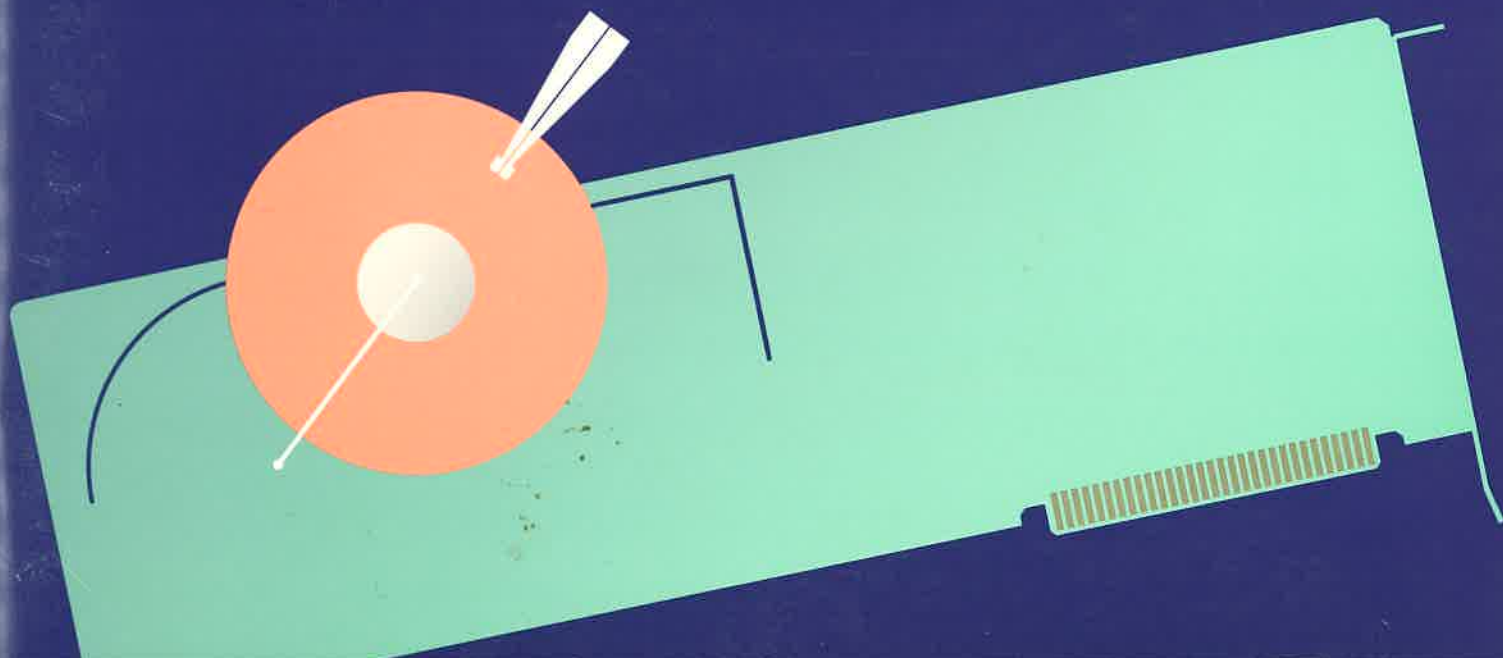


# Plus



# Hardcard™

*Installation and Reference Manual*



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Part No. 730-00-0006 A

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# Preface

////// ■ Hardcard is a Winchester (hard) disk subsystem that is furnished on a single, full size, IBM PC expansion card. It is plugged directly into the connector in the computer's expansion slot without requiring any additional connections.

Hardcard is designed for use with the IBM PC, IBM PC XT, IBM 3270 PC, Compaq Portable, Compaq Plus, Compaq Deskpro (8086 processor), AT&T PC 6300 (dual floppy and 10MB only), and Olivetti PC M24 (dual floppy and 10MB only).

Installation of Hardcard is easy to do, even if you have never added an expansion card to your computer. Step-by-step instructions guide you through all of the procedures required to install Hardcard. Installation software will load DOS onto Hardcard so that you can boot directly from Hardcard. The Hardcard Directory will help you access your programs and data on Hardcard.

## **Hardcard offers you all of the advantages of hard disk storage:**

- Far greater storage capacity.
- Increased speed in getting to and from your application programs and data files.
- The ability to work with large documents.
- Reduced floppy shuffle.

### **Plus more:**

- Fits into any single expansion slot in a PC or XT.
- Faster access time than standard disk drives.
- Takes less than thirty minutes to install.
- Higher reliability.
- Patented AIRLOCK® which parks and locks the heads automatically.
- Runs any version DOS (2.0 or higher).
- Greater durability and transportability.

Hardcard can be installed as the second hard disk drive for additional program and file storage.

In addition, Hardcard offers you Hardcard Directory—a means to select any of your application programs from a menu, instead of having to remember DOS commands or DOS directory names to access and run your application programs.

### **Your Hardcard reference material is composed of three parts:**

1. This Installation and Reference Manual, which is written with the novice computer user in mind, provides detailed, easy-to-follow instructions for installing Hardcard in your system, and DOS onto your Hardcard. In addition, it contains information to assist you with the operation of Hardcard and the Hardcard Directory program.
2. A separate guide, Installing Application Software Onto Hardcard, provides step-by-step instructions for installing many of the leading business software packages onto Hardcard.
3. A Warranty and Service booklet which includes the warranty statement, warranty registration card and service and product support information.

## **Federal Communications Commission—Radio frequency Interference Statement— Instructions to User**

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the operating instructions, may cause interference to radio or television reception. It has been tested and found to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a residential installation.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different outlet so that equipment and receiver are on different branch circuits.
- Ensure that card mounting screw is tightly secured.
- Ensure that card slot covers are in place when no card is installed.

If necessary, consult your dealer service representative for additional suggestions.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interference.

FCC ID numbers are: EU95T8-HC10  
EU95T8-HC20

# *Chapter 1*

## *Installing Hardcard in Your Personal Computer*



////// ■ Installing Hardcard in your personal computer consists of the following:

- Removal of the cover from the computer system unit (see Steps 1 and 2).
- Unpacking the Hardcard (see Steps 3 through 5).
- Installation of Hardcard in the system unit (see Steps 6 through 9).
- Replacing the cover on the system unit (see Steps 10 and 11).
- Installation of the operating system (DOS) (see Steps 12 through 18).
- Installation of application programs (see Chapter 2 and separate guide, *Installing Application Software Onto Hardcard*).
- Modification of the Hardcard Directory menu (see Chapter 2).

The installation information on the following pages applies specifically to the IBM PC and IBM PC XT personal computers. Hardcard can be installed in any available full-length expansion slot in an IBM PC, IBM PC XT, IBM 3270 PC, Compaq Portable, Compaq Plus, Compaq Deskpro, AT&T PC 6300, or Olivetti PC M24.

### **Special Considerations:**

Some of the older IBM PC's, Compaq Portables and AT&T 6300's may require a BIOS ROM upgrade prior to Hardcard installation. To determine if your older computer needs a BIOS ROM upgrade, see the explanation for the error message "Invalid drive specification" in Chapter 5.

We recommend that you not install Hardcard in the rear slot of the Compaq as it is a tight fit.

There may be minor differences in the procedures required for the Compaq, AT&T and Olivetti personal computers such as how the covers are removed and the exact location of the expansion slots. See your computer manual for clarification.

**Turn off and unplug your computer before you start the steps below.**

## *Removing the Cover from the System Unit For All IBM Computers*

### *////// Step 1*

Use a medium size, flat-bladed screwdriver to remove the five cover mounting screws. Place the screws in a safe location; they are required to replace the cover on the system unit.

### *////// Step 2*

**For IBM only** (See lower illustration.)

Grasp the cover of the system unit with both hands and carefully slide it straight forward away from the system unit until you feel a stop. Then tilt the cover upward while still pulling on it until the cover is free.

**For Compaq Portable and Compaq Plus only**

To remove the top cover of the Compaq, place your right hand just to the left of the Compaq name plate and press down **FIRMLY** with the heel of your hand. At the same time, as the cover separates from the back of the computer, use your left hand to pull the back edge of the cover out and up to remove the lid. Next, remove the metal expansion compartment cover by loosening (but not removing) the six screws and one nut which hold it, and lifting it off.



## *Unpacking the Hardcard*

### *////// Step 3*

In addition to Hardcard and this manual, you should have received:

- Installing Application Software Onto Hardcard guide
- Warranty and Service booklet
- "Reinstallation" diskette label
- Hardcard decal
- Two supplemental card guides
- One support bracket

### *////// Step 4*

Open the packaging material containing Hardcard, two card guides and a support bracket. (The black card guide is for IBM PC and IBM PC XT installations, the white card guide and support bracket are for Compaq installations only.) Remove Hardcard from its static-proof jacket.

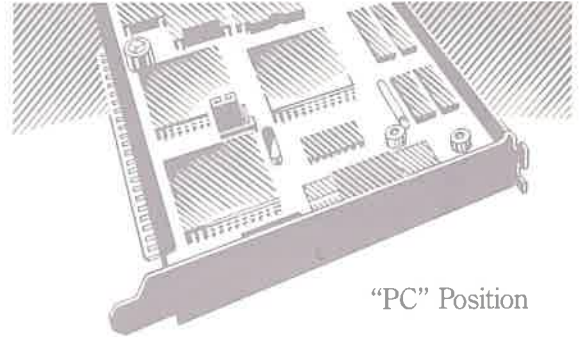
**Avoid touching the gold-plated card-edge fingers.**

*Note: It is a good idea to save the packing materials, including static-proof jacket, in the event you should ever need to ship your Hardcard.*

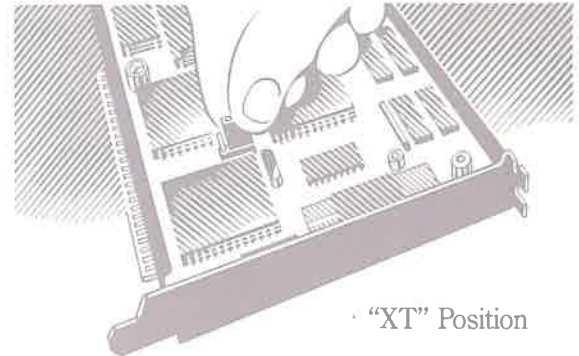
## //// Step 5

Check the jumper on the Hardcard board. All units are shipped from the factory with the jumper installed for Hardcard to be the first hard disk in the system (see “PC” position). If Hardcard is the only hard disk in your system, go to Step 6 right now.

The jumper must be repositioned if Hardcard is being installed as the **second** hard disk in your system (see “XT” position). To change the position of the jumper, grasp the jumper firmly with two fingers and pull it away from the board. Then insert it over the correct adjacent mounting posts and push it in place.



“PC” Position



“XT” Position

## *Installing Hardcard in the System Unit*

### *////// Step 6*

First, select an empty expansion slot in which to install Hardcard. Remove the screw that holds the cover for the expansion slot you selected for Hardcard and then remove the slot cover. Save the screw to install Hardcard.

### *////// Step 7*

**For IBM only** (See lower illustration.)

Locate the mounting holes for the card guide on the front panel of the system unit and press the black plastic card guide into the mounting holes until it is fully seated. If a card guide is already present for the slot you have chosen, remove it and use the one supplied with Hardcard.

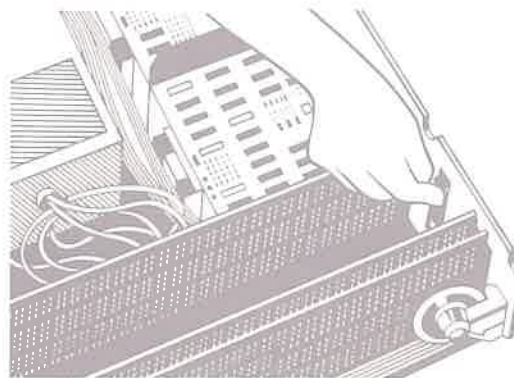
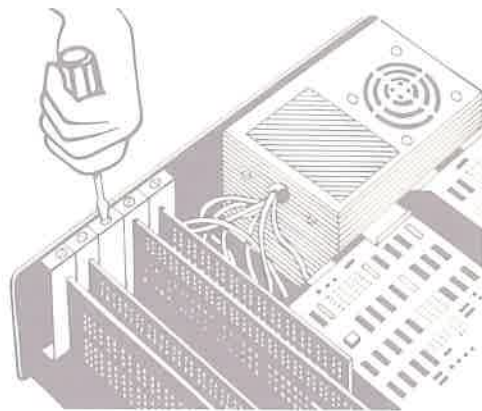
**For Compaq Portable, Compaq Plus only**

Select the slot where Hardcard will be installed. Locate the card guide for that slot and gently pry it off using a flat-bladed screwdriver. Press the replacement white plastic card guide into the mounting holes until it is fully seated.  
*Note: The other white bracket will be used in Step 10.*

**For AT&T only**

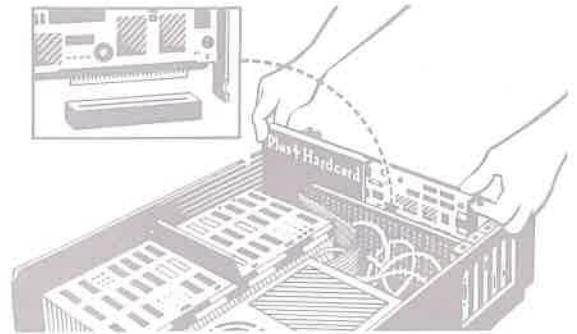
AT&T computers do not require a special card guide. Use the system-supplied card guide.

You are now ready to install Hardcard in the system unit.



### ////// Step 8

While you are holding Hardcard at the front and rear edges, align it with the card guide and the card slot. Then, lower Hardcard into the slot. Check to make sure the gold-plated card-edge fingers are centered over the connector. Now firmly press on the top edge of the Hardcard above the connector until Hardcard is **fully seated** in the connector.



### ////// Step 9

Use the screw you removed in Step 6 above to fasten Hardcard in place. Be sure the hole in the Hardcard bracket is aligned with the hole in the rear panel of the system unit before tightening the screw firmly. **Do not operate Hardcard with this screw missing or loose.**

*Note: In order to maintain proper airflow for adequate cooling, all unused slots in your computer system must have their slot covers installed.*

## *Replacing the System Unit Cover*

### *////// Step 10*

#### **For IBM only**

Position the system cover and carefully slide it toward the rear of the system unit. If you encounter resistance, the cover may be misaligned; slide the cover forward and try installing it in place again.

#### **For Compaq Portable, Compaq Plus only**

On the underside of the metal expansion compartment cover are five plastic support brackets for supporting the expansion boards. Remove the support bracket that is located above the expansion slot where Hardcard will be installed. To remove it, squeeze the side edges of the bracket together near the top end (where it fits into the sheet metal) and pull it out. Snap the white support bracket that was supplied with your Hardcard in place of the one which was removed. Make sure that the word "FRONT," molded into the white support bracket, will face the front of your Compaq after the expansion compartment cover is replaced. Replace the cover, and secure it by tightening the six screws and one nut. *Note: If the support bracket is inserted correctly, the bottom of the bracket will engage Hardcard when the cover is installed.*

### *////// Step 11*

#### **For IBM only**

Check that the screw holes are aligned with the threaded holes. Install and hand-tighten the screws, one at a time. Then tighten the screws with the screwdriver.

#### **For Compaq Portable, Compaq Plus only**

Replace the plastic top cover by inserting the front tabs of the cover under the front edge first; then push down on the back edge of the cover, snapping it into place.

## *Loading DOS on Hardcard*

To assure consistent high quality, each Hardcard is thoroughly tested and formatted at the factory. Special equipment is used to find and set aside any defects that could interfere with the reliable performance of Hardcard. Therefore it is unnecessary to ever run the IBM Advanced Diagnostic Format Option. This option will NOT improve the performance of Hardcard and may actually render Hardcard unusable (see Chapter 6). The regular DOS FORMAT command is compatible with Hardcard, but is accomplished automatically with Hardcard's INSTALL command.

You are now ready to load DOS onto Hardcard via the INSTALL command. Obtain a System diskette of PC DOS or MS DOS 2.0 or later version (it should contain all the system utility programs) and a blank diskette (it does not have to be formatted). The blank diskette will become a Reinstallation diskette for possible future use.

### *//////// Step 12*

Insert your DOS System diskette into drive A and close the drive door.

### *//////// Step 13*

Plug in your computer and turn it on.

### *//////// Step 14*

You will hear a "beep" indicating that the computer is operating properly. Also note that a "+" sign will appear in the upper right hand corner of your screen whenever Hardcard is accessed. The next series of messages depend on your personal computer and which DOS the computer uses. Using PC DOS as an example, you are asked to enter the date and time.

Press





The DOS version number appears (it must be 2.0 or later) followed by the “A” prompt or system prompt:

A>

This prompt indicates that the current, or default drive, is drive A. This is the drive to which DOS is paying attention. If you type the name of a file, DOS will look for the file on the default drive. In the instructions contained in this manual, the prompt will often be shown for reference to indicate the default drive. **Do not type the prompt.**

### ■■■■■■■■ Step 15

When Hardcard is the only hard disk system in a single or dual floppy configuration, Hardcard is designated as drive C. Type the INSTALL command exactly as shown below. Be sure to enter the command from the A> prompt. Type in the entire command all on the same line:

A> **C:INSTALL C** and press



When Hardcard is the second hard disk system in a single or dual floppy configuration, Hardcard is designated as drive D. Be sure that you have booted from your floppy diskette in drive A. Enter the INSTALL command from the A> prompt exactly as shown below. Type in the entire command all on one line:

A> **D:INSTALL D** and then press




*Note: If the following error message appears:*

Not ready error reading drive C (or D, E, F) Abort, Retry, Ignore?

consult Chapter 5 for the message and diagnosis of symptoms.

## ////// Step 16

Follow the instruction messages on the screen until you are requested to remove the DOS diskette from drive A and insert a blank diskette in drive A. Do so, and then press . This diskette will be your backup copy in case you ever need to reinstall the operating system on Hardcard. *Note: If you receive any error message, refer to Chapter 5 for the message and diagnosis of symptoms.*

## ////// Step 17


You will get a message telling you to put your DOS diskette back in drive A. Take the backup diskette out of drive A. Write the DOS version number on the "Hardcard Reinstallation" diskette label and affix it to the backup diskette. Put a write-protect tab on the diskette and store it away in case you ever want to reinstall this version of the operating system and the Hardcard Directory onto Hardcard. Now put the **same** DOS diskette into drive A as you used at the beginning of this procedure in Step 12.


## ////// Step 18

When the copying is completed, the following message is displayed:

**HARDCARD INSTALLATION COMPLETE**

The hands-off installation of your Hardcard is now completed.

Reboot your system by pressing    with the door to drive A open. The system will boot from the first hard disk. If Hardcard is the first hard disk, your system should automatically bring up the Hardcard Directory Main Menu.

*Note: If Hardcard Directory is not displayed after you boot your system, you may access it by typing **HCD** from the appropriate DOS prompt and pressing . If you wish to access Hardcard Directory automatically each time you boot your system, you must change your AUTOEXEC.BAT file. (See Technical Tips, Chapter 6 for instructions.)*

**Congratulations—you are now ready to start installing application software on your Hardcard!**

### *Installing Applications Software on Hardcard*

- ////// ■ You can complete your installation of Hardcard with the installation of your applications software. See your application software reference manuals, Chapter 2 and the guide, *Installing Application Software Onto Hardcard*.

### *Reinstalling Hardcard*

- ////// ■ If it is ever necessary for the operating system on Hardcard to be reinstalled:
- Back up all the files on your Hardcard. Locate your Hardcard Reinstallation diskette (the diskette that you created during the initial installation of Hardcard) and a System diskette of PC DOS or MS DOS 2.0 or later version. (The System diskette should contain all utilities.) Remove the write-protect tab and boot from your Reinstallation diskette. Check the version number which appears on your screen. Be sure your System diskette is the **same** version.
  - Type **REINSTAL C** or **REINSTAL D**, as appropriate, in response to the A > prompt.
  - Follow the instructions on your screen to reinstall the operating system on Hardcard.
  - 1-11


## *Chapter 2*

# *The Hardcard Directory*

## *The Hardcard Directory*

- ///■■■■■ The Hardcard Directory is designed to assist Hardcard users who would rather select their programs from a single menu rather than have to remember and enter the DOS commands necessary to run them each time. A screen-saving feature is included with the Hardcard Directory that turns off your screen if the keyboard is idle for more than five minutes. Pressing any key will reactivate the screen.

## *Using the Hardcard Directory*

- ///■■■■■ Whenever you boot your computer from Hardcard, the Hardcard Directory menu will appear automatically. (If you wish to use the Hardcard Directory menu from Hardcard's DOS prompt, type **HCD** and press  ). The first time you run the Hardcard Directory, examples of Selection Titles (such as "Word Processing" or "Modem Communications") appear on the screen. These selections are only examples and will not run until you have installed the corresponding software on your Hardcard. *Note: the Selection Titles can be changed at any time (see the instructions for modifying the Hardcard Directory menu later in this chapter).*

## *Organizing Software on Hardcard*

- ///■■■■■ When using a hard disk it is useful to use subdirectories to keep programs (and their data files) separate from other programs and their data. Otherwise, all of your files are kept jumbled together in your main directory (root directory), making them difficult to locate and slower to access.

During Hardcard installation, sixteen subdirectories, named SUB1, SUB2, through SUB16, were created for your convenience. However, you are not limited to using only these subdirectory names with the Hardcard Directory. You may also use subdirectories that either you create or that are created automatically during some software installations.

Installation of software into subdirectories and setting up the programs to work with the Hardcard Directory require slightly different installation procedures. Consult both the instructions in your software manuals and in the guide, *Installing Applications Software Onto Hardcard*, as you carefully complete the following four steps:

**//////** *Step 1—Assign a Number (1-16) to Each Software Program.*

Decide which software programs you wish to access through the Hardcard Directory menu, and assign each to a menu Selection Number 1-16. (You do not need to use all sixteen.)

**//////** *Step 2—Copy Software Onto Hardcard*

**Start from the DOS prompt**

If your screen shows the Hardcard Directory Main Menu, press  followed by a **Y**. You will then see Hardcard's DOS prompt, probably a C> or a D>.

**Choose Subdirectories**

Follow the instructions in each software manual for installing the software onto a hard disk. If the program installation allows you to choose a subdirectory name, you can use one of the SUB1 through SUB16 subdirectories, or you can use a subdirectory that you create with the DOS command MKDIR. (MKDIR is a “make directory” command. A subdirectory must be created prior to installing software into it. See your DOS manual for more information about creating and using subdirectories.)

If you use the SUB1 through SUB16 subdirectories, copy programs and their associated data files into subdirectory numbers corresponding to the same menu Selection Numbers, e.g. copy a program that you have decided to access through menu selection 1 into subdirectory SUB1, and the program for menu selection 2 into subdirectory SUB2.

## Programs That Create Their Own Subdirectories

If a software program installation creates its own special subdirectory, you can easily use it with the Hardcard Directory. Simply follow the instructions in your software manual for copying the program onto a hard disk and then follow the instructions in Step 4 of this chapter for modifying the Hardcard Directory Menu Run Commands.

## General Software Copying Instructions

If there are no specific installation instructions for your program in your software manual or in the guide, *Installing Application Software Onto Hardcard*, place the first program diskette into drive A and type the following command:

**COPY A:\*. \* C:\(subdirectory name)**

(where “subdirectory name” stands for whichever subdirectory you wish to use for this software package. e.g. COPY A:\*. \* C:\SUB1 will copy software files from the floppy diskette in drive A to subdirectory SUB1 on Hardcard.)

Repeat the COPY command until all of the diskettes for that program have been copied into their subdirectory.

Later, in Step 4, you will set up the Hardcard Directory menu so that it knows to access each program through its assigned subdirectory.

### Step 3—Set-Up the Software Packages

Some software programs need to be set-up using procedures specific to each program before they will operate properly (e.g. word processing programs need to know which printer your system uses). Instructions for these procedures are found in the individual software manuals.

#### ////// Step 4—Modify the Hardcard Directory Menu

After the software is copied into Hardcard's subdirectories and installed, you will then need to modify each Hardcard Directory menu entry.

##### How to Modify the Hardcard Directory Menu:

Start the Hardcard Directory program either by rebooting or by entering **HCD** from Hardcard's DOS prompt.

To access Modify Menu from the Hardcard Directory Menu Main screen, press . This will bring up the Modify Menu Screen.

You will see four prompts on the Modify Menu screen: Selection Number, Selection Title, Prompt for Diskette (Y/N) and Run Command. An explanation of these four prompts follows.


##### *a. Selection Number*

When the Modify Menu screen appears, the cursor is next to the Selection Number prompt. There are 16 selections, numbered 1 through 16, on the Hardcard Directory Menu. Each number corresponds to one program. To assign a program to one of the selections, or change an existing selection, type its number next to the Selection Number prompt. The information assigned to that item appears.

##### *b. Selection Title*

The Selection Title prompt is used to enter the name of the program as you want it to appear on the Hardcard Directory Menu. Type in a descriptive name, and press .



Selection Titles may be up to 25 characters. If you do not want to assign a program for a selection, leave the Selection Title blank, or type a phrase such as “Not in Use,” and press .

*c. Prompt for Diskette (Y/N)*

Even after installing the software onto Hardcard, some programs use a copy protection that requires the master or key diskette to be placed in drive A to “unlock” the program.

If you have a program in this category, answer **Y** at the Prompt for Diskette prompt so that you will be reminded to insert the required diskette each time you run the program. Answer **N** for programs that do not require key diskettes.

*d. Run Command*

Up to twelve DOS commands can be entered as the Run Commands for each selection. The Run Commands you enter for each selection should correspond exactly with the commands you would enter if you were running the program directly from the DOS prompt.

The Run Command you enter on line 1 must include the drive designator for the location of the application program (e.g. C:, D:, E: etc.)

The Run Command on line 2 must include a Change Directory command of the format “CHDIR \” where “subdirectory name” is replaced with the appropriate name.




Put the program or file name that will run the program on line 3.

The last Run Command should contain the drive location of the Hardcard Directory program.


For example, to run Lotus 123 from subdirectory SUB2 on drive C, you would enter the following Run Commands:

Run Command 1: **C:**  
2: **CHDIR \SUB2**  
3: **LOTUS**  
4: **C:**

*Note: Run Command 1 needs to specify the drive location of the application program regardless of whether or not you use a key diskette in drive A.*



After entering the DOS commands needed to run the program, press , and then save the contents of the screen by pressing . Your entries for this Selection Number will be saved and a blank Modify Menu screen will be displayed. Press  again to return to the Hardcard Directory Main Menu.


### *Hardcard Directory on a Drive Other Than C*

 If Hardcard Directory is not installed on drive C, you must specify the letter of the drive that contains Hardcard Directory as the last Run Command. For example, if Hardcard Directory is on a Hardcard installed as drive D, the Run Commands to run dBASE III from subdirectory SUB3 on drive D would be:

Run Command 1: **D:**  
2: **CHDIR \SUB3**  
3: **DBASE**  
4: **D:**

## *Modifying Run Commands Already Entered*

////// To insert a Run Command between two others, place the cursor on the first character of the line below the line you want inserted, press  to put the cursor into Insert Mode, and press . A blank line will be inserted above the cursor.

You can delete a Run Command by placing the cursor over the first character of the line and repeatedly pressing the  key until the line disappears. It is not necessary to adjust the remaining lines.

When you are finished modifying the menu selections, press , , and another  to return to the Hardcard Directory Main Menu.

## *Running Programs from Batch files (Files Ending with .BAT)*

////// If after running a program from Hardcard Directory, you exit to the DOS prompt at a subdirectory level instead of returning to the Hardcard Directory Main Menu, your software application program is probably run from a batch file.

To determine if your program is run from a batch file, use the CHDIR (change directory command) to go to the subdirectory which contains the application program and its files. Type **DIR** to see a directory listing. If your program file name ends in .BAT, you will need to make a modification to either your Hardcard Directory Run Commands or to your program's batch file. After this modification has been made, you will return to the Hardcard Directory Main Menu automatically upon exiting your program. Choose one of the following two methods for making this modification:

1. Incorporate the contents of the batch file into the Run Command area of Hardcard Directory. First check the contents of the batch file. Type the following from the subdirectory prompt:

**TYPE file.BAT** and press 


(replace “file” with the name of the batch file which runs the program.)

Write down all the command lines of the batch file so that you will be able to add them to Hardcard Directory’s Run Commands.

To get back to the Hardcard Directory, go to the root directory and bring up the Hardcard Directory Main Menu by typing:

**CHDIR \** and press 

**HCD** and press 

Press  from the Main Menu to bring up the Modify Menu screen. Enter the Selection Number for this software package. Add the commands from the batch file by typing each command line into a separate Run Command beginning with Run Command 3. (Command 1 is the drive where the application program is located, Run Command 2 is a Change Directory command. These are always necessary.) For more detailed instruction refer to the directions earlier in this chapter for Modifying the Hardcard Directory Menu.

2. Or, add the following commands to the end of your application's batch file by using the DOS COPY CON command or DOS's EDLIN program:

```
X:  
CHDIR \  
HCD
```





(Where "X:" stands for the drive location of the Hardcard Directory.)

See your DOS manual for a complete explanation of batch file processing.

### *Running DOS Commands From Within Hardcard Directory*

#### **////// DOS Command Option—F4**

Use the DOS command option to gain immediate access to DOS without exiting Hardcard Directory.

When you press  from the Hardcard Directory Main menu, a DOS command screen appears. It has twelve command lines on it. Enter up to twelve DOS commands, one per line, in standard DOS format, pressing  after each command line. Then press , and press  to execute the commands.

When Hardcard Directory finishes running the DOS commands, you are returned to the Hardcard Directory Main Menu screen.

*Chapter 3*  
*Getting Acquainted with Your*  
*Hardcard-Equipped Computer*

Your Hardcard gives you new options to choose from in operating your personal computer.


### *Booting the Computer—Hardcard as the Only Hard Disk Drive*

//////// Up to now, every time you booted your computer—either by turning on power or by pressing   

at the same time—drive A was always chosen by the computer as the boot drive. Your Hardcard-equipped computer now offers you two choices to select as the boot drive.

- a. To select drive C (Hardcard) as the boot drive, make certain that the door to drive A is unlatched (it does not matter if a diskette is in the drive) and then boot the system. The C > prompt is displayed to confirm that Hardcard is working as drive C.
- b. To select drive A as the boot drive, follow the same procedures you followed before Hardcard was installed. Insert a bootable diskette (DOS or an autoboot application program diskette) into drive A and latch the door. Then boot the system. The A > prompt is displayed to confirm that drive A is the boot drive.

### *Booting the Computer—Hardcard as the Second Hard Disk Drive*

//////// In such an installation, Hardcard is drive D. There is no way to boot the computer from Hardcard when Hardcard is the second hard disk drive. Therefore, if after booting you want to change to drive D as the default drive you must type **D:** and then press . The D > prompt is displayed to confirm that drive D is now the default drive.

## Visual/Auditory Prompts

////// Since Hardcard is completely enclosed in your system, there are no status indicators. Two utilities (LIGHT.COM and SOUND.COM) are provided with Hardcard which allow your computer system to indicate when Hardcard is being accessed.

### a. Visual Prompt

When Hardcard is accessed, a small plus sign (“+”) is displayed in the upper right hand corner of your screen. This symbol is displayed whenever Hardcard is reading and writing. The “+” sign comes on in the same way that the red light on your floppy drive comes on whenever the floppy is accessed. Each time you boot up your system, the default setting for use of the “+” sign is ON.

If you wish to disable the “+” sign, type:

**LIGHT OFF** and press 

To reinstall the use of the “+” sign, type:

**LIGHT ON** and press 

*Note: The “+” sign will not be displayed in graphics mode or when a special display adapter board (with its own ROM) is used in your system.*



b. *Auditory Prompt*

Hardcard also has an auditory prompt to indicate when it is being accessed. The default setting of the sound feature is OFF. So, when Hardcard is first installed, there is no sound from your system during access of Hardcard.

To enable the auditory prompt when Hardcard is accessed, type:

**SOUND ON** and press 

To disable the sound feature, type:

**SOUND OFF** and press 

### *Checking the Status of Your Hardcard*

////// You can use the CHKDSK command to see information such as the disk space occupied and remaining on your Hardcard.

*Note: CHKDSK will also display information about the number of bytes in bad sectors. These “bad sectors” are defective sectors that have been mapped out and set aside so that they will not interfere with the operation of your Hardcard. Type:*

**C>CHKDSK** and press 

## *Chapter 4*

# *Using Hardcard as the Second Hard Disk Drive*

////// ■ Hardcard offers you additional data file storage and backup capabilities when used as the second hard disk drive. When adding Hardcard to a computer system which already has one hard disk, be sure that the already-installed drive is the manufacturer's drive (such as in an IBM PC XT or a Compaq Plus) and not an internal or external add-on hard disk drive.

Before installing Hardcard as the second hard disk drive you must first reposition the jumper on Hardcard's printed circuit board. When shipped from the factory this jumper is set for Hardcard to be the first hard disk drive in a computer system (jumper is located in the "PC" position). To use Hardcard as the second hard disk, move the jumper to the "XT" position (see Chapter 1, Step 5.)

Hardcard is designated as drive D within DOS when it is used as the second hard disk drive. Note: Some non-DOS operating systems, such as Microsoft, Xenix, Unisource Venix/86 and IBM PC-IX, will not recognize Hardcard as a second hard disk drive. Remember, an operating system is not bootable from the second hard disk in your computer system. You must boot from drive C (or from floppy drive A) and then you can access drive D. Once you have access to drive D, you may use it in the same fashion as any other drive—you can copy files to it and run programs from it, etc.

The Hardcard Directory requires a few simple changes when run from drive D. Please see Chapter 2, Hardcard Directory, for instructions on what to do.

## *Chapter 5*

# *Error Messages and Diagnosis of Symptoms*

Error messages are used by the computer to tell you that you may have made a typing error, issued an incorrect or unknown command, or performed some other incorrect action; or that some part of the computer system is not operating properly.

Most errors can be cleared up by re-entering or changing commands. Others may require special actions to correct a situation or service to fix some part of the computer.

Hardcard, like other hard disk systems, generates some special error messages. These error messages are related to installation, DOS and the Hardcard Directory. They require specific actions as described in the following paragraphs. This chapter describes most of the Hardcard error messages; those not listed in this chapter are easy to understand and need no further explanation. Refer to your computer's operating manuals or your applications software manuals for any other messages.

*Note: Always backup your files before you execute any of the special DOS commands for partitioning or formatting. These backup diskettes will enable you to restore your data onto Hardcard after the data are erased.*

For information on how to obtain support and service for Hardcard, refer to the booklet, "How to Obtain Service for a Malfunctioning Hardcard."

## *Error Messages—Listed Alphabetically*

////// 1701—Controller 0 error  
1701—Controller 1 error

### **Diagnosis**

Your PC/XT jumper may be in the wrong position or you may have a Hardcard malfunction.

### **What To Do**

First, turn the power OFF and wait at least 20 seconds. Then check that Hardcard has been completely pushed into the slot connection and that the slot cover mounting screw is correctly installed. Then, turn the power back ON and see if this message still appears. If it does, power OFF your system and remove Hardcard. Check that the PC/XT jumper is properly positioned. If Hardcard is the first hard disk in your computer system, the jumper should be in the “PC” position. If Hardcard is the second hard disk, be sure the jumper is in the “XT” position. Once the jumper is properly located and the Hardcard is reinserted, turn power back ON. If the message reappears, contact your dealer.

////// Error formatting the Reinstallation diskette.

Please insert a new diskette into drive A and close the drive door.

Press ENTER when you are ready to continue.

### **Diagnosis**

The format program was unable to copy the DOS system files to the diskette, possibly due to bad tracks at the beginning of the diskette where those files should reside.

### **What To Do**

Insert a new diskette into drive A, close the drive door, and press



//////// Error reading fixed disk boot block.

Please insert a bootable diskette into drive A and press ENTER key when ready.

### Diagnosis

During system boot up, your computer system could not read the partition boot block.

### What To Do

Follow the instructions on your screen to boot from the floppy drive. **Back up your entire Hardcard immediately.** Running REINSTAL will destroy the information on your Hardcard. Run the REINSTAL command to reinstall the operating system on your Hardcard. (See Chapter 1 for instruction.) Reboot your system, and if the error message reappears, contact your dealer for assistance.

//////// Error trying to write to Hardcard. Please verify physical installation of the Hardcard. Verify that you have typed the correct drive identifier. Restart the program.

### Diagnosis

The reinstallation procedure was unable to work on Hardcard. You may have a Hardcard malfunction.

### What To Do

First, turn the power OFF, and check that the Hardcard board has been properly pushed into the slot connection and that the slot cover mounting screw is correctly installed. Then, turn the power back ON and rerun the reinstall process from the beginning. If the message reappears, call your dealer.

////// ■ Hardcard's REINSTAL requires the file xxxx.xxx in drive A. Replace the diskette in drive A with the complete Reinstallation diskette that was created during the initial installation of this Hardcard. Reboot and restart the REINSTAL program.

### **Diagnosis**

One or more of the files on the Reinstallation diskette is missing or has been damaged. Therefore the REINSTAL program will not work properly.

### **What To Do**

If the missing or damaged file is a DOS file, it can be recopied onto the Reinstallation diskette from a DOS diskette of the SAME version DOS as was used to install Hardcard. However, if the file is a non-DOS file that was originally shipped on Hardcard, you should contact your dealer for a new copy of this file.

////// ■ Hard disk boot error—invalid operating system boot block.  
Please insert a bootable diskette into drive A and press CTRL-ALT-DEL to boot the floppy system.

### **Diagnosis**

During system boot up, your computer system successfully read the partition boot block, but its format was incorrect.

### **What To Do**

Follow the instructions on your screen to boot from the floppy drive. **Back up your entire Hardcard immediately.** Running REINSTAL will destroy the information on your Hardcard. Run the REINSTAL command to reinstall the operating system on your Hardcard. (See Chapter 1 for instruction.) Reboot your system, and if the error message reappears, contact your dealer for assistance.



////// ■ Hard disk boot error—invalid partition table.

Please insert a bootable diskette into drive A and press CTRL-ALT-DEL to boot the floppy system.

### Diagnosis

During system boot up, the master boot block was inspected and more than one partition was shown as active. Since only one is supposed to be active at a time, the system does not know which partition to boot up.

### What To Do

Follow the instructions on your screen to boot from the floppy drive. **Back up your entire Hardcard immediately.** Running REINSTAL will destroy the data and files on your Hardcard. Run the REINSTAL command to reinstall the operating system on your Hardcard. (See Chapter 1 for instruction.) Reboot your system, and if the error message reappears, contact your dealer for assistance.

////// ■ Hard disk boot error—operating system boot block read failure.

Please insert a bootable diskette into drive A and press CTRL-ALT-DEL to boot the floppy system.

### Diagnosis

During system boot up, the partition boot block of the active partition could not be read after several tries.

### What To Do

Follow the instructions on your screen to boot from the floppy drive. **Back up your entire Hardcard immediately.** Running REINSTAL will destroy your data and files on your Hardcard. Use the REINSTAL command to reinstall the operating system on your Hardcard. (See Chapter 1 for instruction.) Reboot your system and if the error message reappears, contact your dealer for assistance.

////// Invalid drive specification.

### Diagnosis

You have attempted to access a drive which is not available.

### What To Do

Determine Hardcard's drive designator by typing DIR X:, substituting C, D, E or F for X each time you enter the command, until a list of files is returned that has several filenames starting with the letters HCD (these are Hardcard Directory files). Retype your command using the correct drive identifier.

If you still get this error message, it is possible that your computer system cannot recognize a hard disk. Some IBM PCs, Compaq Portables and AT&T PC 6300s may have this problem because they have an old system BIOS ROM.


### ■ IBM BIOS ROM Determination:

To see if your IBM PC has the new system BIOS ROM (which recognizes a hard disk), you may use the following method to check for a date of 10/27/82 or later:

1. Type: **BASIC**, press  and enter the following statements:


```
10 DEF SEG=&HF000
20 FOR X=&HFFF5 TO &HFFFC
30 PRINT CHR$(PEEK(X));
40 NEXT
```

2. Type: **RUN** and press 



3. A date is displayed, followed by an "OK." If the date you see is not 10/27/82 or later, contact your dealer for a BIOS ROM or system motherboard upgrade.
4. Type: **SYSTEM** and press  to return to DOS.

■ **Compaq BIOS ROM Determination:**

To see if your Compaq PC has the new system BIOS ROM (which recognizes a hard disk) use the following method to check for a ROM revision level of "C" or later:

1. Type: **BASIC**, press  and enter the following statements:

```
10 DEF SEG=&HF000  
20 PRINT CHR$(PEEK(&HFFE6));
```

2. Type: **RUN** and press 
3. A letter will be displayed (probably a "B" or "C"), and an "OK" will be displayed. If the letter is not a "C" or greater, contact your computer dealer for a BIOS ROM or system motherboard upgrade.
4. Type: **SYSTEM** and press  to return to DOS.

■ **AT&T BIOS ROM Determination:**

Remove the bottom panel from the computer and look at the PC board on the underside of your computer system. The revision number on the BIOS ROM chip must be 1.1 or greater.



Invalid fixed disk boot block.

Please insert a bootable diskette into drive A and press ENTER key when ready.

### **Diagnosis**

During system boot up, your computer successfully read the master boot block from the first fixed disk, but its format was incorrect.

### **What To Do**

First, turn the power OFF to your computer system, wait at least 20 seconds and turn power back ON. If the error message reappears, then follow the instructions on the screen and boot your operating system from the floppy drive. If you can access files and data on your hard disk at this point, back up whatever you can because running REINSTALL will destroy the files and data on your Hardcard. Run the REINSTALL command (see Chapter 1 for details) to reinstall the operating system on your Hardcard. Reboot your system. If the message still persists, contact your dealer for assistance.



Not ready error reading drive C (or D, E, F)

Abort, Retry, Ignore?

### **Diagnosis**

If this message appears during installation of Hardcard, it means that the system recognizes the presence of a drive C (or D, E, F), but cannot physically access it. The switches on the main board may have been set to include more than two floppy drives, e.g. to permit additional floppy drives or the use of a Ramdisk program. Your computer system probably recognizes Hardcard as a drive letter different from the one you typed in when you entered the INSTALL command.

## What To Do

You have two choices:

1. Determine Hardcard's drive designator by typing DIR X:, substituting C, D, E or F for X each time you enter the command, until a list of files is returned that has several filenames starting with the letters HCD (these are Hardcard Directory files). Now type the INSTALL command using the correct drive designator.
2. Or you can follow the directions in the Guide to Operations for your computer and reset the system switches to select only two floppy disk drives. Then Hardcard will be recognized as drive C (as the first hard disk) or drive D (as a second hard disk). Retype the INSTALL command using the correct drive letter.

If the error message reappears, contact your dealer for assistance.

////// The Hardcard file xxxx.xxx is missing or has been corrupted.  
Please see your authorized Hardcard dealer or representative to obtain assistance.

## Diagnosis

Hardcard installation requires the file xxxx.xxx. The Hardcard file is missing or has been damaged.

## What To Do

Please see your authorized Hardcard dealer for a copy of the file or to obtain assistance.

////// The Hardcard in your system has not been installed. Please place a DOS diskette into drive A, press CTRL-ALT-DEL to boot the DOS system, and follow the instructions in your Hardcard reference manual.

**Diagnosis**

Installation is incomplete. Your DOS operating system has not been set up on Hardcard via the INSTALL program.

**What To Do**

Run Hardcard's automatic installation procedure. (Refer to Chapter 1 for specific instructions.)

////// Unable to copy files to the Reinstallation diskette.  
Please obtain a new diskette to use as the Reinstallation diskette. Then restart the INSTALL program.

**Diagnosis**

There was a problem copying files from the Hardcard to the Reinstallation diskette during INSTALL. This is most likely due to excessive bad tracks on the diskette.

**What To Do**

Obtain a new diskette to use as the Reinstallation diskette. Run INSTALL as you did before.

////// ■ Unable to locate system files on drive A.

Please insert a new bootable system diskette in drive A, close the drive door, reboot the system, and restart the INSTALL program.

**Diagnosis**

INSTALL was unable to find the system files on drive A. For most DOS systems, these two files are invisible and are named IBMBIO.COM and IBMDOS.COM. A few DOS systems also use the names IO.SYS and MSDOS.SYS. Only these two sets of file names are supported by INSTALL.

**What To Do**

Try booting from a different DOS diskette in drive A. Then run INSTALL as before. If this error persists, obtain assistance from your authorized dealer.

*Chapter 6*  
*Technical Tips*



////// *Tip 1:*

You are advised to back up data regularly that is on your Hardcard. Plus assumes no responsibility for loss of data. For information about backup and restore procedures, consult the DOS manual that accompanies your computer.

////// *Tip 2:*

Running Hardcard's REINSTAL command, HFORMAT or running DOS commands for formatting or repartitioning destroys all the data on your Hardcard. Therefore, it is essential that you back up all your Hardcard files before using any of these commands.

////// *Tip 3:*

IBM Advanced Diagnostic Format Option and DOS FORMAT and FDISK commands—Do not use the IBM Advanced Diagnostic Format Option. “Low level” formatting is done at the factory using a variety of analog and digital techniques on highly sophisticated equipment to map out defects. It is not possible to duplicate the accuracy of this mapping using your personal computer. During the formatting process, the sector interleave is defined on the drive. The IBM Advanced Diagnostic Format Option places a lower performance interleave on the disk and will overwrite the one created at the factory. None of the factory established attributes will change during the life of your Hardcard and the IBM Advanced Diagnostic Format Option does nothing to enhance or refresh them.

The standard IBM DOS FDISK and FORMAT commands (or Plus' HFORMAT command) can be used in the same way they are used on any hard disk. (See the following tip on HFORMAT.COM.) The FORMAT or HFORMAT commands will set aside any new bad sectors should they develop. FDISK can be used to set up multiple disk operating systems.

////// Tip 4:

HFORMAT.COM—A Special Command for Formatting Hardcard. Some versions of DOS have a FORMAT command which requires special patching. Hardcard's INSTALL program will automatically create and use a new program, HFORMAT.COM, for formatting Hardcard if your particular DOS FORMAT command is inadequate. A screen message will tell you if HFORMAT has been created for you during INSTALL.

In addition, if you ever need to run REINSTAL from the Reinstallation diskette, REINSTAL will use the HFORMAT command.

If you ever want to format Hardcard directly, e.g. not through INSTALL or REINSTAL, you must use the HFORMAT command instead of your DOS FORMAT command. All the standard DOS options that can be used with FORMAT, i.e. /S,/V etc. will work with HFORMAT. For example, with the Reinstallation disk in drive A, typing:

**A>HFORMAT C:/S**

would format Hardcard (drive C) and transfer the system files. (For more information on formatting options, reference your DOS manual.)

*Note: To format your floppy diskettes, continue to use your standard DOS FORMAT command.*

Tip 5:

Hardcard as the Second Hard Disk—When installing Hardcard as the second hard disk drive, you must reposition the jumper on Hardcard to change its addresses. Complete installation instructions and illustrations are in Chapter 1. As shipped from the factory, the jumper is installed for Hardcard to be the first hard disk in the system (the jumper is in the “PC” position). To install Hardcard as the second hard disk, change the jumper to the “XT” position. Repositioning the jumper from “PC” to “XT” changes Hardcard’s port addresses from 320H-323H to 324H-327H and Hardcard’s BIOS starting address from C8000H TO CA000H.

Tip 6:

Changing your AUTOEXEC.BAT file to access Hardcard Directory automatically each time you boot your system. To see the contents of your AUTOEXEC.BAT file, type:

**TYPE AUTOEXEC.BAT** and press 

- a. If after typing the above command, you saw nothing returned on your screen except the DOS prompt, your AUTOEXEC.BAT file is empty. (The AUTOEXEC.BAT file distributed with many AT&T computers is empty.) To create a new one, type:

**COPY SHELL.BAT AUTOEXEC.BAT** and press 

- b. If your AUTOEXEC.BAT file already has commands in it, modify the file to include the command “HCD” as the last command.

Now your new AUTOEXEC.BAT file will access the Hardcard Directory automatically every time you boot your system.

////// Tip 7:

Disabling the Hardcard Directory—To disable having the Hardcard Directory Main Menu appear automatically upon booting your computer, rename the AUTOEXEC.BAT file with the name AUTO.BAK. Type:

**REN AUTOEXEC.BAT AUTO.BAK** and press



////// Tip 8:

Moving Hardcard Between Computers—Hardcard can easily be moved between computers of the same manufacturer without having to run REINSTAL. You can remove a Hardcard from an IBM PC and transfer it to an IBM XT, or you can move a Hardcard from a Compaq Plus to a Compaq Portable. Remember that the jumper will need repositioning if Hardcard's order (first or second hard disk) changes. Also keep in mind that DOS will only boot from the first hard disk in a system. See Chapter 1 for further information on installation and jumper changes, and Chapter 3 for clarification of booting considerations.

*Note: Moving Hardcard between computers of different manufacturers requires formatting Hardcard with the new computer's DOS. You must also be sure to use only the DOS utility files that accompany the new DOS.*

////// Tip 9:

Hardcard's compatibility with other boards—Hardcard uses DMA (direct memory access) level 3 and IRQ (Interrupt request) level 5. These are the same as used by the IBM PC XT's hard disk. These cannot be changed on Hardcard; therefore, make sure your peripherals are using a different DMA level and IRQ.

*Appendix A*  
*Specifications*

*Note: The Technical Specifications are the same for both Hardcard and Hardcard 20 unless noted differently.*

### *Operational Features*

- Industry standard IBM PC slot bus
- Hardware 48 bit ECC polynomial with up to 11 bit burst correction
- Sector interleave: 3
- Automatic head retract to landing zone and lock when powered down

### *Reliability*

- MTBF (POH): 40,000 hours
- Preventive maintenance: none
- Component life (years): 5
- Data reliability assured through 48 bit ECC on Data Field and 16 bit CRC on ID Field

### *Performance*

	<b>10MB</b>	<b>20MB</b>
■ Formatted capacity:	10.56	21.20 Mbytes (min.)
■ Transfer rate:	5.00	5.00 Mbits/sec
■ Access times (includes settle time)		
Track to track:	15	10 ms
Average:	65	49 ms
Full stroke:	105	90 ms
Average latency:	8.33	8.33 ms

## *Function*

	10MB	20MB
■ Rotational speed:	3600	3600 rpm
■ Recording density:	13,917	13,917 bpi
■ Flux density:	9278	9278 fci
■ Track density:	812	812 tpi
■ Cylinders		
Physical:	612	615
Logical:	306	615
■ Tracks:	1224	2460
■ Read/Write Heads		
Physical:	2	4
Logical:	4	4
■ Data disks:	1	2
■ Encoding scheme:	RLL 2,7 Code	RLL 2,7 Code
■ Sectors/track:	17 (+ 1 spare)	17 (+ 1 spare)

## *Physical*

- Environmental limits
  - Ambient temperature
    - Storage/Shipping: -40 to +62C
    - Operating: +4 to +50C
  - Ambient relative humidity
    - Storage/Shipping: 5% to 95% RH
    - Operating: 8% to 80% RH
- Altitude
  - Storage: 30,000 ft. (9.1 km)
  - Operating: 10,000 ft. (3.0 km)
- Shock
  - Storage (1/2 sine wave 10 ms): 100 G
  - Operating (1/2 sine wave 10 ms): 10 G
- Vibration
  - Storage (10-500 Hz P-P): 2.0 G
  - Operating (10-500 Hz P-P): 0.5 G
- EMI (Electro-Magnetic Interference)
  - Operating: FCC Class B
- Acoustic noise output: 45 DBA
- Mechanical dimensions
  - Thickness: 1.0 inch (25.4 mm)
  - Height: 4.2 inches (106 mm)
  - Length: 13.4 inches (341 mm)
  - Weight (10MB or 20MB): 2.1 lbs (950 gm)

## *Electrical*

### ■ DC power

Voltage: +12V,  $\pm 5\%$  regulation

+5V,  $\pm 5\%$  regulation

Ripple and noise: 100 mV P-P (12V)

50 mV P-P (5V)

Current demand

**10MB**

**20MB**

Average: .67 A (12V) .47 A (5V) .48 A (12V) .45 A (5V)

Running max.: .70 A (12V) .54 A (5V) .53 A (12V) .50 A (5V)

Start-up: 1.27 A (12V) .54 A (5V) 1.27 A (12V) .45 A (5V)

### ■ Power consumption

Average: 10.9 W

8.0 W

## *Computer Interface*

### ■ DMA channel 3

### ■ Interrupt request level 5

	<b>PC Jumper Position</b>	<b>XT Jumper Position</b>
■ BIOS address	C8000H	CA000H
■ Port address	320H-323H	324H-327H
■ Controller number	0	1



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