third, the floppy disk drive(s) and/other peripherals
 - * fourth, the Winchester Disk Drive Cabinet
 - * finally, the TI Peripheral Expansion System

Note that this is the reverse order of powering up the system. When ready to power up, start with the TI Peripheral Expansion System, then the Winchester Disk Drive, etc.

The 99/4 console is always the last to be powered up.

3. Power Up the 99/4 monitor and console only to check to see that they are working properly. If this checks out then, Power Down again.
4. Unplug the Peripheral Expansion System. Check that the Peripheral Expansion fuse is not blown by looking at the fuse to see if the wire is broken. If the fuse is blown, follow "Changing the Fuse" instructions in the Peripheral Expansion Manual. After replacing the fuse, plug the system back into the wall outlet.
5. Determine which problem occurred during your initial power up sequence and reference the appropriate corrective action outlined here.

5.0 PRODUCT PERFORMANCE

5.2 TROUBLESHOOTING THE HARDWARE

RED LIGHT ON THE WINCHESTER DISK DRIVE FAILED TO GO ON

1. Make sure the entire system is OFF. You should have followed the Power Down sequence outlined above.
2. Reseat the Personality Card by following the Personality Card insertion instructions outlined in Section 2.4.1.
3. Check that all connections are properly made. This includes the Peripheral Expansion System to the console and to the Winchester Disk.
4. Reference the instructions outlined in Section 2.4.2 and REPEAT the procedure to connect the Personality Card to the Winchester and to connect the Winchester to 115 V power.
5. Power Up the system again. If the red light still fails to illuminate, refer to Section 5.4 on Maintenance, Warranty and Service Information.

RED LIGHT ON THE PERSONALITY CARD FAILED TO GO ON WHEN THE CONSOLE WAS TURNED ON

1. Make sure the entire system is OFF. You should have followed the POWER DOWN sequence outlined above.
2. Remember, the Personality Card light goes on and off very quickly when the console is turned on so it is easy to miss.
3. Reseat the Personality Card according to the instructions outlined in Section 2.4.1 and POWER UP the system.
4. If you still don't see the light flash on, then you need to check if another accessory card is causing a general system problem. Remove all accessory cards from the Peripheral Expansion System and one at a time, insert a card, power on the system, and determine if that card is functional. If it is, power down and try another accessory card. If it still seems that the problem is with MYARC's Personality Card, refer to Section 5.4 on Maintenance, Warranty and Service Information.

WINCHESTER DISK AND FAN FAILED TO ACTIVATE

1. Make sure the entire system is OFF. You should have followed the POWER DOWN sequence outlined above.
2. Check for a blown fuse in your building's circuits or in the Winchester Disk Drive Cabinet. UNPLUG THE WINCHESTER DISK DRIVE FROM THE WALL SOCKET.
 1. Check your building's circuit breaker or fuse box to determine if the wall socket fuse is blown.

5.0 PRODUCT PERFORMANCE

5.2 TROUBLESHOOTING THE HARDWARE

2. TO CHECK AND CHANGE THE WINCHESTER DISK DRIVE CABINET FUSE:

Pry the fuse compartment open on the Winchester Disk Drive power socket. The socket is located on the back of the cabinet underneath the rocker switch. The fuse compartment is the rectangular section over the three pronged socket. To pry open, insert screwdriver under lip in middle of fuse holder cover. Remove cover containing two fuses. The fuse next to the cover is a spare, the one behind it is the operational one. The fuse is blown if the filament is broken and/or the fuse is cloudy. If the fuse is blown, remove blown one, snap in spare and reinsert fuse cover unit into compartment.

3. If, upon repowering the unit, the spare fuse blows immediately, refer to Section 5.4 on Maintenance, Warranty and Service Information.

RED LIGHT ON PERSONALITY CARD STAYS ON PERMANENTLY AND THE CONSOLE DISPLAY DOES NOT APPEAR

1. Turn the entire system OFF. You should have followed the POWER OFF sequence outlined above.
2. Reseat the Personality Card by following the Personality Card insertion instructions outlined in Section 2.4.1, wait 2 minutes before repowering.
3. If this same problem recurs, refer to Section 5.4 on Maintenance, Warranty and Service Information.

DISK DOES NOT INITIALIZE PROPERLY

1. Follow the instructions for hardware malfunctions outlined above in "First Step for Hardware Malfunctions." Power up the system again and try to Initialize the disk by following the instructions in Section 3.3.1A, Initialize Disk. Remember to use the utility diskette labeled "Floppy Disk Based."
2. If the disk fails to initialize, perform the disk diagnostic for a "Destructive Test." The procedure for this is outlined in Section 3.3.4B on the "Destructive Test." The test will identify which hardware malfunction is causing the problem. After performing the destructive test, call MYARC for directions on what to do next.

DEBUG

C 1000, 1 (CARD LIGHT TURNS ON
M 5FFE 5030 WDS Ready
0101 not ready

5.0 PRODUCT PERFORMANCE

5.3 ERROR MESSAGES IN THE DISK MANAGEMENT SYSTEM

Below is a list of error messages that may appear while using MYARC's Disk Management System utilities. These messages relate to hard disk operations only.

<u>MESSAGE</u>	<u>CAUSE</u>	<u>CORRECTIVE ACTION</u>
1. INVALID DISK/DIRECTORY/ FILE NAME	*periods or blank spaces embedded within a name	*delete periods and/or spaces in disk directory or file name
2. PATHNAME ERROR	*a directory included in the pathname does not exist	*find out what directories exist by invoking either LIST DIRECTORY and working down the directory structure or MAP DISK for a known directory
	*pathname contains embedded blank spaces, periods, "typo," or ends with a period	*delete blank spaces or periods in disk, directory or file names. Correct "typo" if appropriate
	*pathname exceeds 40 characters or the Directory or file name was entered containing more than 10 characters	*rename directories and files so the pathname does not exceed 40 characters. Check pathname for "typos"
3. FILE/DIRECTORY DOES NOT EXIST	*last name in pathname does not exist but all previous directories do	*find out what files exist by invoking LIST DIRECTORY or CREATE a new directory or OPEN a new file
4. DISK ERROR	*an invalid disk number or disk name was accessed	*obtain an up-to-date listing of disk contents by invoking MAP DISK
	*the disk was not properly initialized and must be re-initialized	
	*the disk may have developed bad media	*perform DISK DIAGNOSTICS to determine if this is the case
5. FILE PROTECTED: CANNOT BE DELETED	*delete file was attempted on a protected file	*unprotect file and re-issue DELETE FILE commands
6. (DIRECTORY) or (FILE) ALREADY EXISTS	*an attempt was made to create or rename a directory or file to a name that already exists	*create or re-name the file or directory with a different name

5.0 PRODUCT PERFORMANCE

5.4 MAINTENANCE, WARRANTY AND SERVICE INFORMATION

MAINTENANCE

The Winchester Disk is factory sealed in a contaminant proof casing so dirt and dust cannot accumulate on the disk. This eliminates the need for preventative maintenance procedures common to most disk systems.

The reliability of the Winchester does not eliminate the need for normal good placement and care practices outlined in Section 2.3 on "Placement and Care of the WDS." We recommend periodic review of that section to ensure continued reliable operation.

WARRANTY

1. Coverage

The WDS/100 carries a 90-day limited warranty against faulty workmanship and materials. This warranty extends to the original purchaser of the WDS/100.

The warranty is void if the WDS/100 has been damaged by accident, unreasonable use, improper or unauthorized service, neglect or other causes not arising out of defects in materials or workmanship. The warranty is also void if the seals to the Winchester Disk Drive or the Personality Card are broken or otherwise tampered with.

2. Disclaimer

Any implied warranties arising out of this sale, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, are limited in duration to the above three-month period. MYARC, INC. shall not be liable for loss of use of the hardware or other incidental or consequential costs, expenses or damages incurred by the consumer or any other user.

3. Legal Remedies

This warranty gives you specific rights, and you may also have other rights that vary from state to state.

4. Performance

During the three-month warranty period, MYARC will repair or replace the defective unit with a new or reconditioned unit (at MYARC's option) when a return is authorized by MYARC, INC. or a duly appointed agent of MYARC, INC. Please refer to the following section on return authorization, service and shipping procedures.

5.0 PRODUCT PERFORMANCE

5.4 MAINTENANCE, WARRANTY AND SERVICE INFORMATION

The repaired or replacement unit will be warranted for three months. Other than your return shipping costs, there is no charge for repair or replacement of in-warranty units if the unit is returned properly packed in the MYARC shipping carton. MYARC strongly recommends that you insure the unit for its value prior to shipment. Repaired or replacement units will be returned to you shipping prepaid within the Continental U.S. unless you request special shipping way.

5. Out-of-Warranty

All out-of-warranty repairs are handled on a time and materials basis. Upon receipt of the unit at our factory, MYARC, INC. will promptly notify you of the estimated service charges and time for repairs.

For fast turnaround, you may choose to use our "Quick Service" plan where, upon return of your damaged unit to MYARC, we will immediately send you a new or refurbished replacement unit. Prices for this service will be based on the rates in effect at the time of the exchange. An approximate charge for this is one-third the total list price of the replaced component. Write to MYARC for more details on this plan.

SERVICE

1. Hardware

Since the WDS/100 is a software system in combination with a complex piece of electronic equipment, malfunctions may be attributable to a variety of causes. FOR THIS REASON, IT IS CRITICAL THAT YOU CALL MYARC, INC., YOUR DEALER OR YOUR OEM TO OBTAIN RETURN AUTHORIZATION FOR IN-WARRANTY REPAIRS OR REPLACEMENT. WE STRONGLY RECOMMEND THAT REQUESTS FOR OUT-OF-WARRANTY REPAIRS ARE ALSO CALLED IN BEFORE RETURN SHIPMENT. THIS MAY ULTIMATELY SAVE YOU TIME AND MONEY BY POSSIBLY AVOIDING UNNECESSARY SHIPPING AND SERVICE COSTS.

2. Hardware Service and Shipping Instructions

- a) BEFORE CALLING, REFER TO AND FOLLOW ALL INSTRUCTIONS IN EITHER THE TROUBLESHOOTING THE HARDWARE OR ERROR MESSAGES IN THE DISK MANAGEMENT SYSTEM SECTIONS OF THIS MANUAL. THE LISTED CORRECTIVE ACTIONS WILL FREQUENTLY ELIMINATE ANY PROBLEMS.
- b) If your Troubleshooting does not resolve the problem, confirm with MYARC, INC. that the unit requires servicing. If the unit is in-warranty, you must have our verbal or written return authorization. MYARC will instruct you on which unit(s) need to be returned. Generally we will request that you send back the entire unit including the Winchester Disk Drive Cabinet, the Personality Card and the power cord. For return authorization, write or call us at: P.O. Box 140, Basking Ridge, NJ 07920 (201) 766-1700.

5.0 PRODUCT PERFORMANCE

5.4 MAINTENANCE, WARRANTY AND SERVICE INFORMATION

c) To protect against possible loss:

- *INSURE THE UNIT FOR ITS FULL VALUE PRIOR TO SHIPPING.
- *PACK THE WDS/100 IN ITS ORIGINAL SHIPPING CARTON.
This carton was custom engineered to protect the unit from shipping and handling shocks.

d) Enclose in the carton, your name and address, your phone number, and RETURN AUTHORIZATION number provided to you. Please be sure to enclose a description providing details of the malfunction. Return the unit, shipping and insurance PREPAID to our manufacturing location: MYARC, INC.
462 Main Road (Route 202)
Towaco, New Jersey 07082

3. Technical Questions

BEFORE CALLING, REFER TO SECTIONS 4.2 AND 5.3 ON ERROR CONDITIONS. THESE SECTIONS PROVIDE CORRECTIVE ACTIONS TO ELIMINATE ERROR CONDITIONS.

If you have additional questions concerning the WDS/100 software interface with the TI Operating System or WDS/100 Disk Management Utilities, Call MYARC (201) 766-1700. Please note this is not a toll free number and we cannot accept collect calls.

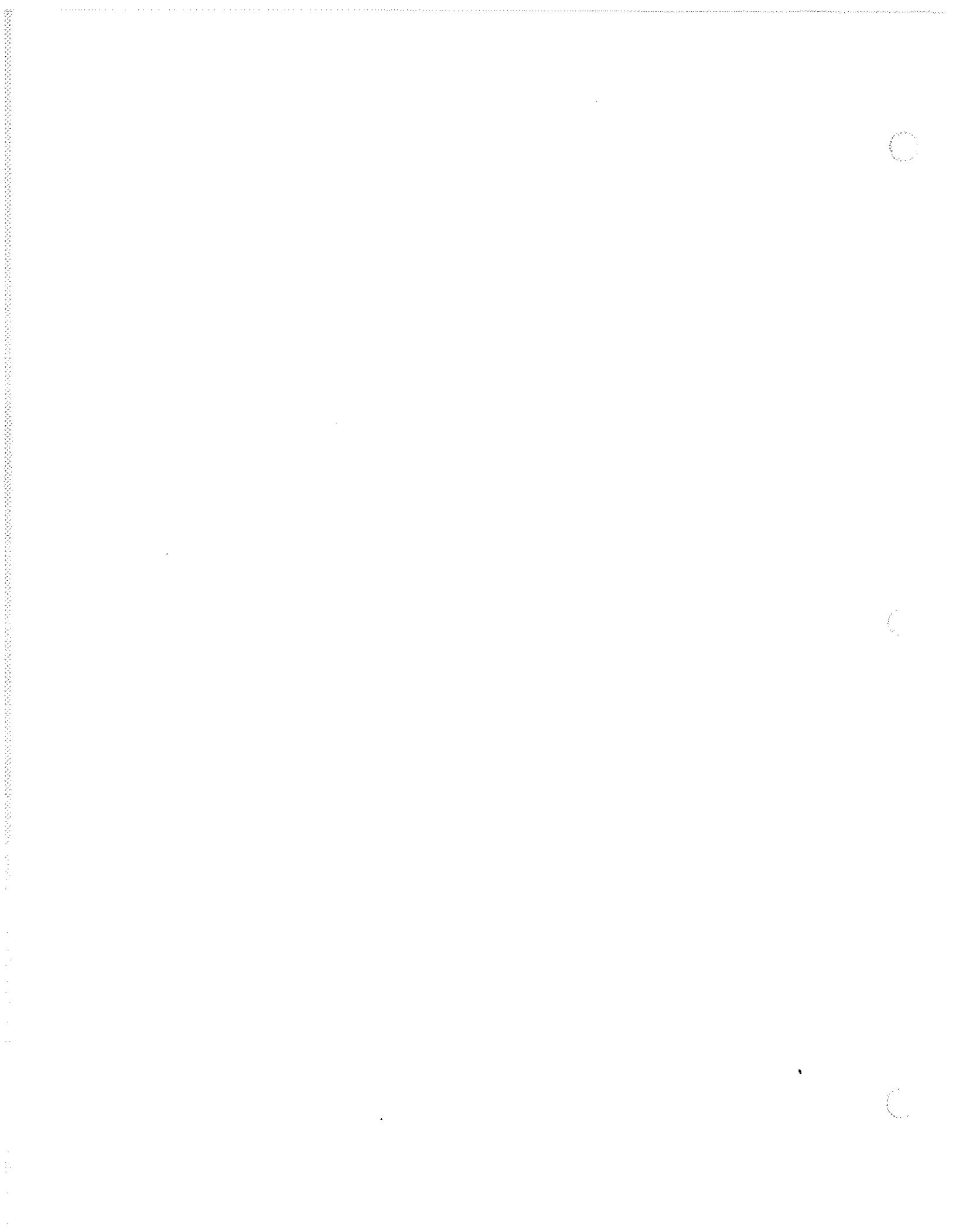
4. Business Hours

MYARC office hours are 9am-5pm, E.S.T. (Standard or Daylight as appropriate) Monday through Friday except for legal holidays.

APPENDIX A

PHYSICAL CHARACTERISTICS

	<u>5-Megabyte</u>	<u>10-Megabyte</u>
PHYSICAL CHARACTERISTICS		
BYTES UNFORMATTED	6.38 MB	12.75 MB
BYTES FORMATTED	5 MB	10 MB
PLATTERS	1	2
ACTIVE DATA SURFACES	2	4
READ/WRITE HEADS	2	4
TRACKS	306	306
TRACK DENSITY	345 tracks/inch	345 tracks/inch
RECORDING DENSITY	7690 bits/inch	7690 bits/inch
ROTATIONAL SPEED	3600 RPM+ 1%	3600 RPM+ 1%
AVERAGE LATENCY	8.3 ms	8.3 ms
TRACK-TO-TRACK ACCESS TIME	3 ms	3 ms
DATA TRANSFER RATE	5.0 Mbits/s	5.0 Mbits/s
START TIME	15 secs.	15 secs.
STOP TIME	15 secs.	15 secs.
DISK DRIVE CABINET	5 3/8" H x 6 7/8" W x 14 3/4" L	5 3/8" H x 6 7/8" W x 14 3/4" L
POWER REQUIREMENTS		
LINE VOLTAGE	110-120 VAC	
LINE FREQUENCY	60 HZ	
ENVIRONMENTAL REQUIREMENTS		
TEMPERATURE, operating	50° to 98° F	
TEMPERATURE, storage	-40° to 140° F	
RELATIVE HUMIDITY, operating	80% MAX, non-condensing	
RELATIVE HUMIDITY, storage	80% MAX, non condensing	



APPENDIX B

PRODUCT SUGGESTION/PROBLEM REPORT FORM

MYARC, INC.
P.O. BOX 140
BASKING RIDGE, N.J. 07920

Please enclose this form to report problems with the hardware, software and/or the documentation. We are also interested in hearing your suggestions for product improvement.

Contact Name: _____ Telephone: _____

Address: _____

City: _____ State: _____ Zip Code: _____

What does this problem report/suggestion concern:

Hardware ___ Software ___ Documentation ___

Please describe the problem and/or suggestion. So that we can best understand your input, please include the following information:

Suggestion/Problem

Information to Include

Hardware

Model type and serial number of your unit

Date of purchase

Specific problem

Software

Describe case you've encountered. Include listings and console terminal messages as appropriate.

If you've discovered a permanent or temporary solution, please describe it.

Documentation

Provide the page number and indicate the relevant section where the error is found or which you are commenting on.

Product improvement suggestion

Please describe your product improvement suggestion and give an application example.

Please forward your input to MYARC, Inc. at the above address. We appreciate your feedback.

C

C

C

APPENDIX C

WDS/100 DISK OPERATIONS WITH TI ASSEMBLY LANGUAGE

When you use the WDS/100 with Assembly Language, you can anticipate assembly times being 3 to 4 times faster than they are with a floppy disk system. Unlike with a floppy, you also have the option of transferring data directly to CPU memory without going through VDP RAM. This speeds application processing time considerably. How this is done is explained in more detail below.

Aside from these benefits, there are no other differences in operation or capability between using TI Assembly Language with the WDS/100 and using it with the floppy disk system. There are however important considerations to keep in mind when using TI Assembly Language with the WDS/100. They are:

- * All the suggestions for maximizing system performance described in Section 5.1 are applicable to TI Assembly Language operations on the WDS/100.

- * Assembler Editor

Source code files, object code files, and list files for the Assembler may be stored on the WDS/100.

Edit files for the Editor may also be stored on the WDS/100.

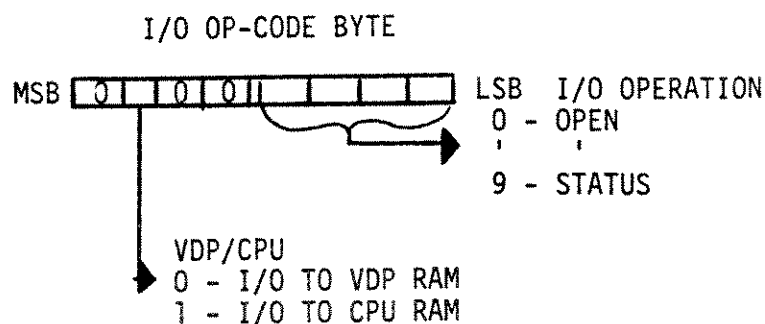
- * The Assembler Editor Cartridge

The Assembler Editor Cartridge is hard coded which means you must continue to load the Assembler/Editor programs from DSK1.

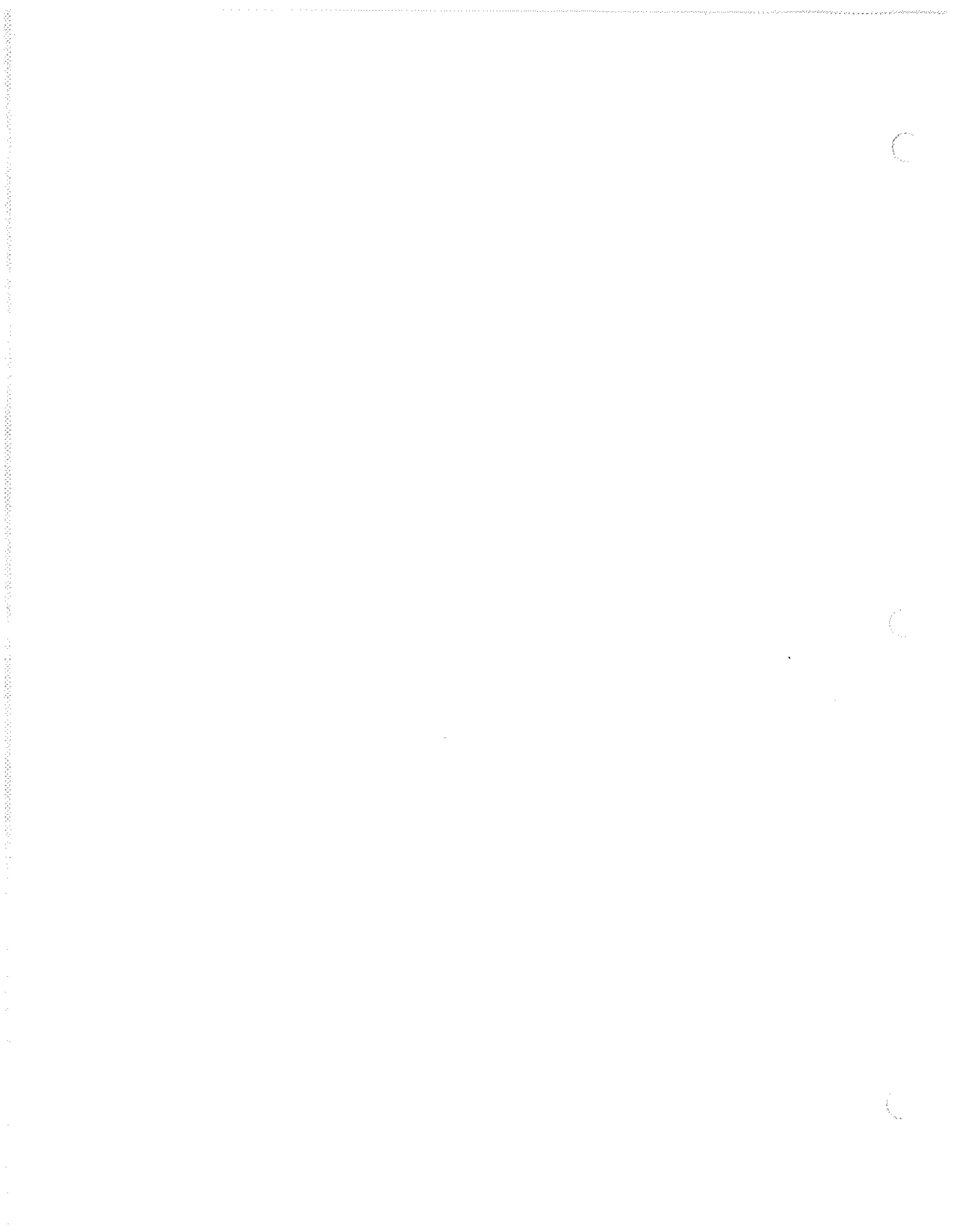
- * Maximum numbers of OPEN files

The system will support 12 concurrent OPENed files. If for example, your Source, Object and Listing files are on the WDS/100, then you can have a maximum of 9 additional OPEN files. Since a COPY statement also OPENS a file, the 9 additional OPEN files include all files OPENed plus all files OPENed through the COPY statement. You could have an additional COPY statement or OPENed file if, for example, one of your files, source, object or listing, was on a floppy.

To load and run programs faster, you can transfer data directly to CPU Memory Expansion. This is done by setting the proper bit in the I/O Op-code byte of the Peripheral Access Block (PAB) as follows.



Refer to the File Management section of TI's Editor/Assembler Manual for more information on PAB's, I/O Op-codes and how to perform I/O from Assembly Language.



APPENDIX D

THE WDS/100 CLOCK OPTION

The WDS/100 clock option provides the capability of date and time stamping files and directories. For data files, the system date/time stamps creation and last revision dates. For directories and program files, the system date/time stamps creation dates only. The clock option will also date/time stamp disk initialization. This is described more fully in the section following the "INITIALIZE TIME" instructions outlined below.

Date and time information is shown in Map Disk and List Directory listings.

For directories and program files, the date stamp will show the creation date and time. For a directory listing that is printed to the screen, the date/stamp format is:

DIRECTORIES

<u>NAME</u>	<u>SIZE</u>	<u>TYPE</u>	<u>P</u>
Example	2	Directory	U

MM/DD/Y HH:MM

Where: MM is a 1 or 2 digit variable for the month when the directory or program file was created.

DD is a 1 or 2 digit variable for the day when the directory or program file was created.

Y is a 1 digit variable for the last digit of the 4 digit year (e.g. "2" for 1982; "3" for 1983) when the directory or program file was created.

HH is a 1 or 2 digit variable for the hour when the directory or program file was created. Hours are based on a 24 clock (e.g. "14" is 2 o'clock pm).

MM is a 1 or 2 digit variable for the minute when the directory or program file was created.

If the listing is printed in hard copy, the date/time stamp will also indicate the seconds and all four characters in the four digit year. The date/stamp format for a printed directory listing is:

DIRECTORIES

<u>NAME</u>	<u>SIZE</u>	<u>TYPE</u>	<u>P</u>	<u>CREATED</u>
Example	2	Directory	U	MM/DD/YYYY HH:MM:SS

Where: SS is 1 or 2 digit variable for the second when the directory was created.

For data files, the format is the same as the directory and program file date/stamp format. In addition, the last revision date is indicated.

The date/stamp format for data file listings that are printed to the screen is:

FILES

<u>NAME</u>	<u>SIZE</u>	<u>TYPE</u>	<u>P</u>
Example	23	D/VAR 80	P

MM/DD/Y

The "LAST REVISED" date is the last time the file was actually written to.

The format for data file listings that are printed in hard copy is:

<u>NAME</u>	<u>SIZE</u>	<u>TYPE</u>	<u>P</u>	<u>CREATED</u>	<u>LAST REVISED</u>
Example	23	D/VAR 80	P	MM/DD/YYYY HH:MM:SS	MM/DD/YYYY HH:MM:SS

The creation date is the actual date the directory or file was created. For program files, this is when the file is actually SAVED. For data files, this is when the file is created or when you initiate OPEN OUTPUT to a data file in TI BASIC. When autocreating a file (by OPENing or SAVEing a previously non-existent file in TI BASIC), the creation date is the date of autocreation.

The same principle holds true for creation dates for restored directories. If RESTORE recreates a directory, then the creation date is the date the directory was RESTORED.

All Map Disk, List Directory, Delete Directory, Back-Up Directory and Restore Directory listings are also date and time stamped. The appropriate time information is shown at the top of the listing.

At system start-up or whenever powering up the peripheral expansion system, the actual date and time must be input to the system to set the clock. This is called "INITIALIZE DATE & TIME." Since the WDS/100 does not check for incorrect time or date entries (eg. "13" in the month column or "25" in the hour column), it is imperative that the date and time are ENTERed correctly. If they were incorrectly ENTERed, the TIME function can be re-initialized to set the clock properly.

The time device is intelligent enough to account for Feb. 29th during leap year, but a new year must be re-ENTERed at the beginning of each year.

The "TIME" device can be initialized from TI BASIC, TI Assembly Language or from the WDS/100's Initialize Time (ID) utility.

To initialize "TIME" from TI BASIC:

1. First, the "TIME" device must be opened. The correct format is:

```
OPEN #file number: "TIME",INTERNAL,FIXED 23
```

2. Next, the "TIME" device must be printed to. The correct format is:

```
PRINT #file number: MIN$, HOUR$, DAY$, MONTH$, YEAR$
```

The variables MIN\$, HOUR\$, DAY\$ and MONTH\$ are 2 characters long. Leading zeroes are necessary for variables that are 1 digit in length. (eg. "01" for January). The variable YEAR\$ is 4 characters long.

3. To read the time, ENTER,

INPUT #file number: SEC\$, MIN\$, HOUR\$, DAY\$, MONTH\$, YEARS\$

An example of how to use the TIME device in a TI EXTENDED BASIC program is shown in a program on the MYARC Utility Diskette. The program can be accessed by ENTERing: DSK.WDS.&TMIT.

To initialize "TIME" from Assembly Language:

1. Access "TIME" through the Peripheral Access Block (PAB).
2. Call "TIME" through the DSRLINK as you would with any I/O device.

To initialize "TIME" from the Disk Management System:

1. The "Initialize Date & Time" option will immediately appear by pressing any key after the WDS/100 Disk Management System is first accessed. The screen will read:

INITIALIZE DATE & TIME

MINUTES :MM
HOURS(0-23) :HH
DAY OF MONTH :DD
MONTH :MM
YEAR :YYYY

ENTER the appropriate information. Precede a single digit number with a "0" ("02" for 2 minutes, "01" for January, etc.). If the number ENTERed exceeds the proper range of the variable (25 for hours), the system will "beep" and the cursor will return to the first position in the entry line. The correct information can now be ENTERed.

Once all information is ENTERed, the system will go to the MYARC MAIN menu. If you had previously ENTERed the date/time, simply press return if the cursor is at the minutes (MM) position. The screen will read:

MYARC WINCHESTER SYSTEM

!!!:MM:SS
MM:DD:YYYY

MAIN MENU

DM-DISK MANAGEMENT
DR-DIRECTORY MANAGEMENT
FM-FILE MANAGEMENT
DD-DISK DIAGNOSTICS
ID-INITIALIZE DATE/TIME
SD-SHOW PRESENT DATE/TIME
EX-EXIT

As shown here, the current date and time appears at the upper right hand corner of the MAIN menu.

2. If SHOW PRESENT DATE/TIME (SD) is ENTERed, the date/time stamp on the MAIN menu is updated to reflect the present time.

If INITIALIZE DATE/TIME (ID) is ENTERed, the system will return to the previous INITIALIZE TIME menu and the clock can be re-set.

Using the clock option to date/stamp the time of disk initialization:

The TIME device will also date/stamp the time of disk initialization. Since the WDS/100 "clock" is located on the MYARC Personality Card (and not on the Winchester Disk) the clock can be initialized before initializing the disk. If the disk is ever re-initialized and the time has been re-set, the system will date/stamp the time of disk re-initialization.

To date/stamp the time of disk initialization, ENTER the appropriate date/time information from the INITIALIZE TIME program. Once this is complete, the MAIN menu will appear and you can proceed with Disk Initialization.

The only place where the disk initialization date/stamp appears is in the "SHOW DISK STATUS" screen printing. When "SHOW DISK STATUS" is invoked, the screen will read:

SHOW DISK STATUS

DISK #1
IS NAMED: X
SECTORS USED: XXXX
SECTORS AVAILABLE: XXXXX
CREATION DATE/TIME:
MM/DD/YYYY HH:MM:SS

PRESS REDO TO RESTART
BACK TO ABORT

APPENDIX E

Copying the MYARC Disk Management Utilities to the Hard Disk

To further improve the productivity of your hard disk system, the MYARC Disk Management Utilities can be copied to the hard disk. Once the utilities are hard disk resident, you can initiate all Disk Management Utilities (except Initialize Disk) without using the floppy diskette.

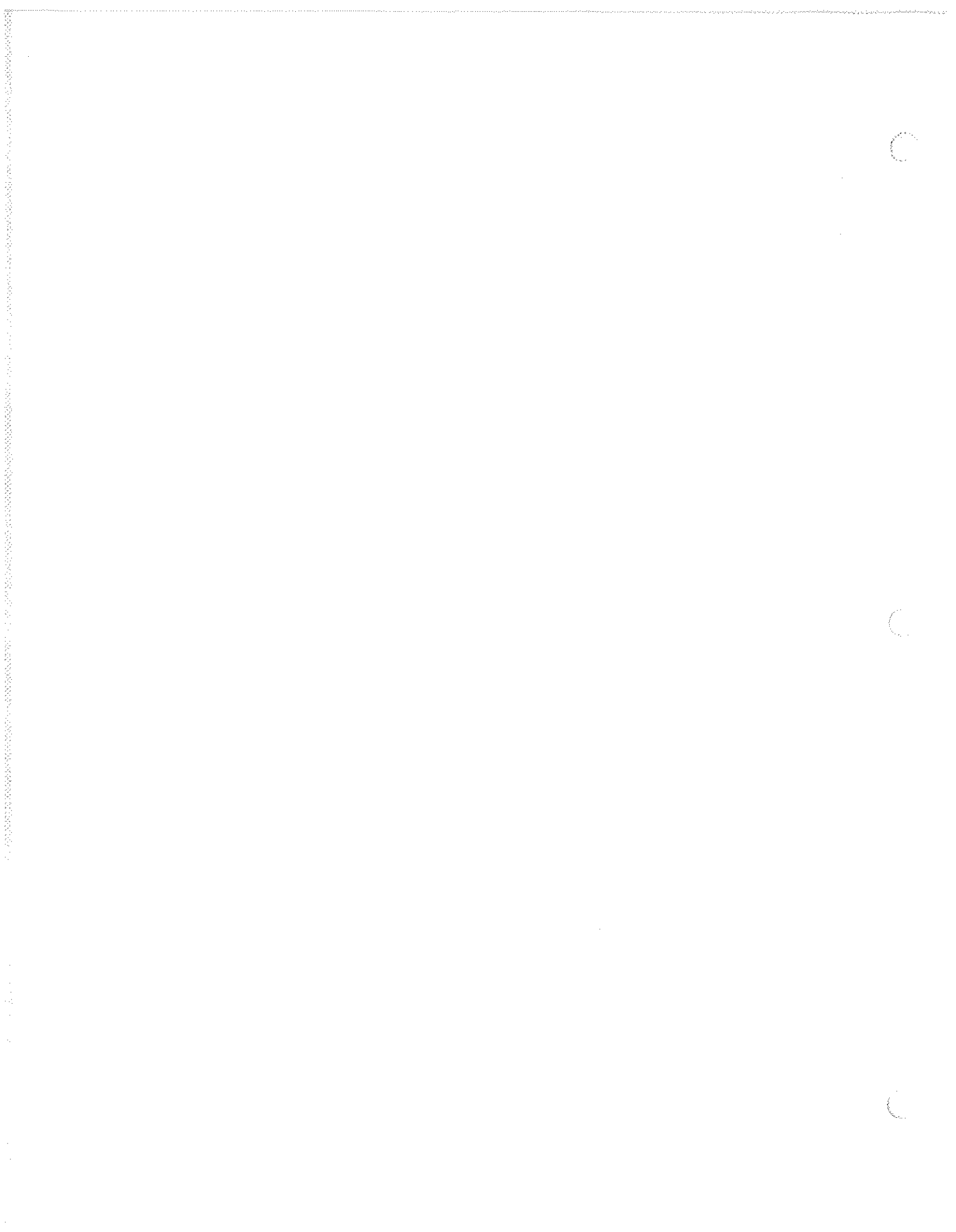
To copy the utilities to the hard disk:

1. Insert the MYARC utility diskette labeled "Floppy Disk Based" in the diskette drive.
2. Create a directory labeled "WDS1.UT". If another directory already exists with this name, re-name that directory.
3. The next step will be to copy the software from the diskette labeled "Winchester Based" to the Winchester using the RESTORE utility.

Invoke the Restore Utility by ENTERing RE from the Directory Management Menu. When the system prompts for the back-up directory pathname, ENTER "WDS1.UT". The system will then ask for the diskette drive number. ENTER the appropriate diskette drive number from which you are restoring the utilities. Finally, the system asks for the back-up diskette name and you ENTER "UT". To complete RESTORE, follow the same sequence from this point on as you would for a normal RESTORE.

4. Once the RESTORE procedure is complete, test to make sure the utilities have been copied by ENTERing RUN "WDS1.UT.LOAD". The MYARC MASTER SCREEN should appear.
5. After completing this procedure, the MYARC Disk Management Utilities can always be accessed from TI EXTENDED BASIC with the command "RUN "WDS1.UT.LOAD".

NOTE: Remember, the Winchester can only be initialized using MYARC's "floppy disk" based utility diskette.



APPENDIX F

Running cartridge based or other applications from the WDS/100/Emulating Floppy Diskettes on the Hard Disk

Program Software for some of the well known TI cartridge applications (eg. TI-Writer, Assembler/Editor) or any program software that accesses DSK1 or DSK.DISKETTE NAME (eg. Multi-Plan), can be run from the WDS/100. This is done by making the WDS/100 emulate the device "DSK1" or the volume named "DSK" and by copying the program software to a file in a Winchester based directory created as WDS1.DSK1 or WDS1.DSK.DISKETTE NAME. When the system is directed to look for a program file in "WDS1.DSK1" or "WDS1.DSK.DISKETTE NAME," it will search for the program file on the Winchester Disk and if it does not find it, will pass control over to the device named DSK1 or DSK. Hence, the system will actually load the program software from either the Winchester Disk or floppy diskette. This is true however only for DSK1. Whenever a program accesses "DSK2" or "DSK3", the system will never search the Winchester.

As an example, to be able to run the Editor/Assembler entirely from the hard disk:

1. Create a directory named "WDS1.DSK1."
2. Copy the three Assembler/Editor files as follows:

from DSKx.EDIT1 to WDS1.DSK1.EDIT1
from DSKx.ASSM1 to WDS1.DSK1.ASSM1
from DSKx.ASSM2 to WDS1.DSK1.ASSM2
3. Once the files are copied, the system is ready to load the program files from the hard disk by using the regular Editor/Assembler cartridge.

Other applications besides the TI cartridges can use this capability as well. Therefore, the following is a summary on how this powerful feature works:

If DSK1.file name or DSK.diskette name.file name is accessed in a program, control is passed to the WDS/100 system. If the device being searched for is DSK1, then the WDS/100 system searches for a directory whose pathname is WDS1.DSK1. If it is not found, the system passes control to the TI floppy disk system. If found, it continues to look for the file name in directory WDS1.DSK1. If found, it will use this file for processing (whether it is a data or program file). If not found, it will pass control to the TI floppy disk system.

The same is true for an access to DSK.diskette name.file name, where it searches for the pathname WDS1.DSK.diskette name.file name where diskette name is a subdirectory of DSK and DSK is a subdirectory of WDS1. If any of these directories/files are not found, control is passed to the TI floppy disk system.

C

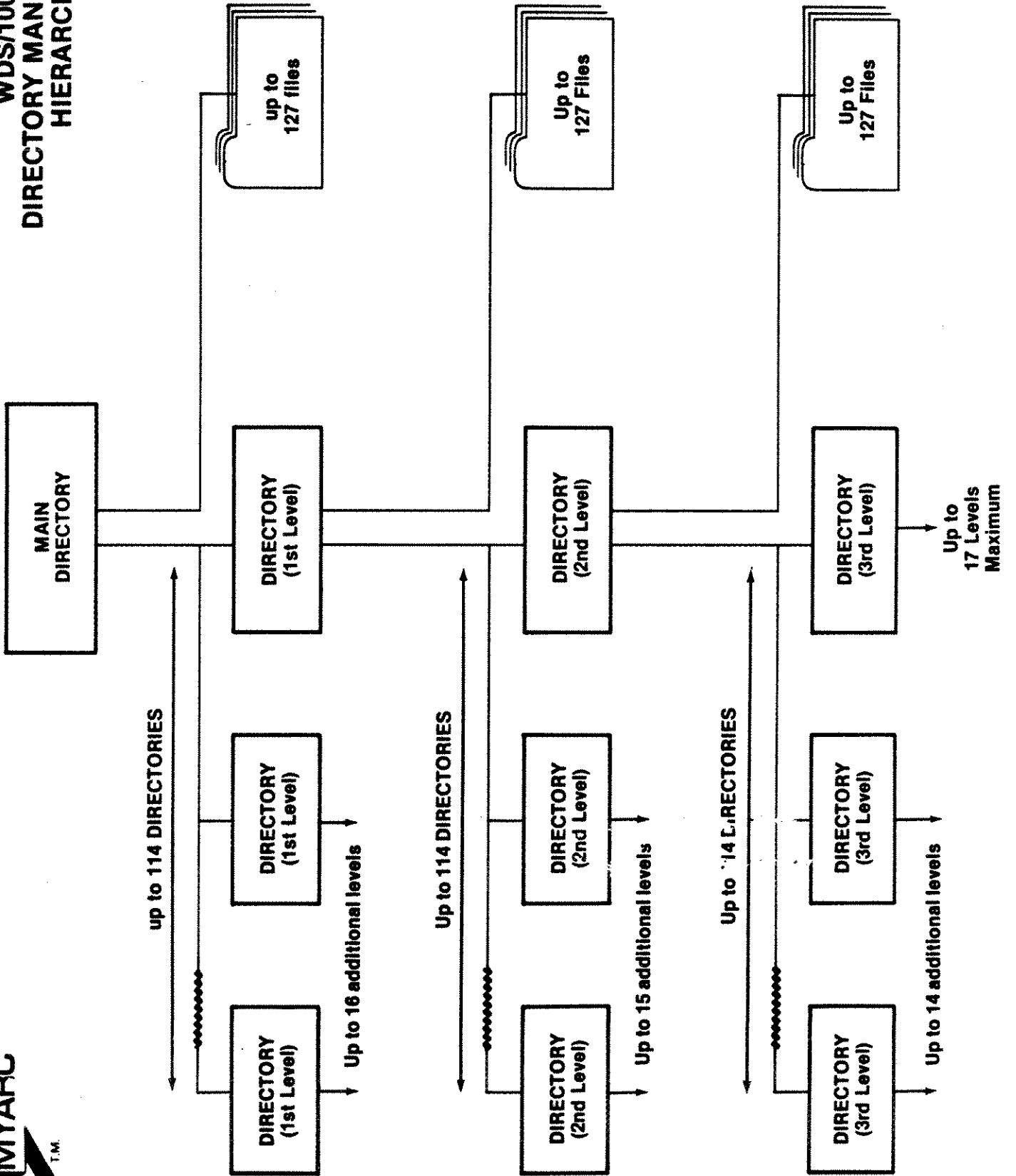
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C



WDS/100 DIRECTORY MANAGEMENT HIERARCHY

EXHIBIT A



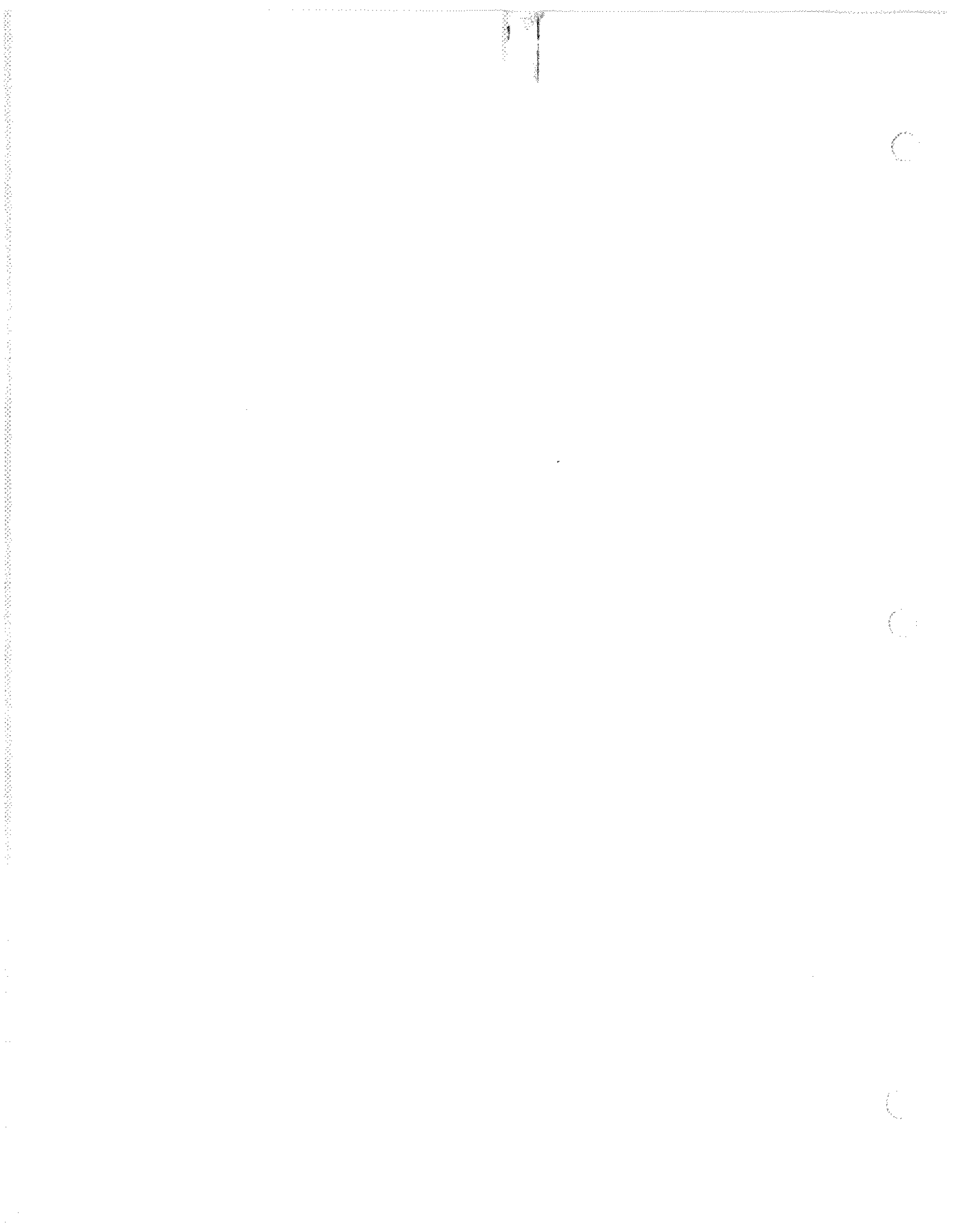
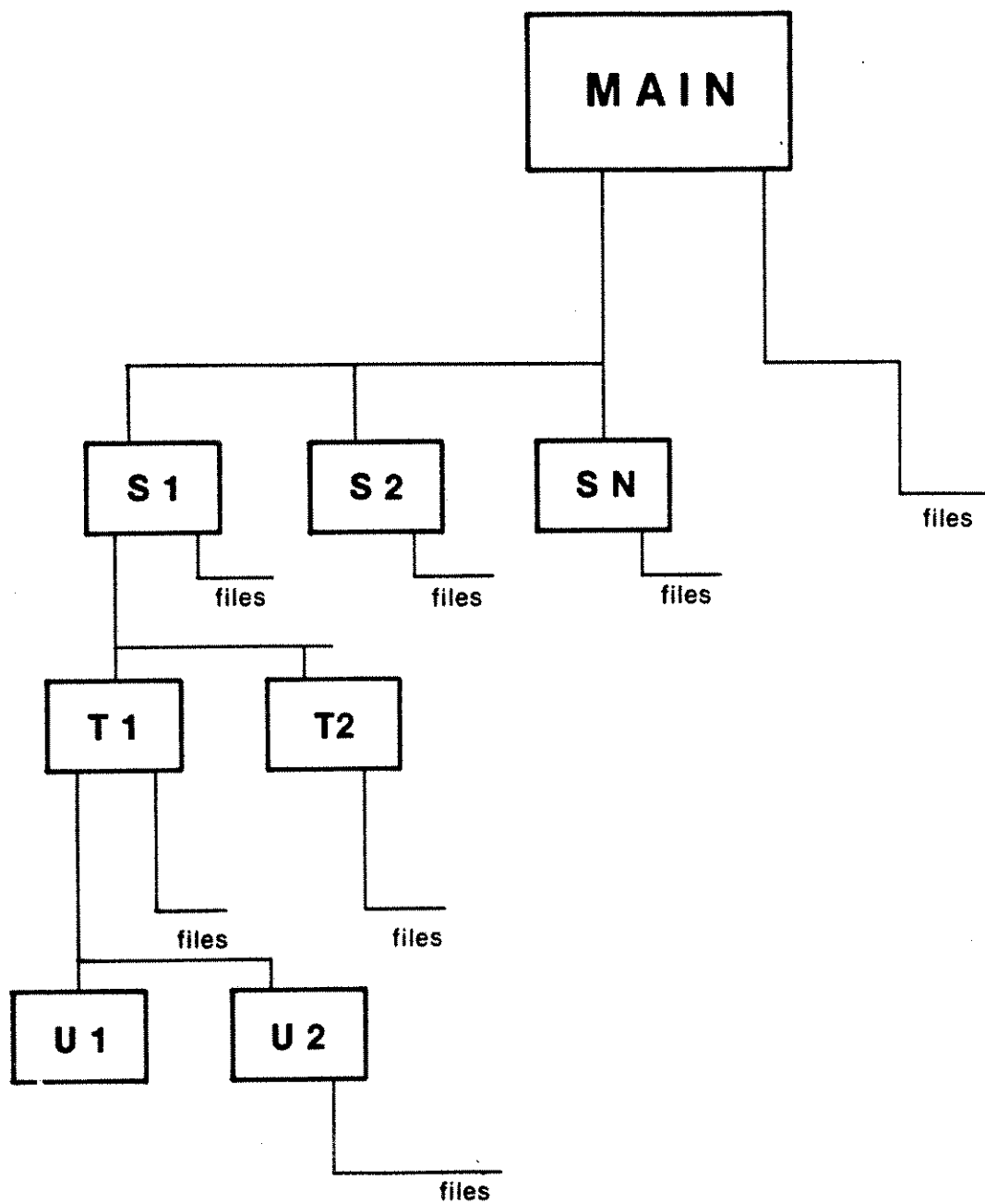
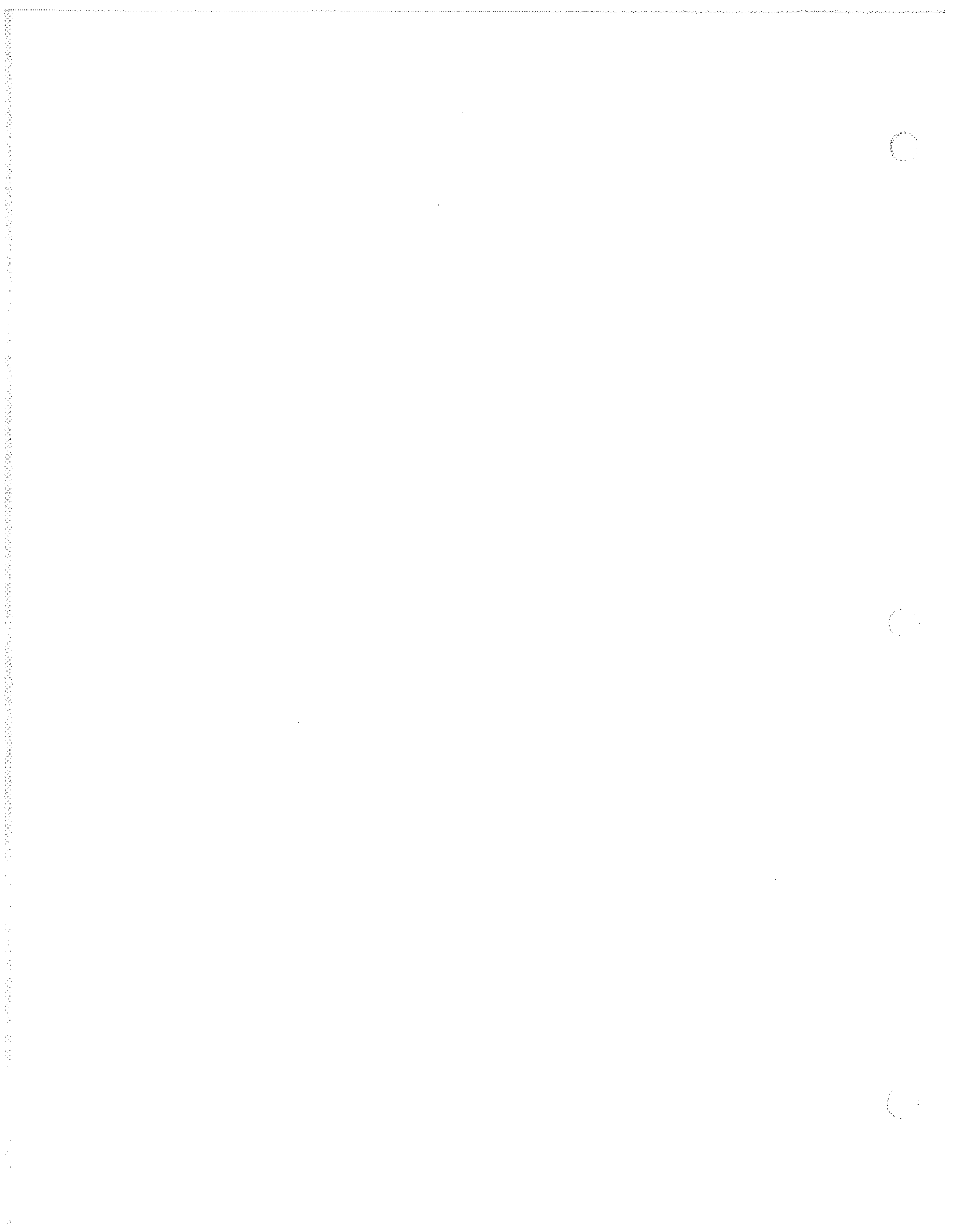


EXHIBIT B





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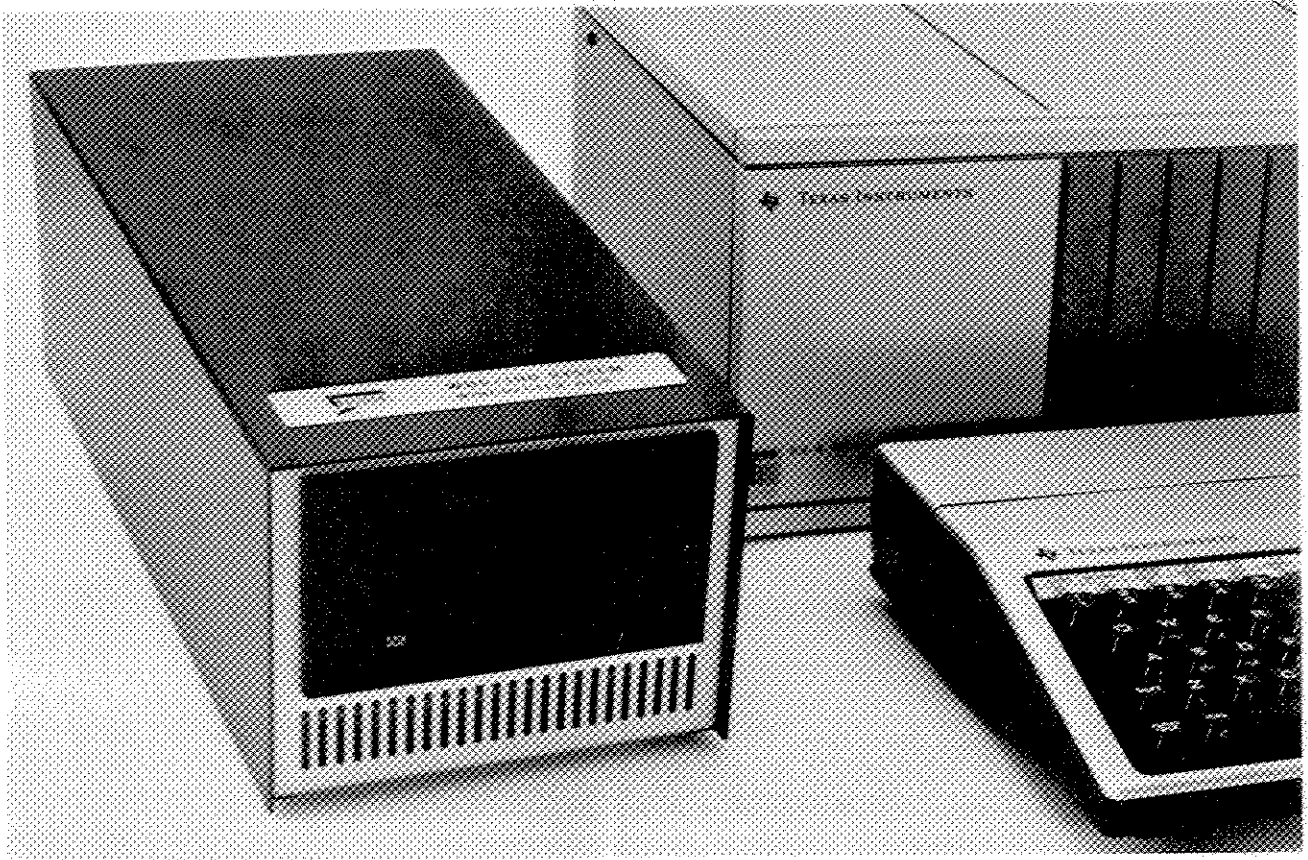
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Winchester Disk And Controller System



MYARC's WDS/100

The newest MYARC product combines a unique system of "Directory" management with Winchester technology for the TI microcomputer.

MYARC, INC. presents its Winchester Disk and Controller System, the WDS/100, which brings hard disk capacity and reliability to users of the TI 99/4(A). MYARC's UNIX*-like "Directory" management uniquely adapts to the file processing requirements of individual users while program and data file integrity is maintained thru MYARC's error correction coding. Available in 5-, 10- and 15-Megabyte models, the WDS/100 is simple to install and requires no costly preventative maintenance!

*a trademark of Bell Laboratories

MYARC packs this and much more into its WDS/100 system at a competitive price. It offers:

Winchester Disk Reliability And High Speed Performance

MYARC's system architecture exploits these features to get the most from the WDS/100.

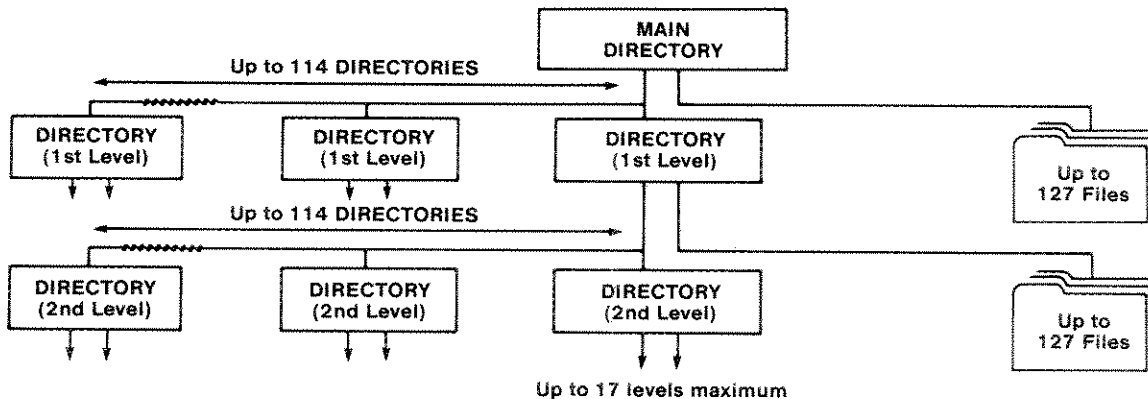
Minicomputer-Like Functionality

Greater on-line storage reduces processing and programming time.

MYARC's firmware resident device service routine — immediately available when power is applied at start up — further speeds operation.

Customized "Directory" Management

The WDS/100 file management system adapts to individual user requirements. Files are grouped into directories. Directories, in turn, can be grouped into higher level directories. Directory groupings can go on for a total of 17 levels with up to 127 files and up to 114 sub-directories for each directory at all levels! This amount of file processing flexibility provides sophisticated capabilities not available on micros today.

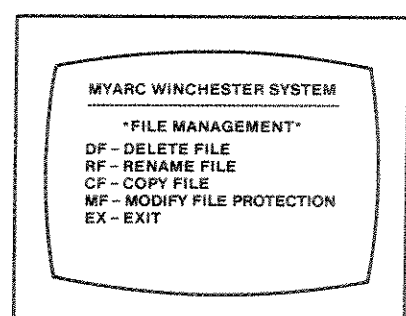
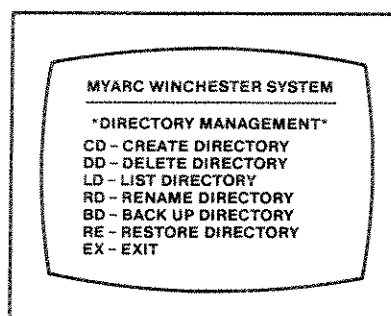
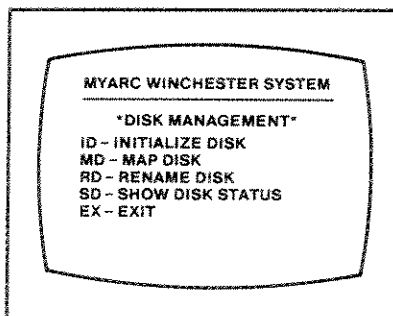


State-Of-The-Art ECC

MYARC takes data integrity one step further — single bit error correction and double bit error detection ensure the safety of the data-base.

Complete Array Of Disk Utilities

The WDS/100 offers Winchester-adapted, TI 99 microcomputer disk utilities . . .



Order Form
(Please Print Or Type)

Date: _____

Mail To:
MYARC, INC.
P.O. Box 140
Basking Ridge, N.J. 07920

<u>Ordered by:</u>	<u>Shipping address if different:</u>
Name _____	_____
Street Address _____	_____
City, State _____	_____
_____ Zip Code	_____ Zip Code

Quantity	MYARC Model No.	Product Description	Unit Price	Total
	WDS/100-5	5-Megabyte Storage	\$2500.00	\$1899-
	WDS/100-10	10-Megabyte Storage	\$2000.00	\$2199-
	WDS/100-15*	15-Megabyte Storage	\$3000.00	NOT AVAILABLE
	Clock Option If Desired		\$50.00 Each	INCL.

*Available On Special Order

Subtotal \$ _____

Payment Method

Please check one:

- Payment in full is enclosed
~~(deduct 2% from Total Price)~~
- Payment of 10% of Total Price enclosed - Balance due C.O.D.

Sales Tax
(N.J. residents) _____

Total Price \$ _____

less payment enclosed
(Minimum of 10% of
total price required) _____

C.O.D. Balance Due \$ _____
(not including shipping
and C.O.D. charges)

Make Checks Or Money Order Payable To MYARC, INC.
Payment Must Be Made In U.S. Dollars

(Price And Order Information On Reverse Side)

WDS/100

Retail Price And Ordering Information

Price:

WDS/100 Winchester Disk and Controller Systems are available in 5-, 10- and 15-Megabyte capacities. Quoted prices include all necessary components — the Winchester Disk Drive Cabinet with flexible cable, the MYARC Personality Card, the MYARC Utility Diskettes, and User Documentation. The WDS/100 has a 90-day limited factory warranty.

Model	Description	Price
WDS/100-5	5-Megabyte storage	\$2500 \$1899-
WDS/100-10	10-Megabyte storage	\$2000 \$2199-
WDS/100-15	15-Megabyte storage	\$3000 NOT AVAIL.
Clock Option	Date and time-of-day	\$50 INCL

Shipping:

Units are shipped FOB factory and normally will be sent shipping and insurance charges collect.

Ordering:

All orders must be accompanied with a minimum deposit of 10% of the total purchase price. The balance will be due payable C.O.D. in cash, U.S. money order or Bank Cashier's Check. Shortly upon receipt of your order, MYARC will send acknowledgement and notification of shipping date.

When orders are accompanied with full payment (check or money order), MYARC ~~will allow a credit of 2% of full purchase price and~~ will prepay all shipping and insurance costs.

Orders received for shipment outside the Continental United States must be accompanied with full payment. Orders will be shipped F.O.B. our factory and are not subject to the 2% prepayment credit.

N.J. residents are subject to and must pay applicable N.J. sales tax.

May 1984

PRICES EFFECTIVE ~~FEBRUARY, 1983~~

The Map Disk utility, for example, provides a comprehensive listing of disk directories and files. With MYARC's clock option,* files are displayed with creation and last revision date and time stamps.

*slight additional cost

Map Disk Listing Example

○	DISK MAPPING FOR: WDS1 DIRECTORY				04/28/1983 19:20:49	
○	<u>NAME</u>	<u>SIZE</u>	<u>TYPE</u>	<u>P</u>	<u>CREATED</u>	<u>LAST REVISED</u>
	DIR1	2	DIRECTORY	U	5/18/1982 16:40:30	
	FILE1	52	I/VAR	P	8/11/1982 12:15:00	12/20/1982 9:55:35
○	DISK MAPPING FOR: WDS1 DIRECTORY DIR1					
○	<u>NAME</u>	<u>SIZE</u>	<u>TYPE</u>	<u>P</u>	<u>CREATED</u>	<u>LAST REVISED</u>
○	FILE1	7	PROGRAM	U	3/18/1983 12:50:34	
	FILE2	13	D/FIX	P	7/20/1982 13:42:53	3/25/1983 17:46:32
	FILE3	20	D/FIX	U	3/21/1983 9:45:22	3/21/1983 11:20:21
	FILE4	22	I/FIX	U	3/22/1983 10:26:18	3/25/1983 9:21:26
○	SUMMARY					
○	NUMBER OF DIRECTORIES - 2					
	NUMBER OF FILES - 5					
	SIZE OF DIRECTORY - 118					

Reliable Back Up

The WDS/100 special utility diskette provides back up facility for Winchester-based files. Recommended procedures minimize back up time and maximize the reliability quotient of the Winchester disk system.

Simple Transition To A Hard Disk Environment

Conversion is not a problem — all TI 99 floppy based files are upward compatible.

User learning curves are minimal — WDS/100 commands and utilities are similar to TI Disk Management commands.

Easy Installation

Just insert the MYARC Personality Card into the Peripheral Expansion System and connect the Winchester Disk Drive to it with one flat lead connector.

Compact, the Winchester disk drive can be flexibly configured.

No special power circuits required. Uses regular 115V line.

TI Extended Basic And Assembly Language Support

Serious software developers will appreciate MYARC's sophisticated facilities. Using TI BASIC, the programmer can simultaneously "OPEN" up to 12 files without using system memory. With TI Assembly Language, the programmer can obtain direct I/O from CPU memory. This speeds processing up to a factor of 10!

Reliability And Factory Warranty

The Winchester Disk Drive is sealed to prevent errors caused by contaminants and the non-contact read/write heads eliminate media wear. All components are of the highest quality and the complete system is rigorously tested and "burned-in" before shipment. The WDS/100 carries a 90-day limited warranty against faulty workmanship and materials.

Service

Prompt out-of-warranty service is provided from our factory. A special "Quick Service" plan for exchange/replacement is also available.

WDS/100 Components

- Five, ten or fifteen Megabyte Winchester Disk Drive Cabinet With Cable and 115 VAC power cord.
- MYARC's Personality Card
- MYARC's 5¼-inch Utility Diskettes
- Complete User Documentation

99/4 (A) Components Required For Operation

- TI 99/4 or 99/4A Console
- CRT Monitor
- One 5¼-inch Floppy Disk Drive
- TI Peripheral Expansion System
- TI Extended Basic
- TI Memory Expansion

<i>Physical Characteristics</i>	<i>Model WDS/100-5</i>	<i>Model WDS/100-10</i>	<i>Model WDS/100-15</i>
Bytes formatted	5MB	10MB	15MB
Platters	1	2	3
Read/write heads	2	4	6
Tracks	306	306	306
Track density	345 tracks/in.	345 tracks/in.	345 tracks/in.
Recording density	7690 bits/in.	7690 bits/in.	7690 bits/in.
Disk drive cabinet	5½"H x 6¾"W x 14¾"L	5½"H x 6¾"W x 14¾"L	5½"H x 6¾"W x 14¾"L
<i>Performance</i>		<i>Environmental Requirements</i>	
Data transfer rate	5.0 Mbits/s	Temperature, operating	50° to 98°F
Rotational speed	3600 RPM	Temperature, storage	-40°F to 140°F
Track-to-track access time	3ms		
<i>Power Requirements</i>			
Line voltage	110-120 VAC	Relative humidity, operating	80% Max. non-condensing
Line frequency	60HZ	Relative humidity, storage	80% Max. non-condensing

Address all inquiries
to your local dealer:

[

or:

MYARC, INC.

P.O. Box 140

Basking Ridge, N.J. 07920

(201) 766-1700

]