Disk Memory System
Model No. DDCC-1
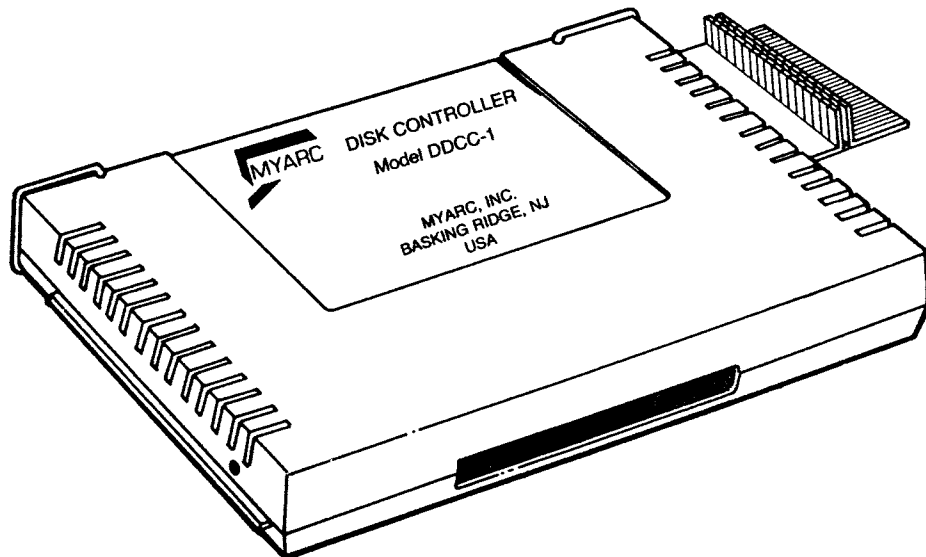
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SCOPE OF THIS MANUAL

This manual describes the installation and operation of MYARC's Model DDCC-1 Disk Controller Card for use with TI's PHP 1200 Peripheral Expansion System.

Major portions of this manual, i.e., those sections dealing with technical descriptions of the TI 99/4A Home Computer System functions, their operation, and detailed instructions for system operation by the user, have been reproduced directly from TI's PHP 1240 Disk Memory System Manual.

Only minor changes relating to the improvements and technical advancements of the MYARC Disk Controller System have been made in the reproduced text.

WE RECOMMEND THAT FIRST-TIME USERS READ THE ENTIRE MANUAL BEFORE PROCEEDING WITH INSTALLATION AND OPERATION.

INTRODUCTION

The MYARC Disk Drive Controller (Card) Model No. DDCC-1 is a further improvement and a technical advancement over the TEXAS INSTRUMENT Disk Controller (Card) Model No. PHP 1240.

MYARC's DDCC-1 disk controller can read and write *both* single-density (SD) *and* double-density (DD) formatting. The PHP1240 can only handle single-density formatting.

MYARC's disk controller system is totally compatible with TI's single-density formatting so that you can both read existing, and write new, floppies in TI single-density format as well as in double-density format.

MYARC's Disk Memory System consists of the following:

> FLOPPY DISK DRIVE CONTROLLER — The disk drive controller, which can control up to four disk drives*, instructs the disk drive(s) where to position the magnetic heads in order to read or write information properly. The controller also puts an index on the diskette, making the data that has been written easy to locate. The DDCC-1 controller system has total flexibility to control double-density (DD) or single-density (SD) and double-sided (DS) or single-sided (SS) disk drives.

> Notes: 1. The DDCC-1 disk controller will control any combination of 4 double-sided or 4 single-sided disk drives. This disk controller also reads and writes interchangeably — and equally well — to the standard TI 99/4A format, single-density diskette.

> 2. If a floppy diskette has been formatted for *DOUBLE-SIDED* operation (single- or double-density), it *CANNOT* be processed on a *SINGLE-SIDED* disk drive. However, formatted, single-sided diskettes can be processed on a double-sided disk drive.

> 3. A floppy diskette formatted in double-density cannot be read in a single-density drive. Any information "read" will be unreliable.

*Purchased Separately

DISK MANAGER COMMAND MODULE — The Disk Manager "Solid State Software" Command Module*, packed with your DDCC-1, helps you maintain the information on your diskettes. Initializing, naming and renaming files, deleting files, copying files and copying diskettes all can be easily performed with the Disk Manager module plugged into the 99/4A console.

Because all control software (firmware) needed for the disk system is in permanent ROM in both the Disk Manager Module and the disk drive controller, the disk memory system uses only a relatively small amount of working space in the computer's available memory (RAM). The Disk Manager Module provides many advanced functions. For instance, in copying a diskette, it rearranges the files on the diskette alphabetically. Also you have the choice of copying selected files instead of an entire diskette. These and many other unique features are described in this manual.

This new disk based management system is an incredible upgrade from the Texas Instruments original equipment disk manager. Some of the many features include single stroke file handling, screen control of colors, Editor Assembler load and run screen, complete control of formatting in three modes, including TI standard double density,(320K) TI standard single density, and NON STANDARD (360K), plus many more. We know you will agree that the MYARC disk controller and disk management system are the highest quality and most versatile disk control peripherals offered in the industry.

PLEASE READ THIS ENTIRE MANUAL BEFORE USING THE DISK MANAGER PACKAGE!!! With the powerful commands available, the user could lose valuable data if not familiar with the operation of this software package.

*The TI Disk Manager "Solid State Software" Command Module II is designed to provide these utilities for up to three (3) disk drives only. If you are using a fourth drive, the DDCC-1 provides disk control and operation of drive #4 when using most other compatible software.

Features of your System

The most important use of the disk system is storage and retrieval of information via TI BASIC programs. Through the proper BASIC commands, you can:

■ SAVE PROGRAMS — Each single-sided diskette holds over 1,312,000 bits of information, while a double-sided diskette holds over 2,624,000 bits of information. As an example, you can store approx. 127 BASIC programs, each 70 lines long, on a single-sided diskette.

■ STORE AND RETRIEVE DATA — You can store data that is accumulated when your programs are run. One single-sided diskette can hold about 164,000 characters, and a double-sided diskette can hold twice as many characters.

■ UPDATE DATA — Through a BASIC program, you can update the information in your files so that they contain the latest, most accurate data.

The Disk Manager Command Module can also be used to maintain information about the diskettes, such as the name of the diskette and the names of the files. Using the Disk Manager module you can:

■ INITIALIZE DISKETTES — Initialization prepares diskettes for use by the system. The routine provides the diskette with header information for each sector. *Note*: New diskettes must be initialized before they can be used.

■ NAME DISKETTES — Each diskette is given its own name, so that the computer can verify that the proper diskette is in place.

■ RENAME, DELETE, AND COPY FILES — These functions also can be performed via TI BASIC; however, the Disk Manager Command Module helps you quickly and easily rename files, delete files, and make copies of files.

■ MODIFY PROTECTION — You may want a file protected so that it cannot be accidentally erased or changed. You can use the Disk Manager Command Module to protect files and, when you want to change them, to release them from protection.

■ COPY DISKETTES — Diskettes are a very reliable storage medium. However, under certain circumstances, the data stored on a diskette can be totally or partially lost. For instance, if electrical power fails while the disk drive is writing on a diskette, some data could be lost. To protect your data, it is customary to make backup diskettes. The Disk Manager module makes it easy to copy diskettes for backup even if you have only one disk drive.

■ PERFORM TESTS — To ensure that the disk system is operating correctly, the Disk Manager Command Module offers two different tests. The first checks several general areas to see that things are as they should be. The second is an exhaustive test. At the end of the tests, all data on the diskette may have been removed. Before testing a diskette, be sure to make a back-up copy; this test overwrites all of the data on the diskette.

Certain other Command Modules also operate with the disk system to save and load your data. See the manuals for each module for further information.

DISKETTE INFORMATION

Your DDCC-1 disk system requires 5¼ inch, single-sided (double-sided if you have the DS option), double-density, soft-sectored diskettes. These diskettes are constructed of a highly flexible plastic film, coated with a thin layer of iron oxide which can be magnetized in very small areas without affecting surrounding areas. The computer interprets these areas of magnetization as coded information.

Note: A diskette comes in a protective jacket inside a storage envelope. For best results, keep the diskette in the storage envelope except while using. Never remove the diskette from its protective jacket.

A single-sided, double-density diskette is divided into tracks which are 40 concentric circles. The tracks are numbered from 0 to 39, starting at the outside track. Each track, in turn, is divided into 16 sectors. Thus, there are 640 sectors, each of which can contain up to 256 bytes of information, or 2048 bits. The sectors are numbered 0 through 639, starting with sector 0 of the first track and going to sector 639 on the last track. Each sector has additional space used only by the controller to verify sector identification and data accuracy.

A double-sided, double-density diskette has 80 tracks. The tracks are numbered 0 to 39 on one side, starting with the outer track, and 40 to 79 on the other side, starting with the inner track. Each track is divided into 16 sectors giving a double-sided diskette 1280 sectors. Each sector can contain up to 256 bytes of information, or 2048 bits. The sectors are numbered 0 to 1279, starting with sector 0 on the first track of the lower side, and sector 639 on the last track of the lower side. Sector 640 is on the last track of the upper side and sector 1279 is on the first track of the upper side. Each sector has additional space used only by the controller to verify sector identification and data accuracy.

The disk controller uses sectors 0 and 1 of the first track to form an index of file locations. If those sectors become damaged and unreadable, the computer cannot locate any files on the diskette, and the contents of the entire diskette will be unusable.

To use your disk drive system, insert the proper diskette, and use TI BASIC or a Command Module designed to operate with the disk system. The work of keeping track of your files and reading from, or writing on, the proper place on the disk is taken care of by the system.

Diskettes can be named for reference purposes. The name of a diskette can be up to 10 characters long and may use any characters except the period and the space character. Valid names for diskettes include:

DISK21	MYDISK	MY_DISK	PRK_DATA
TIRK_DATA	GEORGE	BACK_UP	BU03/24/80

The following are not valid diskette names.

3.1416	MY DISK	THISNAMEISTOOLONG

Write-Protecting Diskettes

Diskettes have a notch in the edge of their protective container. As long as the notch is left open, the drive functions normally. Covering the notch with a piece of special tape provided with the diskette prevents writing on the diskette. When you have a diskette containing programs or data that you want to protect, cover the write-protect notch. Then the information cannot be accidentally written over. If you want to write on the disk later, the tape can be removed.

Caring for Diskettes

1. Handle the diskette by its protective cover. Do not touch any part of the diskette's surface; fingerprints will destroy disk contents.

2. Be careful not to bend the diskette.

3. Do not write on the diskette cover with a ball-point pen or pencil; only use a felt-tip pen.

4. Do not scratch the surface of the diskette. Any scratch, even if too small to be seen, may destroy all the information on a number of sectors. This usually causes information to be lost from most of the files on the diskette.

5. Do not expose diskettes to magnetic fields or excessive heat or cold.

6. Do not place tape of any kind (masking or other) on the surface of a diskette.

7. Do not remove a diskette from a drive if the drive light is on.

Any magnet or magnetic field can affect data on a diskette. Do not bring any magnet near a diskette, and do not put a diskette near or on top of anything that generates a magnetic field, such as a television, a monitor, a speaker, etc. Also be aware of more obscure magnetic sources, such as magnetic cabinet latches, magnets in children's toys, and magnetic note holders. As a general rule, do not store diskettes within three feet of any magnetic source.

CAUTION

Never put a diskette in the drive until the controller and disk drive are properly connected and power is turned on to all units. Also, never insert or remove diskettes when the drive light is on.

Diskettes should always be stored in their protective jackets.

SET-UP INSTRUCTIONS

Once you've unpacked the unit, you're ready to insert the Controller Card into the peripheral system. (Save the packing material for storing or transporting the unit.) The steps involved in inserting and checking the operation of the Disk Drive Controller Card, an internal disk drive, and external disk drives are included in this section. Please read this material completely before proceeding.

CAUTION

Electronic components can be damaged by static electricity discharges. To avoid damage, do not touch the connector contacts.

The Peripheral Expansion System unit has eight slots into which accessory cards can be inserted. The Peripheral Expansion Card must occupy slot number 1. (For information on setting up the peripheral system, refer to the Peripheral Expansion System owner's manual.) If you have an internal Disk Memory Drive (Model PHP1250) in the Peripheral Expansion System unit, the Disk Drive Controller Card must occupy slot number 8. Other cards can be inserted in any of the remaining slots.

PLEASE NOTE

1. The set-up instructions provided in this section, including all illustrations, reference original TI equipment. Drives made by other manufacturers may differ in some details.

2. The MYARC DDCC-1 Controller will control up to four (4) disk drives. Except for implementing Utilities, all references in this and in other sections of this manual to three (3) drives and/or DSK1, DSK2, and DSK3 apply also to four (4) drives and DKS1, DSK2, DSK3, and DSK4.

Disk Drive Information

As it comes from the factory, a disk drive is ready to run as the only drive on your system. If you are using more than one drive, complete the following steps for all but one of the drives. The last external drive should be connected without being altered.

DO THE FOLLOWING ONLY IF YOU ARE USING TWO OR THREE DRIVES!

1. WARNING: ALL POWER CORDS MUST BE DISCONNECTED FROM THE POWER OUTLETS DURING THE FOLLOWING PROCEDURE!
2. To remove the cover, do one of the following.
   - *Internal Disk Drive* — On the side of the disk drive is a tab located near the back of the drive. On the back of the drive is a hole designed to help lift the tab to remove the disk drive cover. Remove the cover by lifting the tab and then sliding out the drive's contents.
   - *External Disk Drive* — On all but one of your drives, use a Phillips-head screwdriver to remove the six screws that hold the cover. Lift the cover off.
3. Locate the main printed circuit board. On it, locate the termination resistor pack. It has 14 leads and looks like an integrated circuit. (*Note*: The main boards look slightly different on the internal and external drives, but the pack is in the same place on each.) Be careful not to disturb the strapping pack (or shunt pack, which is also removable) located very near the resistor pack.

SHUNT PACK
TERMINATION RESISTOR PACK
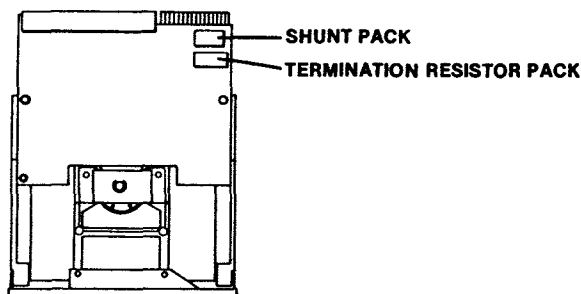
4. Remove the termination resistor pack by prying each end up slightly with a small screwdriver and then lifting it out. Pull straight up.
5. Save the single drive termination resistor pack so that you can reinsert it if the drive is ever to be used again as a single or last disk drive. If you do replace the pack, note that if the socket for the resistor pack has more holes than there are pins on the pack, the pack should be installed toward the outer edge of the circuit board, leaving the unused holes toward the center of the board.
6. Replace the cover on the drive, aligning and tightening the screws carefully. DO NOT OPERATE ANY UNIT WITHOUT REPLACING THE COVER.

The procedure for setting up the Disk Memory System depends on the type of disk drive(s) you have.

- If you have an internal drive only, see "Connecting the Controller Card to an Internal Disk Drive."

- If you are using an internal disk drive with one or more external disk drives, follow the directions in "Connecting the Controller Card to Both Internal and External Disk Drives."

- If you have one or more external drives and no internal drive, follow the directions in "Connecting the Controller Card to External Disk Drives."

Connecting the Controller Card and an Internal Disk Drive

1. Turn off the computer console and all attached devices.
2. WARNING: TO AVOID DAMAGING ACCESSORY CARDS, WAIT TWO (2) MINUTES AFTER TURNING OFF THE UNIT FOR THE POWER TO DISCHARGE BEFORE PROCEEDING.
3. Remove the top from the peripheral system by depressing the latches on the back edge of the top and pulling up.
4. Two Phillips-head screws attach the front casing of the disk drive compartment. One is located on the top of the peripheral system, and the other is on the bottom of the unit. Remove the top screw.
5. Carefully place the Peripheral Expansion System on its left side (the disk drive compartment now should be at the top). Remove the screw on the bottom of the peripheral system.

   Note: Save the screws to secure the internal disk drive in place after it is installed in the Peripheral Expansion System.

BOTTOM VIEW
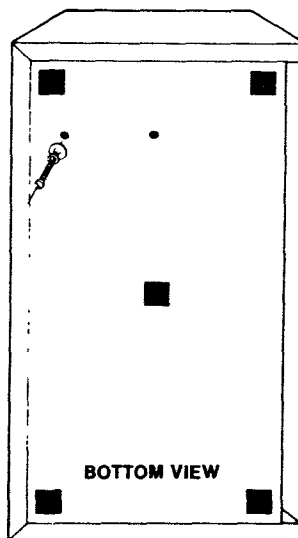
6. Place the peripheral system in its proper upright position, and remove the front casing from the opening of the disk drive compartment. (Save the front casing in case you want to remove the internal disk drive from the Peripheral Expansion System later.)
7. Two flexible cables are packed with the Controller Card: one is for connecting an internal disk drive, and the other is for connecting external drives. Locate the cable which has different types of connectors at each end; this is the cable used to connect the Controller Card to the internal drive. (Save the cable with identical connectors at each end for connecting external drives.)

   Examine the connnector tab on the side of the Controller Card and the 34-pin connector on the internal disk drive connector cable. Note the proper orientation of the two; you will have to connect them through a slot at the back of the drive compartment after the Controller Card is in place. The tab and the 34-pin connector are keyed so that they can only be connected in one way.
8. Next, note that the label identifying the Disk Drive Controller Card is on the top of the card. On the front of the card is an indicator light. The light can be seen from the front of the peripheral system unit when the card is active.

CONNECTOR TAB
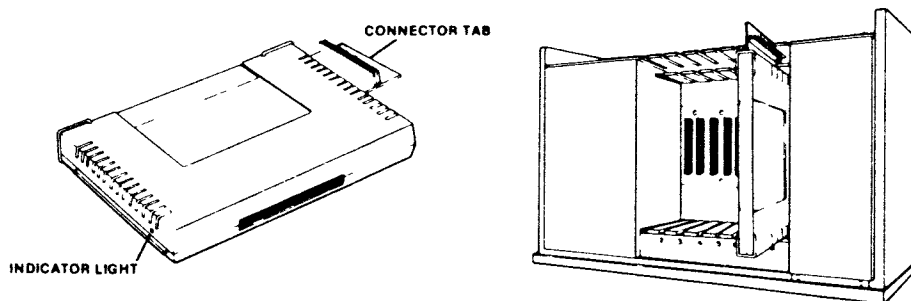
INDICATOR LIGHT

9. Hold the Disk Drive Controller Card so that the indicator light faces the front of the peripheral system and the connector tab faces the back of the unit. Carefully align the card with slot number 8 and press down firmly until the card is in place. (The card can be placed in any slot, but the cable then interferes with other slots.)

10. Attach the 34-pin connector of the disk drive cable to the 34-pin connector on the side of the tab on the Controller Card. You will have to reach through the disk drive compartment to do this. (If you look down into the Peripheral Expansion System from the top, you can see the connector as you make the connection.)

11. A four-wire power cord is inside the compartment. One end of this cord is connected to the peripheral system. Plug the loose end of the cord into the four-pin connector on the back of the disk drive. This connector is also keyed to fit only one way.

POWER CONNECTOR

EDGE CONNECTOR

POWER CORD
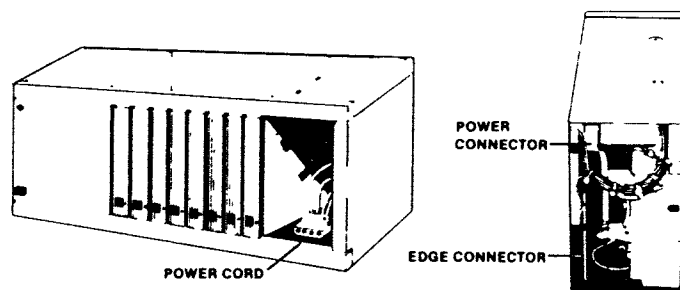
12. Attach the edge connector of the disk drive cable to the 34-pin connector tab on the back of the disk drive.

13. Two screws hold the cover of the disk drive in place. Remove these screws, using a Phillips-head screwdriver, and save the screws for installing the disk drive.

14. Slide the disk drive into the compartment so that the red indicator light is in the top left-hand corner. *Note:* Align the screw openings on the top and bottom of the peripheral system with the holes in the disk drive. If they do not line up, the drive may be in upside down.

SCREW OPENINGS

INDICATOR LIGHT
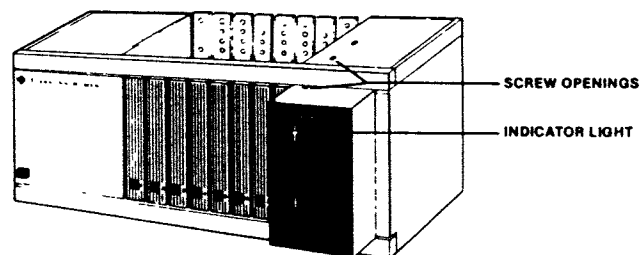
15. Again, carefully place the peripheral system on its left side. Using the screws removed from the front casing and the disk drive cover, insert two screws into the openings on the bottom of the peripheral system. After they are secure, place the peripheral system in its proper upright position, and insert the other two screws in the openings on the top of the system.

16. Replace the top on the peripheral system by sliding the front edge under the extension on the front of the unit. Firmly press down on the back edge of the top. Do not run the system without the top in place; the top ensures proper ventilation. *Note:* If the top does not fit properly, remove the card and realign it in the slot, remembering to press down firmly until the connection is made.

Connecting the Controller Card to both Internal and External Drives

1. If your disk system includes both an internal disk drive (Model PHP 1250) and one or more external drives (Model PHP 1850), first remove the termination pack from the internal drive and install the internal drive and the Controller Card, following the instructions in the preceding section.
2. Connect the flat ribbon connector extending out from your disk drive to the connector tab of the Controller Card which extends from the back of the Peripheral System. Make sure that the pins on the tab align with the holes on the connector cable.
3. If you are using an internal drive, then the internal drive is your drive #1. All additional drives will be numbered, *in sequence,* up to a maximum of four. Do NOT skip over a number.
4. Following instructions in your drive manual, set the pins or switches *in each drive* to correctly correspond to each drive number.

CAUTION

Always disconnect the Peripheral Expansion System before moving the computer console. The cable connecting the console and peripheral system is not designed to support the weight of the units. To prevent damage, always disconnect all devices before moving any part of your Home Computer system. For long distance moves, remove all cards from the Peripheral Expansion System and repack the devices in their original packing material.

Connecting the Controller Card to External Disk Drives

1. Turn off the computer console and all attached devices.
2. WARNING: TO AVOID DAMAGING ACCESSORY CARDS, WAIT TWO (2) MINUTES AFTER TURNING OFF THE UNIT FOR THE POWER TO DISCHARGE BEFORE PROCEEDING.
3. Remove the top from the peripheral system unit by depressing the latches on the back edge of the top and pulling up.
4. The label identifying the Controller Card is on the top of the card. On the front of the card is an indicator light. Hold the Disk Drive Controller Card so that the indicator light faces the front of the peripheral system unit and the connector tab faces the back of the unit.

CONNECTOR TAB

INDICATOR LIGHT
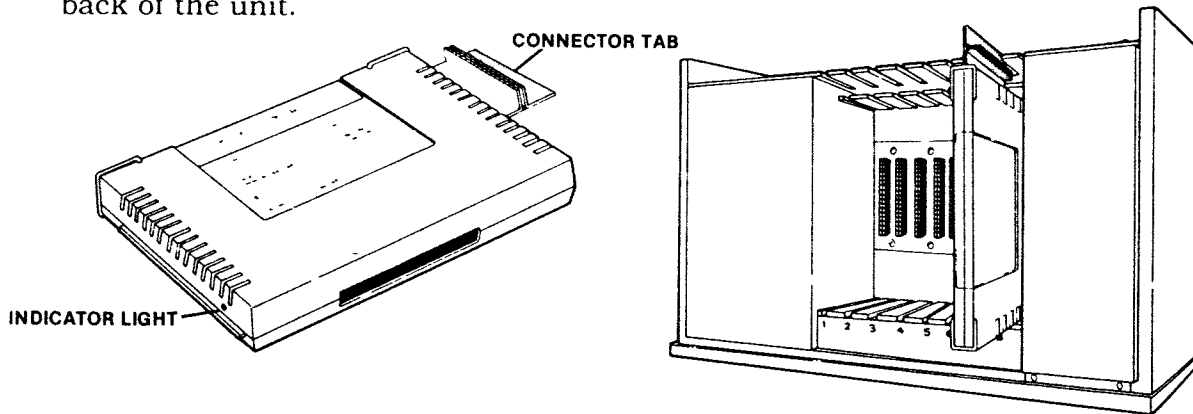
5. Carefully align the card with the desired slot so that the connector tab faces the back of the peripheral system; firmly press the card down into the slot until connection has been made.
6. Replace the top on the peripheral system by sliding the front edge under the extension on the front of the unit. Firmly press down on the back edge of the top. Do not run the system without the top in place; the top ensures proper ventilation. *Note*: If the top does not fit properly, remove the card and realign it in the slot, pressing down firmly until the connection is made.
7. Connect the flat ribbon connector extending out from your disk drive to the connector tab of the Controller Card which extends from the back of the Peripheral System. Make sure that the pins on the tab align with the holes on the connector cable.
8. All these external drives will be numbered, *in sequence*, up to a maximum of four. Do NOT skip over a number.
9. Following instructions in your drive manual, set the pins or switches *in each drive* to correctly correspond to each drive number.

Starting the System

After the Controller Card has been inserted into the Peripheral Expansion System unit and the drives have been connected, plug the power cords into your electrical wall outlets. Next, turn on the power switches on the backs of your external disk drives (if any) and then the switch on the front of the peripheral system unit. *Note*: When you turn on the peripheral system, the internal disk drive is automatically turned on.

WARNING

Each time you operate your computer/disk system, follow this power-up sequence:

1. Turn on the external disk drives.
2. Turn on the Peripheral Expansion System unit.
3. Then turn on the monitor and computer console.

For proper memory allocation by the computer, the Peripheral Expansion System must be ON when the computer console is switched on. Otherwise, the disk drives, Controller Card, and Disk Manager module will not function correctly. The computer console must be turned off and turned back on in order to restore normal operation.

When you turn on the console, the disk drives' working lights may come on briefly and then go off. If they stay on, the disk drive cable is probably plugged in upside down. Turn off all units and make sure that the disk drive cable connections have been made properly.

Testing the System

Note: Do not put any diskettes in the drives yet. If you have more than one external drive attached, they must all be switched on, even if you plan to use only one.

Go into TI BASIC and enter the following program.

```
100 OPEN #1:"DSK1.X"
110 CLOSE #1
```

Run the program and observe drive one (DSK1). The light should come on briefly, indicating that the drive is connected properly. If the drive light does not come on or if it comes on and stays on, check all connections and see that all devices have power. *Note*: The Controller Card light flashes when the controller accesses a disk drive.

Even though the disk drive is operating, the following message appears on the screen because there is no diskette in the disk drive.

```
*1/0 ERROR 06 IN 100
```

Repeat the test for drives two and three if you have them, altering the program to reference DSK2 and DSK3, respectively.

When you have verified that the disk drives are operating, type BYE and press **ENTER**. You are ready to start using your disk system as described in the following sections of this manual. If you have problems in operating the disk system, please review the *Service and Warranty* section thoroughly before returning any units for repair.

Removing the Disk Drive Controller Card

1. Turn off the computer console, Peripheral Expansion System, monitor, and any other attached accessories.
2. Wait two minutes and remove the top from the peripheral system unit.
3. If you have an internal disk drive, disconnect the drive from the Controller Card. (See page 11.)
4. Using both hands, firmly pull to remove the card from its slot in the peripheral system unit.

A QUICK LOOK AT THE DISK SYSTEM

This section describes how you can use the system to initialize a diskette, write a program, save it on the diskette, run the program to write and read information from the diskette, and see the catalog of what is on the diskette.

Make sure that power is supplied to all devices. Turn on the external disk drives, Peripheral Expansion System, monitor, and computer. Insert a new diskette in drive one (DSK1). Plug the Disk Manager Command Module into the computer.

Press any key to proceed. Then select the Disk Manager module by pressing the appropriate number key. After a brief title sequence, the following screen appears.

```
        DISK MANAGER
   1. FILE COMMANDS
   2. DISK COMMANDS
   3. DISK TESTS
   4. SET ALL COMMANDS FOR
      SINGLE DISK PROCESSING

   YOUR CHOICE? 1
```

The number 1 and the cursor (a small rectangle) alternately flash in the space following the YOUR CHOICE? prompt. Some prompts already have an answer in place. These preprogrammed responses (*default values*) represent common or usual answers to these prompts. If the answer is the one you want, just press **ENTER** to confirm it. If you want to give a different response, type the response you want and then press **ENTER**. In this case, number 1 is the default option. However, you want option 4 because only drive one is going to be used at this time. Choosing this option speeds up the processes. Select it by pressing the **4** key and pressing **ENTER**. The screen changes so that what was option 4 now says SINGLE DISK PROCESSING HAS BEEN INITIALIZED.

To select the second option, Disk Commands, press **2** and then press **ENTER**. The following screen appears.

```
        DISK COMMANDS
   1 CATALOG DISK
   2 BACKUP DISK
   3 MODIFY DISK NAME
   4 INITIALIZE NEW DISK

   YOUR CHOICE? 1
```

Again option number 1 is the preselected default. However, every new diskette must be initialized so that the computer can use it. Initialize the diskette by pressing **4** and then pressing **ENTER**. The following screen appears.

```
        INITIALIZE NEW DISK
   MASTER DISK [1-3]? 1
   DISK NOT INITIALIZED

   NEW DISK NAME? _____
```

The prompt MASTER DISK (1 - 3)? has already been answered as 1 because you selected single disk operation. You can answer the prompt NEW DISKNAME? with any valid name up to ten characters long. Valid diskette names can contain any characters with ASCII codes of 32 through 95, with the exception of the period and the space character, since the Disk Manager module recognizes *only* characters in this range. (See the *User's Reference Guide* for a complete list of ASCII character codes.)

For best results, use only upper-case characters A through Z and other characters with ASCII codes of 95 and lower in naming both your diskettes and your files.

Your response to the next three prompts depends on the types of disk controller, disk drives, and diskettes you are using. MYARC'S DDCC-1 SYSTEM supports 40 tracks of single- or double-density data per diskette side. The type of disk drive and diskette you are using determines whether or not you can write to and read from both sides of the diskette.

In answer to the prompt TRACKS PER SIDE?, enter **40**. Most disk drives support **40** tracks per diskette side.

In response to the prompt SINGLE SIDED (Y/N)?, press **Y** and then press **ENTER** if you are using a single-sided disk drive. If both your diskette and disk drive are double-sided, enter **N**. (For more information about diskette types, see page 7 of this manual.)

In answer to the prompt SINGLE DENSITY (Y/N)?, enter **N** if you are using double-density diskettes. Enter **Y** if you are using single-density diskettes.

When you have answered this prompt, the initialization process begins. The time required for initialization is approximately one minute for a single-sided diskette and about two minutes for a double-sided diskette. The message

        INITIALIZE NEW DISK
        WORKING....PLEASE WAIT

is on the screen for a moment. Then the message 0 < WORKING....PLEASE WAIT appears, followed by 1 < , and then 2 >. The number 2 is increased by one as each sector is initialized.

After the initialization process, the message

        DSK1 – DISKNAME = diskname
        AVAILABLE = nnn   USED = nnn

appears. Each sector that is unusable increases the USED number by one and decreases the AVAILABLE number by one.

The following appears at the bottom of the screen:

        COMMAND COMPLETED
        PRESS: PROC'D, REDO,
            BEGIN, OR BACK

Now, press **BEGIN** to return to the main Disk Manager selection list. Then press **BACK**. When the master title screen appears, press any key to go to the master selection list. Select TI BASIC and enter the following program.

```
100 OPEN #1:"DSK1.FIRSTFILE",RELATIVE,INTERNAL
110 FOR A = 1 TO 20
120 PRINT #1:"THIS IS RECORD";A
130 NEXT A
140 INPUT "WHICH RECORD?":A
150 IF A<1 THEN 200
160 IF A>20 THEN 200
170 INPUT #1,REC A-1:A$,B
180 PRINT A$;B
190 GOTO 140
200 CLOSE #1
```

To save the program on the diskette in disk drive one under the name "PROGRAM 1", enter SAVE DSK1.PROGRAM1. The disk drive "working" light goes on, the diskette spins, and the program is saved on the diskette. Enter NEW to erase the program from the computer's memory. Enter OLD DSK1.PROGRAM1. The program is loaded into the computer's memory from disk drive one. Enter LIST to see the program.

Enter RUN to run the program. The disk drive "working" light comes on as twenty items are stored. The prompt WHICH RECORD? appears. Enter a number from 1 to 20. That record is retrieved and displayed on the screen. You can retrieve the records in any order, as often as you like.

When you are finished, enter 21. The file is closed and you are back in TI BASIC. Enter BYE to leave BASIC to ensure that the file is properly closed and no data is lost.

With the master selection list on the screen, select the option for the Disk Manager Command Module. Set the commands for single disk processing as you did before. Again choose option 2, DISK COMMANDS. Then choose option 1, CATALOG DISK, and the following screen asks:

```
CATALOG DISK
MASTER DISK [1-3]? 1
DISKNAME = diskname
WHERE DO YOU WANT LISTING?
1 SCREEN
2 SOLID STATE PRINTER
3 RS232 INTERFACE
4 OTHER
YOUR CHOICE? 1
```

The first prompt, MASTER DISK (1-3)?, has already been answered as 1 because single disk operation has been initialized. Press **ENTER**. You want the catalog on the screen, so press **ENTER** to confirm that choice.

A screen similar to the following appears.

```
DSK1 – DISKNAME = diskname
AVAILABLE = nnn USED = nnn

FILENAME   SIZE    TYPE       P
_____ _____  _____ _

FIRSTFILE         8 INT/FIX 80
PROGRAM1          2 PROGRAM

WORKING...PLEASE WAIT
PRESS
CLEAR TO ABORT COMMAND
```

After the screen has been filled with all the information, the bottom message is replaced with:

```
COMMAND COMPLETED
PRESS: PROC'D, REDO
       BEGIN, OR BACK
```

On the catalog, *diskname* is the name you gave to the diskette. The number after AVAILABLE is the number of sectors not used. The number after USED is the number of sectors in use. The information below shows that FIRSTFILE is an internal file with a fixed length of 80 bytes taking up 8 sectors and PROGRAM1 is a program file taking up 2 sectors. Since there is nothing under "P," neither of the files is protected.

To leave the Command Module, press **BEGIN** and then **BACK**.

That completes the quick look at the disk system. The next sections describe in detail all of the capabilities of the Disk Memory System.

DISK MANAGER COMMAND MODULE OPERATION

The Disk Manager Command Module is used to perform operations that are impossible or inconvenient in TI BASIC. The module lets you store, retrieve, or manage files by choosing options and giving answers to prompts on the display screen.

Certain key functions that appear on the display are as follows.

- PROC'D — Pressing **PROC'D** causes the computer to perform the action that was requested or to repeat the current process.
- REDO — Pressing **REDO** enables you to start again at the top of the current display so that you can make changes in the answers to your prompts.
- BEGIN — Pressing **BEGIN** takes you back to the main Disk Manager selection list.
- BACK — Pressing **BACK** takes you back to the previous index (selection list).

(*Note*: These options are always active when the cursor appears on the screen.)

Some prompts already have an answer in place. These preprogrammed responses (*default values*) represent common or usual answers to these prompts. If the answer is the one you want, just press **ENTER** to confirm it. If you want to give a different response, type the response you want and then press **ENTER**.

IMPORTANT NOTICE

To leave the Disk Manager Command Module without the chance of losing any programs or data stored on the diskette, follow this procedure:
1. Press **BEGIN** to return to the initial Disk Manager index.
2. Then press **BACK** to leave the module, closing all files.

Editing

If you want to correct a typing error before you press **ENTER**, use the left-arrow key to move the cursor back to the character you want to change. Retype the correct character(s).

You also can erase a line (before pressing **ENTER**) by pressing **CLEAR**.

In certain applications, DELETE and INSERT also are active.

After you have pressed **ENTER**, you must press **REDO** to change or correct entries.

File Commands

The first option on the main selection list of the Disk Manager module is FILE COMMANDS. Choosing this option gives you access to the commands that operate on individual files rather than the entire disk.

When you choose the FILE COMMANDS option, the following screen appears:

```
        FILE COMMANDS
    1 COPY FILE
    2 RENAME FILE
    3 DELETE FILE
    4 MODIFY FILE PROTECTION

    YOUR CHOICE? 1
```

COPY FILE — You can copy a file in TI BASIC by reading it and then writing it, item by item, to the new file. With the Command Module, you can do the process more simply. When you choose this option, the following screen appears:

```
        COPY FILE
    MASTER DISK [1-3]?1
```

Your response to the prompt MASTER DISK (1-3)? indicates which disk drive contains the file you are going to copy. When you answer the prompt, the DISKNAME is filled in, and the prompt FILENAME? appears. Enter the name of the file you wish to copy.

The prompt COPY DISK (1-3)? appears. Your answer determines which disk drive will be copied to. When you answer it, the DISKNAME is filled in and the prompt FILENAME? appears. Enter the name you want to give the file.

Note: The Disk Manager module recognizes *only* characters with ASCII codes of 32 through 95. For best results, use only upper-case characters A through Z and other characters with ASCII codes of 95 and lower (excluding the period and the space character) to name your files.

RENAME FILE — When you choose this option, the following screen appears.

```
        RENAME FILE
    MASTER DISK [1-3]? 1
```

Your response to the prompt MASTER DISK (1-3)? indicates which disk drive contains the file you want to rename. When you answer, the DISKNAME is filled in and the prompt FILENAME? appears. Enter the present name of the file. The prompt NEW FILENAME? appears. Enter the new name that you want the file to have.

The name of a file can be up to ten characters long and can use any characters except the period and the space character. Valid names for files are the same as valid names for diskettes.

Note: If your filename contains lower-case alphabetical characters or other characters with ASCII codes above 95, you cannot use the RENAME FILE option.

DELETE FILE — With the Command Module, you cannot only delete a file, but also go through all files on a diskette, choosing which ones to delete. When you choose this option, the following screen appears.

```
        DELETE FILE
    SELECTIVE [Y/N]? N
```

The answer to the prompt SELECTIVE (Y/N)? determines whether you delete just one file or go through the diskette choosing which files to delete. If you enter N, then you delete just one file. If you enter Y, you may select which files you wish to delete

The prompt MASTER DISK (1-3)? appears. Your response indicates which disk drive contains the file(s) you are going to delete. Based on your answer, the DISKNAME is filled in. If you have chosen not to be selective, the prompt FILENAME? appears. Enter the name of the file you wish to delete.

If you have chosen to be selective, each file on the diskette is presented by name, and you choose whether or not to delete it by answering the prompt DELETE (Y/N)? If a file is protected, and you choose to delete it, the prompt OVERRIDE PROTECTION (Y/N)? appears. If you want to delete the file even though it is marked as protected, enter Y. If you do not wish to delete it, enter N.

MODIFY FILE PROTECTION — This Command Module enables you to mark a file so that it cannot be changed or overwritten. When you choose this option, the following screen appears:

MODIFY FILE PROTECTION
MASTER DISK [1-3]? 1

Your response indicates which disk drive contains the file you want to modify. When you answer the prompt, the DISKNAME is filled in. Then, enter the name of the file you wish to alter. The answer to the prompt PROTECT (Y/N)? determines if the file is to be protected from being written on. If you answer Y, it is protected. If you answer N, it is not protected.

If a file is protected, you cannot copy another file over it or rename it with the Command Module. Attempts to perform these operations will cause an error message to appear. In TI BASIC, a protected data file may only be opened for input; it cannot be written to.

Disk Commands

The second option on the main selection list of the Disk Manager module is DISK COMMANDS. Choosing this option gives you access to the commands that involve the entire disk.

DISK COMMANDS
1 CATALOG DISK
2 BACKUP DISK
3 MODIFY DISK NAME
4 INITIALIZE NEW DISK

YOUR CHOICE? 1

CATALOG DISK — Choose this option to get a catalog of all the programs and data files on the disk. When you choose it, the following screen appears.

CATALOG DISK
MASTER DISK [1-3]? 1

Choose the disk drive containing the diskette that you want cataloged. As soon as you enter the disk drive number, the diskette's name is filled in, and the following appears:

```
WHERE DO YOU WANT LISTING?
1 SCREEN
2 SOLID STATE PRINTER
3 RS232 INTERFACE
4 OTHER

YOUR CHOICE? 1
```

If you choose 1, the listing appears on the monitor screen. If there are too many lines to fit on the screen, press and hold the **Space Bar** until the lines stop scrolling. Press and hold the **Space Bar** again to resume scrolling. *Note*: If your filenames contain lower-case alphabetical characters or other characters with ASCII codes above 95, these characters will not be displayed properly on the screen.

If you choose 2, SOLID STATE PRINTER, the entire catalog is printed on the Thermal Printer connected to the computer.

If you choose 3, RS232 INTERFACE, the entire catalog is transferred to the RS232 Interface with default parameters. From there it may go to a line printer, through a modem, or to whatever device is connected to the RS232 Interface. See section "Using the RS232" for more information on its use.

If you choose 4, OTHER, the prompt DEVICE NAME appears. You may then choose any device and file that you could choose if you were using the TI BASIC command OPEN. For example, you could enter DSK1.CATLIST, and the catalog would be put on the diskette in disk drive one under the file name CATLIST.

The catalog list has the following form:

```
DSK1 – DISKNAME = diskname
AVAILABLE = nnn USED = nnn
FILENAME        SIZE  TYPE          P
----------      ---   ------------  -
AAAAAAAAAA      nnn   PROGRAM
BBBBBBBBBB      nnn   DIS/VARnnn    Y
CCCCCCCCCC      nnn   DIS/FIXnnn
DDDDDDDDDD      nnn   INT/VARnnn    Y
EEEEEEEEEE      nnn   INT/FIXnnn
```

Diskname is the name you gave to the diskette. The number after AVAILABLE is the number of unused sectors, and the number after USED is the number of sectors in use for program and data storage, plus the sectors that are not usable. The available and used sectors total 638 for a 40-track double-density, single-sided diskette and 1278 for a 40-track double-density, double-sided diskette.

The FILENAME is the name of the file, and SIZE is the number of sectors used for the file. TYPE gives the parameters of the file. If a file type is PROGRAM, the file is probably a program or mirror-image data. DIS/VARnnn indicates a DISPLAY format file of VARIABLE length records, with a maximum record length of nnn characters. INT/VARnnn designates an INTERNAL format file of VARIABLE-length records, with a maximum record length of nnn characters, while a file listed as INT/FIXnnn is an INTERNAL format file of FIXED-length records, with a record length of nnn characters. (See "File Processing" in the next section of this manual for an explanation of file specification.) The "P" column indicates whether or not the file is protected. If a "Y" is present, the file cannot be altered or deleted.

BACKUP DISK — Choose this option to make a copy of a diskette. Copying a diskette gives you a spare copy of data and programs in case something happens to the original. (To copy diskettes if you are using a single disk drive, select SINGLE DISK PROCESSING, and follow the instructions given on the screen.)

Note: How long the backup takes depends on two things: the number of files on the master diskette and the length of each file. Also, if the copy diskette has not previously been initialized, the initializing process will require approximately one additional minute. As a general rule, it takes about 20 seconds to copy 11.5 bytes of data.

The following describes the backup process when you have two or three drives. When you choose this option, the following display appears:

        BACKUP DISK
    SELECTIVE [Y/N]? N

Your response to the prompt SELECTIVE (Y/N)? determines if all the files or only selected files on the diskette are to be copied. If you enter N, all files on the diskette are copied. If you enter Y, you may choose which files you want to copy.

The prompt MASTER DISK (1-3)? appears, requesting the number of the disk drive containing the diskette that is to be copied. When you answer that prompt, the diskette's name is filled in.

The prompt COPY DISK (1-3)? appears. Your response here determines which diskette will have the data copied onto it. If the diskette is initialized, its name is filled in. If it is not initialized, the message DISK NOT INITIALIZED appears. Then the prompt INITIALIZE NEW DISK (Y/N)? appears. Data cannot be copied unless the new diskette is initialized. If the diskette is initialized and has data on it, the data is not erased in the copy process unless the file on a diskette has the same name as a file on the master diskette. If so, that file is replaced by the file on the master diskette.

If the sectors USED on the master diskette exceed the sectors AVAILABLE on the copy diskette, there will not be enough room on the copy diskette. If you want all of the information on the same diskette, press **CLEAR** to stop the process and insert a new diskette. Another option is to selectively copy files onto the diskette and then copy the remaining files on a new diskette.

If you choose to initialize the diskette, the prompt DISKNAME? appears. Enter the name you want to use for the new diskette. Then the prompt TRACKS PER SIDE? appears next. Enter the number of tracks, which is usually 40.

The prompt SINGLE SIDED (Y/N)? appears next. Your answer depends on both the type of diskette and drive you are using. If both your diskette and drive are double-sided, you can select the double-sided option by pressing **N** and then **ENTER**. If you are using a single-sided diskette, press **Y** and then **ENTER**.

The third prompt SINGLE DENSITY (Y/N)? appears next. Again, enter your answer.

After the new diskette is initialized, or if it was already initialized, the copy process continues. If you are copying the entire diskette, the message

> WORKING....PLEASE WAIT
> PRESS: CLEAR TO ABORT COMMAND

appears, and information about the copying process appears on the screen as files are copied.

Note: If you need to stop the process, you may have to press and hold **CLEAR** for a few seconds. The Disk Manager module will not stop until it finishes copying the current file. Hold down **CLEAR** until the module responds.

If you are copying only selected files, each file is listed, followed by the prompt COPY FILE (Y/N)? You may choose to copy the file by entering **Y** or not to copy it by entering **N**.

On a single disk drive system, the following procedure is used to copy the contents of one diskette to another. First, select single-disk processing. Second, insert the master diskette into the disk drive. The computer reads as much data as possible from the first diskette into the computer's memory. Then, the screen prompts you to remove the first diskette and insert the copy diskette. Next, the computer writes the data from the computer's memory onto the copy diskette. Then the computer prompts you to remove the copy diskette and reinsert the master diskette. Repeat the process until all the data has been copied.

MODIFY NAME — Choose this option when you want to change the name of the diskette. When you choose it, the following screen appears:

> MODIFY DISK NAME
> MASTER DISK [1-3]? 1

Your response to MASTER DISK (1 - 3)? indicates the disk drive that contains the diskette. The disk name is then filled in, and NEW DISKNAME? appears. Enter the name you want to give the diskette. *Note*: The Disk Manager module recognizes *only* characters with ASCII codes of 32 through 95.

INITIALIZE NEW DISK — A new diskette must be initialized before the computer can use it. When you choose this option, the following screen appears.

> INITIALIZE NEW DISK
> MASTER DISK [1-3]?

Your response to the prompt MASTER DISK (1-3)? indicates the disk drive that contains the diskette. Then the name of the diskette or the message DISK NOT INITIALIZED appears, followed by the prompt NEW DISKNAME? You then type and enter whatever name you want to give the disk. Legal disk names are up to ten characters, excluding periods and blanks.

The prompt TRACKS PER SIDE? appears. Type the number of tracks (a maximum of 40 for single-side diskettes) and then press **ENTER**. The next prompt asks SINGLE SIDED (Y/N)?. If you have both a double-sided diskette and disk drive, press **N** and **ENTER** to get the maximum storage out of the diskette; otherwise, press **Y** and **ENTER**. The third prompt, SINGLE DENSITY (Y/N)? then appears. Enter your response.

The diskette is initialized, a process that takes about a minute for a single-sided diskette and about twice as long for a double-sided diskette. The message

INITIALIZE NEW DISK
WORKING...PLEASE WAIT

is on the screen for a moment. Then the message 0 < WORKING....PLEASE WAIT appears, followed by 1<, and then 2>. The number 2 is increased by one as each sector is initialized.

Disk Tests

The third option on the Disk Manager selection list is DISK TESTS. It is sometimes necessary to check the condition of a diskette, the disk drive, and the controller. There are two levels of testing that can be done. The first is called a quick test. For a single-sided diskette, each loop takes about two minutes if you choose to make the test destructive and about 40 seconds if you choose to make it non-destructive (information on the disk is preserved). For a double-sided diskette, each loop takes about twice as long if you choose to make the test destructive and about 80 seconds if you choose to make it non-destructive. The non-destructive test should satisfy most requirements. The destructive version of the test could be done to new diskettes to determine whether or not they are good.

The second test is a comprehensive test that runs an exhaustive check on the diskette, controller, and disk drive. In the process, it destroys all the data that was on the diskette. Before running this test, you should make a backup copy of the diskette if you want to retain its data, or you can run the test on a blank diskette. The comprehensive test for a single-sided diskette takes about 15 minutes for each loop and about twice as long for a double-sided diskette.

Note: After a diskette has been put through a destructive test, it must be initialized before it can be reused. Also, if a diagnostic test reports an error condition, repeat the test with a known good diskette to verify that the disk system is at fault.

When you choose DISK TESTS, the following screen appears.

DISK TESTS
1 QUICK TEST
2 COMPREHENSIVE TEST

YOUR CHOICE? 1

If you choose 1, QUICK TEST, the following screen appears.

QUICK TEST
DESTRUCTIVE TEST [Y/N]? N

The prompt DESTRUCTIVE TEST (Y/N)? allows you to control whether or not the data on the disk is destroyed. If you want it destroyed, answer **Y**. If you do not want it destroyed, answer **N**.

The prompt, MASTER DISK (1-3)? appears. Your response indicates which disk drive holds the diskette you want to test. When you answer, the DISKNAME is filled in, and the prompt TRACKS PER SIDE? appears if you selected DESTRUCTIVE TEST. The diskette is tested for the number of tracks you enter. The prompt SINGLESIDED (Y/N)? appears next. If you have both a double-sided diskette and drive, press **N** and then **ENTER**; otherwise, press **Y** and then **ENTER**. Next, the prompt SINGLE DENSITY (Y/N)? appears. Enter your response. The prompt LOOP (Y/N)? now appears. It determines whether the test is to be run once or over and over until you stop it. Answer **Y** if you want it to be run repeatedly. Answer **N** if you want it to be run just once.

The prompt LOG ERRORS? (Y/N)? appears. Your answer determines whether or not any errors found are to be recorded on another device in addition to being shown on the screen. If you do not want any other record, enter **N**. If you want a record somewhere else, enter **Y**. If you enter **Y**, the prompt DEVICE NAME? appears. You then may enter the device and file name to which you want the log to go. For example, if you want a record put on the diskette in drive two under the filename LOGLIST, enter DSK2.LOGLIST. If you want the logged errors printed on an attached Solid State Thermal Printer, enter TP as the device name. Note that you cannot log to the disk drive that is being tested.

When the test is run, the record of any errors looks like this:

```
BAD ADDRESS/CODE nnn/nn
TOTAL ERRORS: nn
COMPLETED PASS: nn

WORKING...PLEASE WAIT.
PRESS
CLEAR TO ABORT COMMAND
```

The first number after BAD ADDRESS/CODE indicates the sector that was found to be bad. The second number is the error code for the error that was found. (See *Appendix B.*) An error tone is generated for each error found.

The number after TOTAL ERRORS: is the total number of errors that have been found so far in the diskette. The number after COMPLETED PASS: is the number of times the test has been run. If you have chosen not to have the test loop, then only one pass is made. Otherwise, this test shows how many loops have been run so far.

If you choose to run the comprehensive test, the following screen appears.

```
COMPREHENSIVE TEST
DESTRUCTIVE
MASTER DISK [1-3]? 1
```

Note: This test takes about 15 minutes for a single-sided diskette and about twice as long for a double-sided diskette to complete. All data and/or programs on the diskette will be lost.

From this point on, the procedure is the same as for the Quick Test. Just respond to the prompts as they appear on the display.

The Comprehensive Test consists of six tests that write to and read from all of the sectors on the diskette.

Single Disk Processing

Option 4 on the main selection list of the Disk Manager module is SET ALL COMMANDS FOR SINGLE DISK PROCESSING. Choose this option if you only have one disk drive or if you are only going to be using DSK1. After you choose this option, the message SINGLE DISK PROCESSING HAS BEEN INITIALIZED appears on the screen. (You may go back to multiple disk operations only by leaving the module and reentering it.)

Be sure to insert a diskette into the disk drive before selecting any other commands. The prompts MASTER DISK (1-3)? and COPY DISK (1-3)? will automatically be answered each time you choose an option, and the disk will be accessed immediately.

DISK SYSTEM OPERATION WITH TI BASIC

Your disk memory system can be used conveniently with TI BASIC. This section discusses saving/loading programs and processing file data with programs.

The disk system requires some working space in the main memory (RAM) of the Home Computer. The exact amount of space required depends on the number of files which are allowed to be open at any given time. In TI BASIC this number is preset to 6. The disk system then uses 1804 bytes of RAM.

You may use the CALL FILES statement to change the number of files that may be open. Keep in mind, however, that increasing the number of allowable open files also increases the amount of memory used by the disk system. (See CALL FILES for more information.)

Saving and Loading Programs

The disk system stores and retrieves TI BASIC programs quickly and efficiently. Approximately 127 seventy-line programs can be stored on a DD, SS diskette and 127 one-hundred-forty-line programs can be stored on a DD, DS diskette.

The SAVE command is used to store a program on the diskette. The format is

        SAVE device.program-name

The *device* is DSK1, DSK2, or DSK3, depending on which disk drive you want to address. The *program-name* is any valid identifying name you want to give your program. Valid program names can be up to ten characters long and can include any character except the period and the space characters.

For example, to store a program called COLORDEMO on the diskette in drive one, you would enter this command (with the program in memory):

        SAVE DSK1.COLORDEMO

Alternatively, the diskette's name can be specified, rather than the number of the disk drive. To store a program called COLORDEMO on a diskette named MYDISK, you enter:

        SAVE DSK.MYDISK.COLORDEMO

The computer searches all attached drives until it finds the one that contains the diskette named MYDISK.

The OLD command is used to read a program from a diskette. The format is:

        OLD device.program-name

When you enter the OLD command, the program you designate by name is read into the computer's memory. You can then run it, list it, or edit it — just as you would use a program entered from the keyboard.

File Naming Conventions

A filename can be up to ten characters long and may contain any character except the period and the space character. However, the Disk Manager module recognizes *only* characters with ASCII codes of 32 through 95. For best results, use only upper-case characters A through Z and other characters with ASCII codes of 95 and lower (excluding the period and the space character) to name your files.

File Processing

There are seven main TI BASIC statements that are used to access files on diskettes. They are OPEN, CLOSE, INPUT, PRINT, EOF, RESTORE, and DELETE. In addition, a special subprogram named CALL FILES lets you change the number of files allowed to be opened at the same time. The following discussions of each of these statements relate to their use with the disk system.

OPEN — The OPEN statement prepares a TI BASIC program to use data files stored on diskettes. It provides a link between a file-number used in a program and the file on the diskette, and it describes a file's characteristics so that a program can process or create the file. If the file already exists, the description that is given in the program must match the actual characteristics of the file.

The OPEN statement has the following general form:

OPEN #file-number:"device.file-name" [,file-organization] [,file-type] [,open-mode] [,record-type]

The *file-number* and *device.file-name* must be included in the OPEN statement. The other information may be in any order or may be omitted. If an item is omitted, the computer assumes certain defaults, which are described below.

■ *file-number* — The *file-number* (1 through 255 or an expression) is assigned to a particular file by the OPEN statement. (File number 0 is the keyboard and screen of the computer. It cannot be used for other files and is always open.) You may assign file numbers as you wish, with each file having a different number.

The *file-number* is entered as a number sign (#) followed by a number or a numeric expression that, when rounded to the nearest integer, is a number from 1 to 255 and is not the number of a file that is already open.

■ *device.file-name* — The *device* refers to the diskette on which a particular file is stored. If a file is on a diskette in disk drive one, the device is DSK1. For drive two, the device is DSK2. For drive three, the device is DSK3. The *file-name* may be any valid file name.

Instead of the disk drive number you may use DSK followed by a period, the diskette name, a period, and then the file-name.

OPEN #1:"DSK.DISKETTE1.FILE1"

The computer will search all drives for the diskette with the name you give.

■ *file-organization* — The records in a file can be accessed either sequentially or randomly. Records accessed sequentially are read or written one after the other. Records accessed randomly can be read or written in any order, including one after the other.

To indicate which access method you wish to use, enter either SEQUENTIAL for sequential accessing or RELATIVE for random accessing. If you are creating a file, you may optionally specify the number of records on a file by following the word SEQUENTIAL or RELATIVE with a number or a numeric expression. If you do not specify the *file-organization*, the default is SEQUENTIAL.

■ *file-type* — Files can be stored on diskettes either in easily readable ASCII characters or in machine-readable binary form. If the information is going to be printed or displayed for people to use, ASCII format is usually a better choice. In most cases, binary records are preferred because they take up less space and are processed faster by the computer.

To specify that you wish the file to be in ASCII format, enter DISPLAY. (The length of a DISPLAY-type record is limited to approximately 150 bytes.) To specify binary format, enter INTERNAL. If you do not specify a *file-type*, the default is DISPLAY.

■ *open-mode* — This entry instructs the computer that the file may be both read and written upon (UPDATE), may only be read (INPUT), may only be written to (OUTPUT), or may only be added to (APPEND).

If a file is marked as protected, it cannot be written to and may only be opened for input. Also, APPEND mode can only be specified for VARIABLE length records. If you do not specify an *open-mode*, the computer assumes the default UPDATE.

Note: If an unprotected file already exists on a diskette, specifying an *open-mode* of OUTPUT to the same file name writes over the existing file with the new file. You can prevent this by opening in the update mode and reading all the existing records so that you move to the end of the file or by using the RESTORE statement with the proper record number.

■ *record-type* — File records may be all the same length (FIXED) or may vary in length (VARIABLE). If they are all FIXED, shorter records are padded to make up the difference. Any that are longer may be truncated to the proper length. Files that have FIXED-length records are processed faster than files with VARIABLE-length records but usually take up more space on a diskette.

If you like, you may specify a maximum length of a record by following VARIABLE or FIXED with a numeric expression. The maximum length for a VARIABLE file is 254 bytes, and the maximum for a FIXED file is 255 bytes. If you do not specify a record length, the default is 80.

RELATIVE files must have FIXED-length records. If you do not specify a *record-type* for a RELATIVE file, the default is FIXED.

SEQUENTIAL files have either FIXED or VARIABLE-length records. If you do not specify a *record-type* for a SEQUENTIAL file, the default is VARIABLE. A file with FIXED-length records may be reopened for either SEQUENTIAL or RELATIVE access.

The following are examples of OPEN statements.

OPEN #1:"DSK1.MYFILE"

Creates or reopens a file on the diskette in drive one with a name of MYFILE. The file is a SEQUENTIAL file in the UPDATE mode with DISPLAY format and VARIABLE length records having a maximum length of 80 bytes. (These are the default attributes assigned by the computer.)

OPEN #23:"DSK.MYDISK.X",RELATIVE 100,INTERNAL,OUTPUT,FIXED 80

Creates or reopens a file named X on the diskette named MYDISK in whichever drive it is located. The file is a RELATIVE file in the OUTPUT mode with INTERNAL format and FIXED-length records having a maximum length of 80 bytes. Initially, 100 records are made available for the file, if enough room exists on the diskette.

OPEN #243:A$,INTERNAL

Creates or reopens a file on the diskette in drive two with a name of ABCD if A$ equals DSK2.ABCD. The file is a SEQUENTIAL file in the UPDATE mode with INTERNAL format and VARIABLE-length records having a maximum length of 80 bytes.

CLOSE — The CLOSE statement discontinues the association between a file and a program. After the CLOSE statement is performed, the file is not available unless it is opened again with an OPEN statement. Files may optionally be deleted by adding :DELETE to the end of the CLOSE statement.

The CLOSE statement has the following general form:

CLOSE #file-number [:DELETE]

The *file-number* is the number which you used in the OPEN statement to open the file.

If you do not close a file, data on it may be lost. If a program ends due to a BREAK statement, by your pressing **CLEAR**, or because of an error, files may not be closed even if you have a CLOSE statement later in the program. However, you can close the files properly by entering CLOSE *#file-number*, NEW, or BYE if you wish to leave BASIC. Editing the program also automatically closes any open files.

Note: If you leave TI BASIC by pressing **QUIT**, data may be lost. Leave TI BASIC only by entering BYE when you are processing files.

INPUT — The INPUT statement allows you to read data from diskette files. It only can be used with files opened in INPUT or UPDATE mode.

The INPUT statement has the following general form:

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 particular file by the OPEN statement. The *file-number* is entered as a number sign (#) followed by a number or a numeric expression that, when rounded to the nearest integer, is a number from 1 to 255 and is the number of a file that is open.

- *record-number* — A *record-number* refers to the record on the file which you want to read. The *record-number* can only be specified for RELATIVE files. (SEQUENTIAL files are read in sequential order.)

- *variable-list* — The *variable-list* is the list of variables into which you want the data from the file to be read. It consists of string or numeric variables separated by commas.

The following are examples of INPUT statements.

INPUT #1:X$

Puts into X$ the next value available in the file that was opened as #1.

INPUT #23:X,A,LL$

Puts into X, A, and LL$ the next three values from the file that was opened as #23.

INPUT #11,REC 44:TAX

Puts into TAX the first value of record number 44 of the file that was opened as #11.

INPUT #3:A,B,C,

Puts into A, B, and C the next three values from the file that was opened as #3. 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 condition and reads the specified record.

PRINT — The PRINT statement allows you to write data onto diskette files. It can only be used with files opened in OUTPUT, UPDATE, or APPEND mode.

The PRINT statement has the following general form:

PRINT #file-number [,REC record-number][:print-list]

The *file-number* must be included in the PRINT statement. The *record-number* may optionally be included when writing to random-access (RELATIVE) files. The *print-list* is also optional.

■ *file-number* — The *file-number* is the number assigned to a particular file by the OPEN statement. The *file-number* is entered as a number sign (#) followed by a number or a numeric expression that, when rounded to the nearest integer, is a number from 1 to 255 and is the number of a file that is open.

■ *record-number* — A *record-number* refers to the file record you want to write. The *record-number* can only be specified for random files (RELATIVE).

■ *print-list* — The *print-list* is the list of values that you want to put on the file. It consists of string or numeric variables or constants separated by commas, colons, and semicolons.

The following are examples of PRINT statements.

PRINT #1:X$

Puts the value of X$ into the next position of the file that was opened as #1.

PRINT #23:X;A;"TIMES 4"

Puts the value of X, A, and "TIMES 4" into the next record in the file that was opened as #23.

PRINT #11,REC 44:"TAX"

Puts the string constant "TAX" into record number 44 of the file that was opened as #11.

PRINT #3:A;B;C,

Puts the values of A, B, and C into the next three positions in the file that was opened as #3. The comma after C creates a pending print condition. When the next PRINT statement is performed, one of the following actions occurs:

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

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

EOF — The EOF (end-of-file) function indicates whether there is another record to be read from a file. The EOF function has the following general form:

EOF(file-number)

The value of the *file-number* must correspond to the number of an open file.

The EOF function always assumes that the next record is going to be read sequentially, even if you are using a RELATIVE file.

The value returned by the EOF function depends on where you are in the file. If you are not at the end of the file, the value returned is 0. If you are at the end of the file, the function returns a value of 1. If the diskette is full and you are at the end of the file, the function returns a value of – 1.

The following are examples of the EOF function.

PRINT EOF(3)

Prints a value of 0, 1, or – 1, according to whether you are at the end of the file that was opened as #3.

IF EOF(27)< >0 THEN 1150

If you are at the end of the file that was opened as #27, control is transferred to line 1150.

The usual way to keep track of the last record in RELATIVE files is to maintain a "dummy" record as the first record in the file. This record contains the number of records in the file. Each time you change the length of the file, you must update this record.

RESTORE — The RESTORE statement is used to position you at a specified record on a file. The statement has the following general form:

RESTORE #file-number [,REC record-number]

The *file-number* must be included in the RESTORE statement when it is used with files. The *record-number* may optionally be included.

■ *file-number* — The *file-number* is the number assigned to a particular file by the OPEN statement. The *file-number* is entered as a number sign (#) followed by a number or a numeric expression that, when rounded to the nearest integer, is a number from 1 to 255 and is the number of a file that is open.

■ *record-number* — The *record-number* indicates which record on the file you want to access. A *record-number* is allowed only with RELATIVE files.

The following are examples of the RESTORE statement.

RESTORE #6
                          Resets the file pointer to the first record on the file that was opened as #6 so that the next INPUT or PRINT statement referring to the file will access the first record.

RESTORE #23,REC 12
                       Resets the file pointer to the thirteenth record on the file (remember that the first record is number zero) so that the next INPUT or PRINT statement referring to the file will access the first record.

With RELATIVE files, RESTORE is generally used only to position the internal counter at the end of the file since the record that you want to read or write can be specified in the INPUT or PRINT statement.

DELETE — The DELETE statement is used to delete files. It has the following general form:

> DELETE "device.file-name"

The *device* refers to the drive containing the diskette on which a particular file is stored. If a file is on a diskette in disk drive one, the device is DSK1. For drive two, the device is DSK2. For drive three, the device is DSK3. The *file-name* may be any valid file name.

Note: Files can only be deleted if they are not protected.

CALL FILES — The FILES subprogram is used to change the number of files (a maximum of six) that can be open at the same time. (The default number of allowable open files in TI BASIC is six.) The amount of memory (RAM) available is reduced by 256 bytes for each allowable open file.

The CALL FILES command has the following general form:

> CALL FILES(number)
> NEW

The *number* must be a single digit from 1 through 6 which specifies the number of files that can be open at the same time. The command NEW *must* be made immediately following the CALL FILES command. If CALL FILES is not executed, the default number of files that can be open is 6.

CAUTION

CALL FILES only can be used as a command in TI BASIC. It must not be used as a statement in a TI BASIC program. Using CALL FILES in a program or not following it with NEW can cause unpredictable results, including loss of a program and/or loss of data on a diskette.

Cataloging Files

By accessing the file index on a diskette, you can use TI BASIC to read a catalog of disk contents. The diskette-index (or catalog) file is an unnamed, INTERNAL-format, FIXED-length file. The following is an example of an OPEN statement that accesses the catalog on drive one:

    100 OPEN #1:"DSK1.",INPUT,RELATIVE,INTERNAL

Note: File-name is omitted, since the catalog is an unnamed file.

Every record in the catalog file contains four items: one string and three numeric values, written in INTERNAL format. There are exactly 128 records in the file, numbered from 0 through 127.

Record #0 contains information about the diskette. The string (up to 10 characters in length) indicates the name of the diskette, and the numerical items give the following information:

- the record type (always a zero for record #0)
- the total number of sectors on the diskette
- the number of available sectors on the diskette

Records 1 through 127 contain information about the corresponding files in the index. The string item is the file-name, and the numeric items are as follows:

- The file type (a negative value if the file is protected)
  - 1 = DISPLAY/FIXED data file
  - 2 = DISPLAY/VARIABLE data file
  - 3 = INTERNAL/FIXED data file
  - 4 = INTERNAL/VARIABLE data file
  - 5 = BASIC program or other "memory image" data

- The total number of sectors allocated for the file
- The total number of bytes per record

A type-5 file always has a zero (0) as the number of bytes per record, since this measurement does not relate to memory image data.

A sample program listed at the end of this section illustrates how to display a diskette catalog.

Sample Programs

Three programs are included in this section. The first illustrates some of the techniques that can be used for file management, showing how to open a file, write records randomly to it, and read records randomly from it. The second program shows how to save the contents of the screen on a file and put it back on the screen later. This is useful if you have created a graphics screen and want to be able to store and retrieve it. The third program shows how to read the catalog from a diskette using TI BASIC.

GENERAL PROGRAM — The following program illustrates general file handling techniques for a random-access file.

The first section, lines 100 through 120, gives the entry instruction.

```
100 CALL CLEAR
110 OPEN #2:"DSK1.GENFILE",RELATIVE 50,INTERNAL
120 PRINT "ENTER 'XXX' TO LEAVE ENTRY"::
```

The next section, lines 130 through 210, allows entry of up to 50 records, numbered 1 through 50. Line 160 checks to see if the last record has been entered. If 50 records have been entered, line 210 informs the user that the file is full.

```
130 REM ENTRY SECTION
140 TOTAL = 0
150 INPUT "RECORD "&STR$(TOTAL + 1)&" ":BUFFER$
160 IF BUFFER$ = "XXX" THEN 220
170 PRINT #2,REC TOTAL + 1:BUFFER$
180 TOTAL = TOTAL + 1
190 IF TOTAL < 50 THEN 150
200 REM PRINT FULL MESSAGE
210 PRINT "FILE FULL"
```

The next section, lines 220 through 320, allows the user to choose what to do.

```
220 REM CONTROL SECTION
230 PRINT ::"1 = PRINT FILE"
240 PRINT "2 = PRINT A RECORD"
250 PRINT "3 = CHANGE A RECORD"
260 PRINT "4 = ADD A RECORD"
270 PRINT "5 = LEAVE THE PROGRAM":::
280 INPUT "ENTER YOUR CHOICE? ":X
290 PRINT
300 IF X < 1 THEN 220
310 IF X > 5 THEN 220
320 ON X GOTO 1000,2000,3000,4000,5000
```

The next section, lines 1000 through 1060, prints the entire file in sequential order.

```
1000 REM PRINT A FILE
1010 RESTORE #2,REC 1
1020 FOR COUNT = 1 TO TOTAL
1030 INPUT #2:BUFFER$
1040 PRINT COUNT;BUFFER$
1050 NEXT COUNT
1060 GOTO 220
```

The next section, lines 2000 through 2040, prints a specific record.

```
2000 REM PRINT A RECORD
2010 GOSUB 10000
2020 INPUT #2,REC RECNUM:BUFFER$
2030 PRINT RECNUM;BUFFER$
2040 GOTO 220
```

The next section, lines 3000 through 3040, allows a record to be changed.

```
3000 REM CHANGE A RECORD
3010 GOSUB 10000
3020 INPUT "ENTER NEW DATA? ":BUFFER$
3030 PRINT #2,REC RECNUM:BUFFER$
3040 GOTO 220
```

The following section, lines 4000 through 4050, allows a record to be added.

```
4000 REM ADD RECORD
4010 IF TOTAL = 50 THEN 210
4020 TOTAL = TOTAL + 1
4030 INPUT "ENTER DATA? ":BUFFER$
4040 PRINT #2,REC TOTAL:BUFFER$
4050 GOTO 220
```

Lines 5000 through 5020 close the file at the end of the program.

```
5000 REM LEAVE THE PROGRAM
5010 CLOSE #2
5020 END
```

The last section, lines 10000 through 10050, is a subroutine used for user input of a record number.

```
10000 INPUT "WHICH RECORD? ":RECNUM
10010 IF RECNUM < 1 THEN 10030
10020 IF RECNUM < = TOTAL THEN 10050
10030 PRINT "INVALID RECORD NUMBER"
10040 GOTO 10000
10050 RETURN
```

SAVE AND RESTORE A SCREEN — Lines 100 through 210 of the following program can be used as a subroutine in other programs when you want to save something you've created on the screen. (Be sure that you change the file name each time you use the program so that you don't write over a file that you have previously saved.) This program only saves and restores the characters that are on the screen. Information about redefined characters and colors is not saved.

```
100 REM SAVE A SCREEN
110 REM ADD AT END OF THE PROGRAM THAT PRODUCES THE SCREEN
120 REM
130 REM CHOOSE A UNIQUE FILENAME
140 OPEN #20:"device.file-name",INTERNAL
150 FOR ROW = 1 TO 24
160 FOR COLUMN = 1 TO 32
170 CALL GCHAR(ROW,COLUMN,X)
180 PRINT #20:X
190 NEXT COLUMN
200 NEXT ROW
210 CLOSE #20
```

The following runs as an independent program. It recalls the contents of a screen that has been previously saved and then puts it on the screen.

```
100 REM REPRODUCE A SCREEN
110 OPEN #30:"device.file-name",INTERNAL
120 FOR ROW = 1 to 24
130 FOR COLUMN = 1 to 32
140 INPUT #30:X
150 CALL VCHAR(ROW,COLUMN,X)
160 NEXT COLUMN
170 NEXT ROW
180 CLOSE #30
190 REM DELAY TO GIVE TIME TO LOOK AT THE SCREEN
200 FOR DELAY = 1 to 10000
210 NEXT DELAY
```

READ THE CATALOG — The following program enables you to read and print the catalog for a diskette from TI BASIC. Lines 100 through 160 set up a single-dimension array of five items corresponding to the five types of files. The next four lines ask for the number of the drive containing the diskette you want to catalog and then check to be sure you've made a valid entry.

```
100 CALL CLEAR
110 DIM TYPE$(5)
120 TYPE$(1) = "DIS/FIX"
130 TYPE$(2) = "DIS/VAR"
140 TYPE$(3) = "INT/FIX"
150 TYPE$(4) = "INT/VAR"
160 TYPE$(5) = "PROGRAM"
170 INPUT "MASTER DISK(1-3)? ":A
180 A = INT(A)
190 IF A < 1 THEN 170
200 IF A > 3 THEN 170
```

The next section opens the file, reads the diskette information for record #0, and displays it on the screen.

```
210 OPEN #1:"DSK"&STR$(A)&".",INPUT,RELATIVE, INTERNAL
220 INPUT #1:A$,J,J,K
230 DISPLAY "DSK";STR$(A);" - DISKNAME= ";
A$:"AVAILABLE= ";K;"USED= ";J-K
```

The remainder of the program reads the remaining information in the index, formats it, and displays the catalog on the screen.

```
240 DISPLAY:"FILENAME SIZE TYPE P":
"---------- ----- --------- -";
250 FOR LOOP = 1 TO 127
260 INPUT #1:A$,A,J,K
270 IF LEN(A$) = 0 THEN 350
280 DISPLAY:A$;TAB(12);J;TAB(17);
TYPE$(ABS(A));
290 IF ABS(A) = 5 THEN 320
300 B$ = " "&STR$(K)
310 DISPLAY SEG$(B$,LEN(B$) - 2,3);
320 IF A > 0 THEN 340
330 DISPLAY TAB(28);"Y";
340 NEXT LOOP
350 CLOSE #1
```

APPENDIX A: Error Codes in TI BASIC

The normal error codes for your computer are given in the *User's Reference Guide*. The following codes are for errors that relate to the disk system.

Error codes are two-digit numbers. The first digit indicates the command or statement involved in the error, and the second digit tells you the type of error.

FIRST DIGIT   COMMAND OR STATEMENT

0	OPEN
1	CLOSE
2	INPUT
3	PRINT
4	RESTORE
5	OLD
6	SAVE
7	DELETE
9	EOF

SECOND DIGIT   TYPE OF ERROR

0   The disk drive specified could not be found.

1   DEVICE or FILE WRITE PROTECTED — Unprotect the disk by removing the tape from the write-protect slot, or remove protection via the Disk Manager module.

2   BAD OPEN ATTRIBUTE — One or more OPEN options were illegal or didn't match the file's actual characteristics.

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 — The diskette is full, or you are trying to open more files than are allowed.

5   ATTEMPT TO READ PAST END OF FILE.

6   DEVICE ERROR — May occur if you are trying to process a double-sided diskette on a single-sided disk drive, or if the diskette is not initialized or is damaged. It also may occur if the system had its power disconnected during a previous print, the disk drive unit is not functioning properly, etc.

7   FILE ERROR — The indicated file or diskette doesn't exist or you are trying to read a BASIC file as if it were data.

APPENDIX B: Error Codes in the Disk Manager Command Module

If an error code occurs while you are using the Disk Manager Command Module, the error codes may have different meanings from those listed in *Appendix A*.

OPEN errors — An error in an OPEN statement will generate an error code from 00 to 07, and the meanings correspond to those listed under SECOND DIGIT in *Appendix A*.

The following tables explain the meanings of the remaining two-digit error codes.

FIRST DIGIT	TYPE OF ERROR
1	OTHER
2	SEEK OR STEP
3	INPUT
4	PRINT
(5 through 8 are not used)	
9	SPECIAL ERROR CODE FOR COMPREHENSIVE TEST

SECOND DIGIT	TYPE OF ERROR
1	RECORD NOT FOUND
2	CYCLIC REDUNDANCY CODE
3	LOST DATA
4	WRITE PROTECTED
5	WRITE FAULT
6	NO DISK/DRIVE or DRIVE NOT READY
7	INVALID INPUT PARAMETERS
(8 is not used)	
9	SPECIAL ERROR CODE FOR COMPREHENSIVE TEST

The following examples demonstrate several typical error codes and their interpretations.

ERROR CODE	MEANING
16	NO DISK or NO DRIVE
17	INVALID INPUT PARAMETERS
21	SEEK ERROR
31	RECORD NOT FOUND ON INPUT
32	CYCLIC REDUNDANCE CODE ERROR ON INPUT
33	LOST DATA ON INPUT
41	RECORD NOT FOUND ON PRINT
42	CYCLIC REDUNDANCY CODE ERROR ON PRINT (ID FIELD)
43	LOST DATA ON PRINT
44	WRITE PROTECTED
99	COMPREHENSIVE TEST DATA WRITTEN ON TEST 5 COULD NOT BE VERIFIED DURING TEST 6

APPENDIX C: Diskette/Cassette Operations

Transfer Programs Between Cassettes and Diskettes

To transfer programs between cassettes and diskettes, load the program into the computer's memory using the OLD command. Then save the program using SAVE.

For example, the following sequence transfers a program from a cassette to the diskette in disk drive one and assigns BRYAN as the file name.

```
OLD CS1

(follow normal cassette instructions)

SAVE DSK1.BRYAN
```

The data is now on the diskette in drive one under the name "BRYAN".

The following sequence transfers a program named "EDGIN" from the diskette in disk drive one to a cassette.

```
OLD DSK1.EDGIN
SAVE CS1
(follow normal cassette instructions)
```

The program is now on the cassette.

Transfer Data from Cassette to Diskette

To transfer data from a cassette to a diskette, you must read it from the cassette into the computer and then store it on the diskette. You should first decide how you are going to store the data on the diskette; that is, what parameters you are going to use in the OPEN statement.

The following program transfers data from a cassette to a file named KAY on disk drive one. The file is set up in a default format.

```
100 OPEN #50:"CS1"
110 OPEN #60:"DSK1.KAY"
120 INPUT #50:X$
130 REM WHEN THE FILE ENDS, THE PROGRAM WILL HAVE AN ERROR
140 PRINT #60:X$
150 GOTO 120
```

When you run the program, you will be instructed how to use the cassette.

The EOF function cannot be used with cassettes. After you run the program, it ends with error 33 because the cassette runs out of data. YOU MUST LEAVE BY ENTERING "BYE." If you leave by pressing QUIT, data may be lost from the diskette.

APPENDIX D: Adjusting Disk Drive Track-to-Track Access Time

TI's PDP 1250 Disk Drive, as with many other available drives, has a standard track-to-track access time equal to 20 milliseconds(ms). Drives are now becoming available with much shorter access time equal to 6 ms.

Your DDCC-1 is designed with an added feature which permits the disk controller to process information at the new, higher 6 ms speed for any, or all drives that can operate at 6 ms. Check your disk drive manual. If you have one or more drives with an access speed equal to or less than 6 ms, you can adjust disk controller processing to obtain the faster access time for each such drive.

The access speed adjustment is made by setting the correct dip switch for each of your up-to-4 drives. All 4 switches were preset at the factory in CLOSED position for 20 ms.

To make the adjustment proceed as follows:

1. Shut off all power and remove the DDCC-1 Controller Card after detaching all cables from the Card. Place the Card on a flat surface, screw side up.
2. Remove the 4 screws. CAREFULLY turn the Card completely over and place back on table Now lift off the top cover to expose the PC board.
3. Locate the dip-switch assembly. Note that the switches are numbered 1 to 4. These numbers correspond to drives #1-4. At this point all switches should be in the CLOSED position corresponding to 20 ms access time operation.
4. For each drive with specified access time of *6 ms or less, press* or slide the corresponding switch to the OPEN position.
5. Replace the top cover and then, holding both top and bottom covers, CAREFULLY turn over the Card and replace the 4 screws.
6. Follow Set-Up instructions to reinstall the Card and place the system back into operation.

CAUTION

1. We recommend that you *not* make this access time adjustment until *after* your system has been up and running.

2. Do *not* attempt to set a 6 ms access time unless your drive is designed to operate at 6 ms or less *and* the manufacturer has so specified.

IN CASE OF DIFFICULTY

If the disk system does not appear to be working properly, check the following:

1. *Power* — Be sure all devices are plugged in. Then turn on the power to the units in the proper sequence: disk drives and Peripheral Expansion System first, followed by the console and the monitor.

2. *Card Position* — Turn the power off, wait two minutes, and remove the top of the peripheral system. Verify that all cards are inserted properly and then replace the top.

3. *Cable* — Check to be sure that the proper cables are being used. Check the cables for loose or broken leads. Check to see that the cables are properly connected, right side up.

4. *Software* — Be sure all commands and statements are used as described in this manual. If the disk system works properly with the Disk Manager Command Module but not with a program, the problem is probably with the program. Especially check the use of OPEN, INPUT, and PRINT.

5. *Diagnostic Tests* — Check the diskette, controller, and disk drives for proper operation by running the diagnostic tests.

6. *Peripheral Expansion System* — Check for proper connection between the console and peripheral system.

7. *Home Computer* — Check to see that the Home Computer works properly with all accessories disconnected.

8. If none of the above procedures corrects the difficulty, consult "If You Have Questions or Need Assistance" or see the "Maintenance and Service Information" section of the *User's Reference Guide*.

IF YOU HAVE QUESTIONS OR NEED ASSISTANCE

If you have questions concerning Model DDCC-1 Disk Drive Controller Card operation or repair, contact first the dealer from whom you purchased the equipment.

Your dealer will be able to quickly answer most questions. If your dealer doesn't have an immediate answer, the dealer will either contact MYARC or suggest you contact us directly by mail or phone.

Our address and telephone number are:

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

(201) 766-1701

Please Note: This telephone number is not a toll-free number and collect calls cannot be accepted.

MYARC
™

The disk controller card you have purchased is a greatly
enhannced version. The followinng is a detail of the operating
system changes in MYARC'S LEVEL III disk controller.   If your
system is equiped with the new high speed drives with 6ms track
times be sure to refer to page 46 of the operating manual.   by
setting the dip switches on these units to the 6ms position you
can take full advantage of the incredible speed of this LEVEL
III controller.

New System commands are as follows:

CALL ILR- This command emulates the call init command available
with the Editor assembler operating system. This routine may be
used from the command level, or from a runninng BASIC program.
Care must be exercised when using this command. When executed
all programs and data will be cleared from the expanded memory.

Example as executed from BASIC:

```
100 CALL CLEAR
110 CALL ILR
120 END
```

CALL LR("DSK1.OBJECTFILE")- This command emulates the call load
command used in the Editor Assembler System.

Example as run from BASIC.

```
100 CALL ILR
110 CALL LR("DSK1.OBJECTFILE")
```

CALL LLR("START") : This command is the same as the CALL LINK
command used with the Editor Assembler.

Example:

```
100 CALL ILR
110 CALL LR("DSK1.OBJECTFILE")
120 CALL LLR("START")
130 END
```

CALL DIR(X): This command allows the user to catalog any of four
disk drives.   This command may be executed from command level
without overwriting the program in memory. Just substitute the
X with the drive of your choice and watch it work.
Example:

CALL DIR(1) would catalog disk drive number one.

```
100 CALL DIR(1)
110 GOTO 110
```