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## ABOUT THIS BOOK

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This manual introduces you to the GRiDCase 1500™ Series computer. It shows you how to set up your GRiDCase 1500 and gives you the basics of how to operate it.

To begin using your GRiDCase 1500 Series computer, read the step-by-step setup instructions given in Chapter 1.

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## BOOKS YOU MAY NEED

You may want to refer to the following books for further information on using the GRiDCase 1500.

### GRiD Software Publications

*InteGRiD Software Manual* (Order Number: 029600-43), for reference information on GRiD's integrated MS-DOS application environment.

*Getting Started: GRiD Software for the GRiDCase* (Order Number: 029100-43), for introductory information on GRiD software.

*Management Tools Reference* (Order Number: 029200-43), for reference information on the GRiD Management Tools.

*GRiDMaster User's Guide* (Order Number: 021231-43), for information on using GRiDMaster.

*GRiDTerm and GRiDReformat User's Guide* (Order Number: 021141-43), for information on using GRiDTerm.

*GRiD3101 and GRiDReformat User's Guide* (Order Number: 021151-43), for information on using GRiD3101.

*GRiDVT100 and GRiDReformat User's Guide* (Order Number: 021191-43), for information on using GRiDVT100.

## MS-DOS Publications

*GRiDCase MS-DOS Reference: Release 3.2 Version D* (Order Number: 029515-40), for reference information on using MS-DOS on GRiDCase 1500 Series computers.

## Hardware Publications

*Model 3401 GRiDCase 3 1/2-Inch Pocket Floppy Diskette Drive* (Order Number: 03401-40), for information on setting up and operating the pocket floppy disk drive.

*Model 3402 GRiDCase 5 1/4-Inch Pouch Floppy Diskette Drive* (Order Number: 03402-40), for information on setting up and operating the pouch floppy disk drive.

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# CHAPTER 1: SETTING UP YOUR GRiDCASE 1500 SERIES COMPUTER

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This chapter describes how to prepare your GRiDCASE 1500 Series Computer for use. It covers checking the contents of the shipping box, setting up the computer, starting up (booting) the operating system, and closing the computer for travel.

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## CHECKING THE CONTENTS OF THE BOX

Figure 1-1 shows the parts included in each shipping carton.

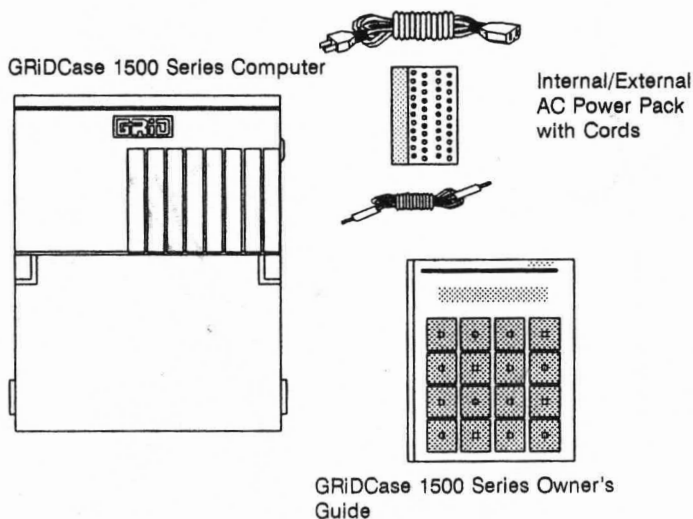


Figure 1-1. Contents of Box

Check for shipping damage or missing parts. If there are any problems, contact the GRiD representative who sold you the computer.

Keep the shipping carton and all original packing materials in case you need to return your GRiDCase 1500 for upgrading or service. Do not ship the computer in a carton other than the original shipping carton, as damage may result.

The internal/external AC power pack shipped with your GRiDCase 1500 is one option for powering the computer. In addition to the power pack, there are other available options for powering your system. Chapter 4 explains all of these options.

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## STARTING UP YOUR GRIDCASE 1500 SERIES COMPUTER

This section explains how to get your computer up and running quickly. It does **not** cover connecting printers, external drives, or other external devices. If you want to connect a printer or external drive before starting your computer for the first time, refer to chapters 2, and 6, respectively.

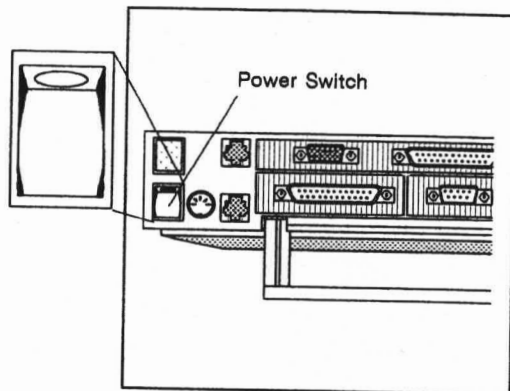
Begin by clearing a sturdy, flat work surface.

You should have handy the power supply you plan on using to power the computer. This can be the internal/external AC power pack included with your computer, the optional internal battery pack, or the optional external battery pack. For information on powering your computer, see Chapter 4.

To set up and start the computer, follow the steps listed below.

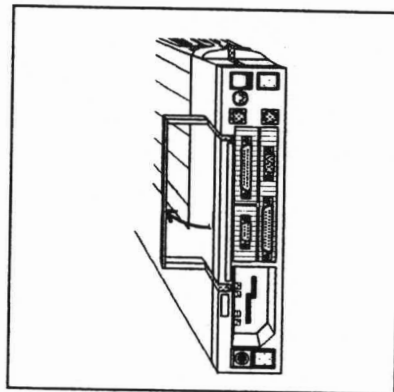
1. **Make sure the power switch is off.**

The power switch is on the back of the computer at the far left as you face the rear of the computer. Press the bottom of this switch to turn off the computer.

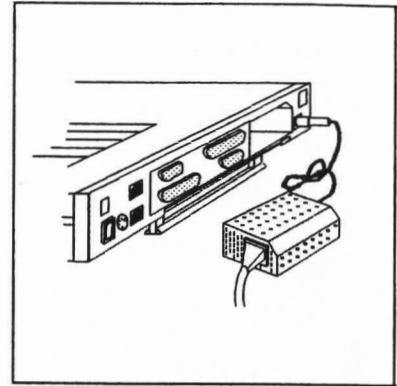


2. **Pull down the computer's handle/leg (optional).**

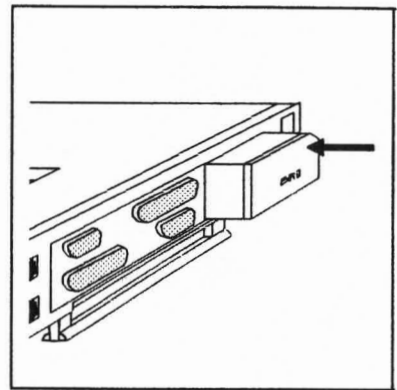
You can use the leg to improve your viewing/typing angle. Pull the handle straight out from the back of the computer and then pivot it down 90° to act as a leg.



- 3a. **If you are using the internal/external AC power pack externally, connect it to the computer and plug it in.** Plug the end of your power pack cord into the DC input connector on the back of the computer. Then plug one end of your power cord into the power cord socket on the AC power pack, and the other end into a wall outlet that accepts a three-prong plug. If you use a plug adapter, make sure it is properly grounded.

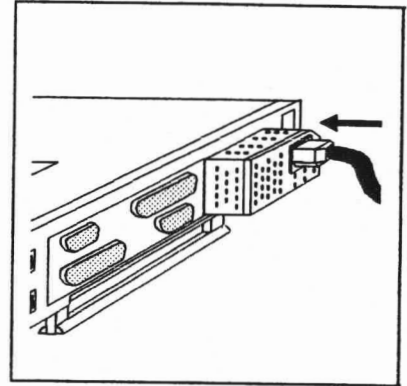


- 3b. **If you are using the battery pack, insert it into the computer.** Hold the battery pack with the label facing you. Insert it into the power pack slot on the back of the computer until it clicks into place.



- 3c. If you are using the internal/external AC power pack internally, insert it into the computer.

Hold the AC power pack with the power cord socket facing you. Plug one end of the power cord into the power cord socket on the back of the power pack. Insert the power pack into the power pack slot on the back of the computer until it clicks into place. Then plug the other end of the power cord into a wall outlet that accepts a three-prong plug. If you use a plug adapter, make sure it is properly grounded.

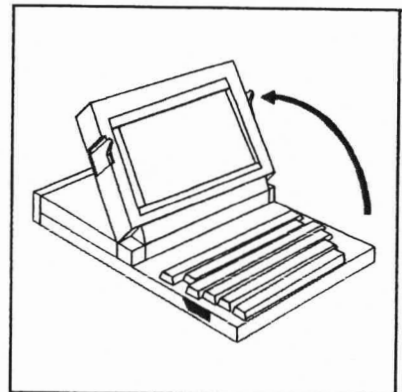


#### WARNING

Always insert the power pack into the computer before you plug the power cord into an outlet. Failure to do so exposes you to the hazard of an electrical shock from the exposed contacts on the end of the power pack.

4. Lift up the screen.

The screen is locked to the frame by one latch on each side. Pull these latches toward you and lift the screen.

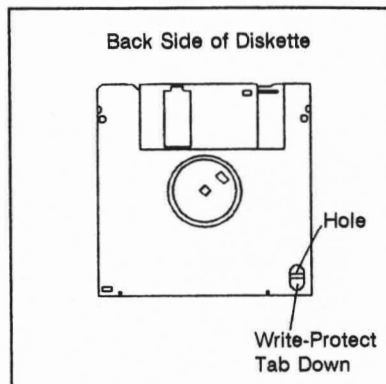




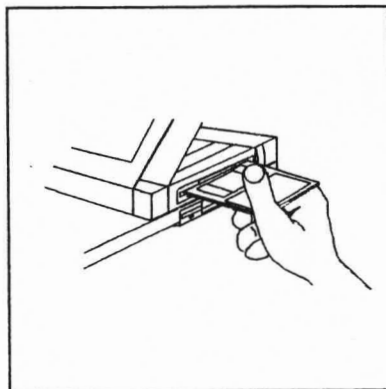
**CAUTION**

The screen must be treated with care. Never use abrasive substances on the screen. For complete information on cleaning the screen, see the section **Cleaning Your GRiDCase 1500 Series Computer** in Chapter 8.

5. **Write protect the operating system diskette. (Optional)** To protect the data on your 3 1/2-inch operating system diskette, slide the write-protect tab on the back-side of the diskette until the hole is uncovered.

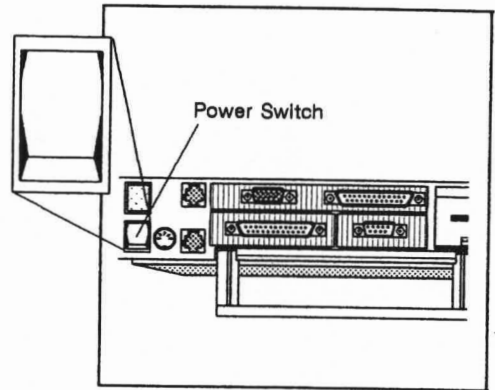


6. **Insert the operating system diskette until it clicks into place. (Not required if you have the operating system in ROM or on an optional hard disk.)** Hold the diskette with the label facing upwards and the metal edge closest to the disk drive opening. Insert it into the internal diskette drive. (If your computer has two internal diskette drives, put the diskette in the **top** drive.) An arrow on the diskette shows the proper direction for insertion.



Never jam the diskette into the drive. If you have difficulty inserting the diskette, press the eject button, and then try again.

7. **Turn on the power switch.**  
**Press the top of this switch to turn on the computer.**



Wait for the software to load. When you turn on the power, the computer loads software from the 3 1/2-inch diskette in the internal diskette drive — or from the hard disk — into main memory (RAM). This takes between 10 and 20 seconds, depending on your system's configuration.

**NOTE:** If you have the operating system in Read Only Memory (ROM), the computer will load it unless you designate otherwise. To start from your floppy diskette drive, press **F** when you hear the beep after turning on the power. If you want to use an operating system located on another disk or diskette device, see the section Starting Up the Operating System (Booting) below for instructions.

When the loading is finished, the initial operating-system screen is displayed.

If you want to connect any other devices to your computer, such as a printer or pocket floppy diskette drive, see the section The Rear View in Chapter 2, and Chapter 6, Connecting External Diskette Drives.

#### CAUTION

To avoid damaging your GRiDCase 1500 Series computer, before connecting or disconnecting any external device, always turn off the power of both the GRiDCase and the external device. GRiDCase 1500 Series computers contain low power circuitry, which can be damaged by static discharge. Static discharge occurs any time you connect or disconnect any external device (printer, storage device, power pack, and so on) to the computer when the power is on.

You may want to adjust the screen angle by tilting the screen to the desired position. Also, depending on the lighting conditions, you may need to adjust the contrast/brightness of the screen using the contrast/brightness control switch to the right of the screen. Units equipped with LCD screens also have an LCD back-light brightness switch immediately to the left of the screen. Turn this switch up to increase screen readability in areas where ambient lighting is poor.

Note that increasing the brightness of the computer's screen will increase power consumption and, therefore, decrease battery life.

## If You Have an Internal Hard Disk

If your GRiDCase 1500 Series computer has an internal hard disk, the hard disk is already formatted and contains all the MS-DOS operating system files. You can load MS-DOS from the hard disk simply by turning the computer on.

To load programs and data onto the hard disk, you need either a ROM cartridge or a floppy diskette drive. If your system is not equipped with an internal diskette drive, and you do not have access to an external drive, call your GRiD representative for more information and assistance.

If you should ever need to reload MS-DOS onto the hard disk, use the SYS command to copy the operating system to the hard disk.

---

## STARTING UP THE OPERATING SYSTEM (BOOTING)

The computer follows a specific order when choosing the storage device from which to load the operating system software. This device ordering is shown in Table 1-1. The computer first searches for the operating system software in ROM, and if it does not find the software there, it looks on the hard disk (on systems so equipped) or on diskette drive A (if the system includes a diskette drive).

**NOTE:** On systems equipped with one floppy diskette drive and a 10- or 20-megabyte hard disk (and no MS-DOS ROMs), the operating system is **always** loaded from the hard disk, unless you explicitly override the normal search sequence (see below). This is **unlike** most other PC/AT-compatible computers, which search for the operating system on floppy diskette drive A before looking on the hard disk.

You can override the normal search sequence and choose the device from which you want the computer to load the operating system software. To start from another device, hold down the key indicated in Table 1-1 for several seconds as you turn on the power switch. For example, to start from internal floppy diskette drive A, you would press F while turning on the power.

*Table 1-1. Order of Devices Searched During Loading*

<b>Device</b>	<b>Key</b>
Read Only Memory (ROM)	R
Hard Disk	H
Floppy	F (Internal, pocket, or pouch diskette drive A, depending on switch settings and which external drive, if any, is connected)

## WARM START-UP

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Once start-up is complete, you may on occasion find it necessary to restart your computer again as you work. For example, it may be necessary to restart your computer if the keyboard locks up.

At this point, you should reboot the computer by pressing

### **Ctrl-Alt-Del**

This method, called a warm start-up, restarts the operating system while leaving your power supply on. This saves wear and tear on the power supply and power switch, and the booting time is faster than if you pressed the power switch. A warm start also uses less battery power than a cold start.

If the warm start-up method is unsuccessful, you should press the power switch. When you use the power switch to restart the computer, always wait a few seconds before turning the computer on again. This ensures that the software is loaded properly.

---

## CLOSING YOUR GRIDCASE 1500 SERIES COMPUTER

To prepare your GRiDCase 1500 Series computer for travel, follow the steps listed below:

1. Save your files. For information on saving files, consult the *MS-DOS Reference* manual.

### WARNING

If you have an internal hard disk, wait until the hard disk in-use light goes out before you turn off the power. This ensures that the hard disk's read/write heads are "parked." The system automatically moves the drive heads to a part of the disk that contains no data. This allows you to move the computer without damaging the hard disk and losing data.

2. Close the screen panel. Press it down gently until you hear it click shut.
3. Disconnect all cords.

Don't forget your peripherals, cables, diskettes, manuals, and any accessories you want to take with you.

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## CHAPTER 2: GETTING TO KNOW YOUR GRiDCASE 1500 SERIES COMPUTER

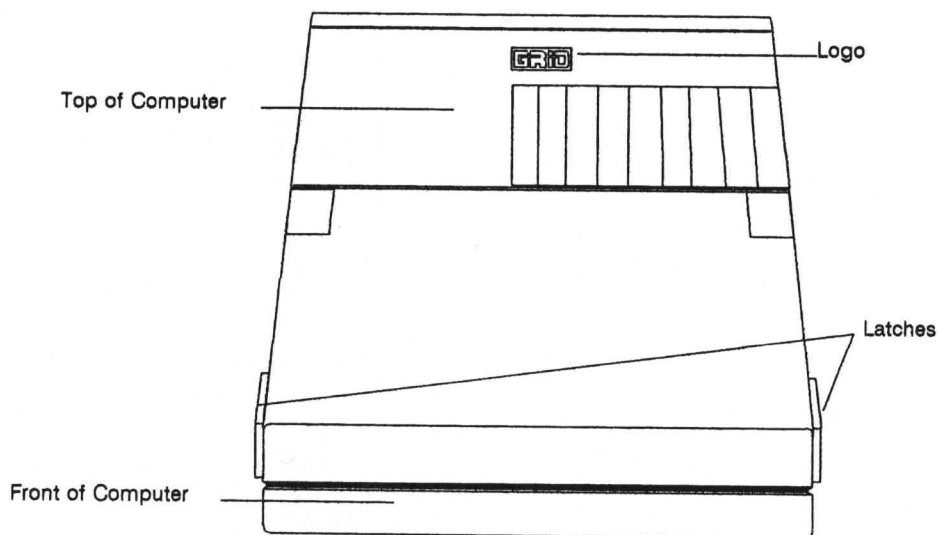
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This chapter introduces you to your GRiDCase 1500 Series Computer, giving a detailed description of the top, front, side, and rear views of the computer.

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### THE TOP VIEW

The top view of the computer is shown in Figure 2-1. Note that the GRiD logo is on the top of the case, toward the rear, and the screen latches are on the sides, toward the front.

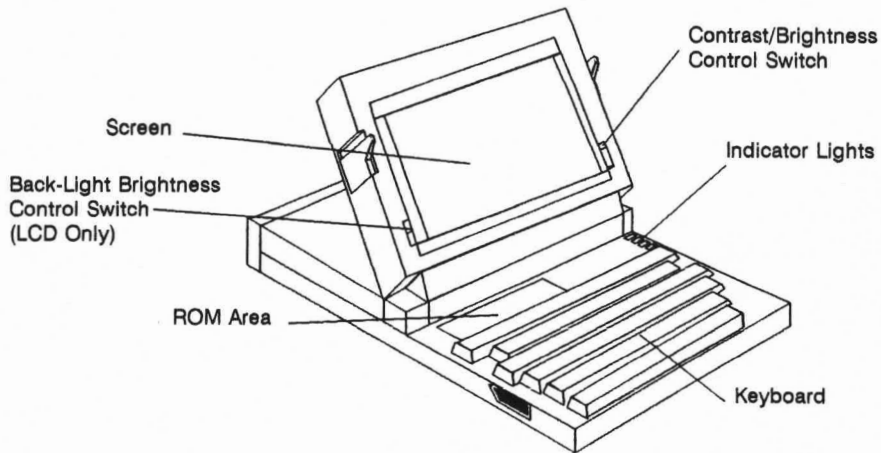


*Figure 2-1. Top View of a GRiDCase 1500 Series Computer*



## THE FRONT VIEW

The front view of a GRiDCase 1500 Series computer is shown in Figure 2-2.



*Figure 2-2. Front View of a GRiDCase 1500*

### Screen

The screen is used to display your data. You should treat it with care. For complete instructions on cleaning the screen, see the section *Cleaning your GRiDCase 1500 Series Computer* in Chapter 8.

**NOTE:** You can also connect an external color monitor to your computer, as described in the *Video Output Connector* section at the end of this chapter.

## Contrast/Brightness Control Switch

The contrast/brightness control switch, at the right of the screen, controls the brightness of the optional plasma screen or the contrast of the standard LCD screen. This switch increases the contrast or brightness of the screen when pushed toward the top of the screen, and decreases the contrast or brightness when pushed toward the bottom of the screen.

**NOTE:** If you have a plasma screen, the brightness of the screen affects power consumption – the brighter the screen, the greater the power consumption. Increasing the brightness of an LCD screen's back light also increases power consumption. Therefore, it is a good idea to decrease the brightness to conserve power when using a battery pack.

## Back-Light Brightness Control Switch

GRiDCase 1500 Series computers equipped with the standard LCD screen also have a slide switch controlling the brightness of the screen's back light. Push this switch all the way to the bottom position to turn the back light off; all the way to the top position for maximum brightness.

## Indicator Lights

The four indicator lights above the keyboard near the right side of the computer are defined as follows:

- **Upper Disk In Use:** In-use light for the upper drive on two-drive models. When this indicator is lit, file access is taking place on the upper drive. Do not eject a drive or turn off the computer while this light is lit. On single-drive models, this indicator is present, but is not used.
- **Lower/External Disk In Use:** In-use light for the lower drive on two-drive models. When this indicator is lit, file access is taking place on the lower drive. Do not eject a diskette from the drive or turn off the computer while this light is lit. This light will also illuminate when an external diskette drive is accessed.

- **Processor Low:** Processor speed indicator. Both the GRiDCase 1520 and the GRiDCase 1530 are equipped with dual-speed microprocessors. The 1520's 80C286 ordinarily runs at 10 MHz. The 1530's 80C386 ordinarily runs at 12.5 MHz. Both can, however, be slowed down to 6 MHz. There is generally no reason to do this unless you have added one or more expansion cards to your computer by attaching the optional expansion chassis. Some expansion cards cannot be run at a speed higher than 6 MHz. Switching to the lower processor speed may have only a slight effect on performance, depending on your application<sup>1</sup>. When you switch to the lower clock speed, the processor speed indicator lights to remind you that you are running at the slower speed.
- **Battery Low/Charging:** When the computer is being powered by an internal battery pack, and the battery pack's charge becomes dangerously low, this indicator turns red. This indicates that you have between 5 and 10 minutes of operation left. You should save any files you are working on and then either supply AC power or turn the computer off and change battery packs.

If you have a low battery in the power pack slot, and you connect the AC power pack externally, the AC power pack begins to recharge the battery pack. While the battery pack's charge remains low, the indicator appears orange (actually a combination of red, to indicate a low battery, and green, to indicate charging is taking place). When the battery pack's charge is no longer low, the indicator turns green. This indicates that, although the charge is no longer dangerously low, the battery pack is still being charged. When the battery pack is fully charged, the indicator goes out entirely.

1 Processor clock speed is relatively unimportant to applications that are input/output intensive. When you are using a word-processing program, for example, the computer is spending most of its time waiting for you to strike keys—your typing speed, not the processor's clock speed, is the primary determinant of overall speed.

## ROM Area

The ROM area contains sockets where you can insert ROM cartridges. A ROM cartridge is a storage device for programs. Each cartridge can hold up to 256K (about 262,000 characters). You can install up to two ROM cartridges, giving you 512K characters of additional storage space. Refer to the Read Only Memory (ROM) Installation and Use guide that came in your ROM package for information on installing ROM cartridges.

### CAUTION

Always turn off the power before attempting to install or remove ROM cartridges.

## Keyboard

Figure 2-3 shows the keyboard. The keyboard provides you with all the functionality of the IBM PC/AT keyboard. The keys marked in green and blue provide the additional functions found on the IBM keyboard.

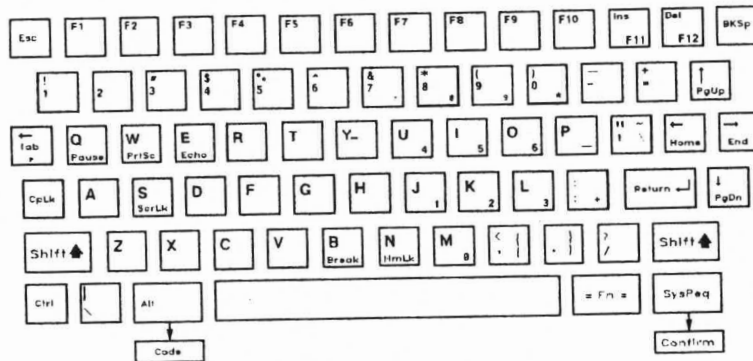


Figure 2-3. GRiDCase 1500 Series Keyboard

To use the **F11** IBM PC function key, hold down the **Fn** key (in the lower right-hand corner of the keyboard) and press the **Ins** key. To use the **F12** function key, hold down the **Fn** key and press the **Del** key. To use function keys **F13** through **F20**, hold down the **Shift** key and press one of the keys **F3** through **F10**, where **F3** corresponds to **F13**, and so on.

## Using the Numeric Keypad

To conserve space, the GRiDCase 1500 Series keyboard overlays the numeric keypad keys on the regular alpha-numeric keyboard (refer to Figure 2-3.)<sup>1</sup>.

To use the Numeric keypad keys, you must first put the computer in NumLock mode. To do so, press the **NmLk** key.

While the computer is in NumLock mode, the numeric keypad keys return numeric values only; you cannot use the key's alpha values. To return the keys to their standard alpha-numeric values, press **NmLk** again.

You can also access the numeric keypad keys when the computer is not in the NumLock mode. To do so, press the **Fn** key and the desired keypad key simultaneously.

Table 2-1 lists IBM PC and PC/AT special keys and their GRiDCase 1500 equivalents.

1 Note that the cursor-movement keys found on the IBM numeric keypad are separate keys on the GRiDCase keyboard.

*Table 2-1. IBM PC and PC/AT Special Keys and GRiDCase 1500 Equivalents***Function Keys**

Function Key	IBM Key	GRiDCase 1500 Key
F1	F1	F1
F2	F2	F2
F3	F3	F3
F4	F4	F4
F5	F5	F5
F6	F6	F6
F7	F7	F7
F8	F8	F8
F9	F9	F9
F10	F10	F10
F11	Shift-F1	Fn-F11
F12	Shift-F2	Fn-F12
F13	Shift-F3	Shift-F3
F14	Shift-F4	Shift-F4
F15	Shift-F5	Shift-F5
F16	Shift-F6	Shift-F6
F17	Shift-F7	Shift-F7
F18	Shift-F8	Shift-F8
F19	Shift-F9	Shift-F9
F20	Shift-F10	Shift-F10

**Cursor-Control Keys**

IBM Key	GRiDCase 1500 Key
RightArrow	RightArrow
LeftArrow	LeftArrow
DownArrow	DownArrow
UpArrow	UpArrow
End	Fn-End
Home	Fn-Home
PgDn	Fn-PgDn
PgUp	Fn-PgUp

---

**Typewriter Keyboard Keys**

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<b>IBM Key</b>	<b>GRiDCase 1500 Key</b>
Break	Fn-Break
Echo	Fn-Echo
Enter	Return
Pause	Fn-Pause
Shift-PrtSc	Fn-PrtSc
Right Shift	Right Shift
Left Shift	Left Shift
Tab	Tab
Shift-Tab	Shift-Tab

---

**Numeric Keypad Keys**

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<b>IBM Key</b>	<b>GRiDCase 1500 Key</b>
Del	Del
Ins	Ins
Num Lock	Fn-NmLk
Gray +	numeric keypad + (;)
Gray -	numeric keypad - (P)
Gray *	numeric keypad * (0)
1	numeric keypad 1 (J)
2	numeric keypad 2 (K)
3	numeric keypad 3 (L)
4	numeric keypad 4 (U)
5	numeric keypad 5 (I)
6	numeric keypad 6 (O)
7	numeric keypad 7 (7)
8	numeric keypad 8 (8)
9	numeric keypad 9 (9)
0	numeric keypad 0 (M)
Scroll Lock	Fn-ScrLk

---

---

### Special Characters

---

IBM Key	GRiDCase 1500 Key
[	Fn-[
]	Fn-]
{	Fn-Shift-{
}	Fn-Shift-}
~	Fn-Shift-~
'	Fn-'

---

Consult the *MS-DOS Reference* manual to learn how the keys function on a GRiDCase 1500 Series computer.

### Three Special Key Combinations

Pressing the following three keys simultaneously toggles video output between the built-in display and an external monitor attached to the video output connector:

#### Ctrl-Alt-Tab

The key combinations shown below change the current color mapping mode (the way in which color output is displayed on the built-in screen). There are six color mapping modes. The default is mode 1.

**Ctrl-Alt-Fn→** increments the color mapping mode.

**Ctrl-Alt-Fn←** decrements the color mapping mode.

You can also use the **MODE** command to set the color mapping mode – refer to Chapter 9.



The key combinations shown below switch between high and low processor speeds.

**Ctrl-Alt-Fn-↓** sets the processor to low speed (6MHz)

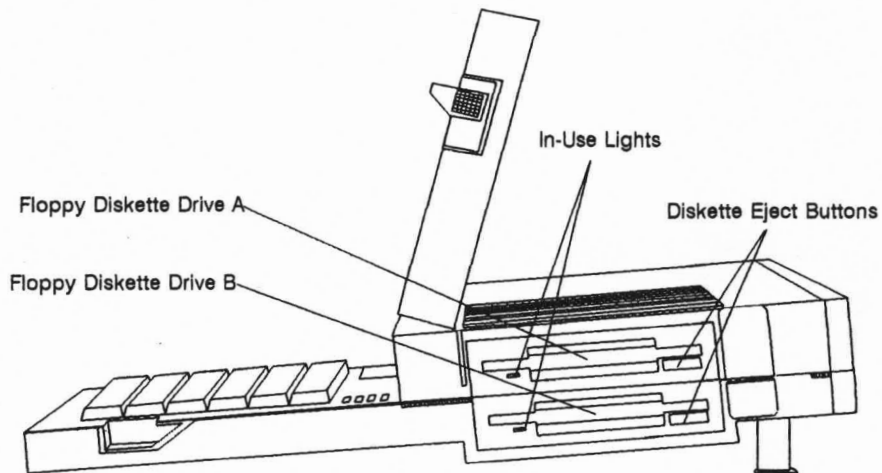
**Ctrl-Alt-Fn-↑** sets the processor to high speed (1520: 10 MHz; 1530: 12.5 MHz)

You can also use the **MODE** command to set the processor speed—refer to Chapter 9.

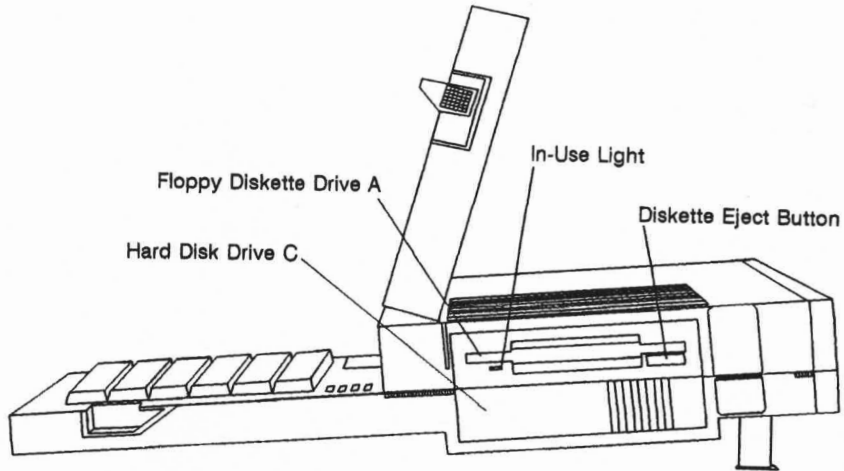
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## THE SIDE VIEW

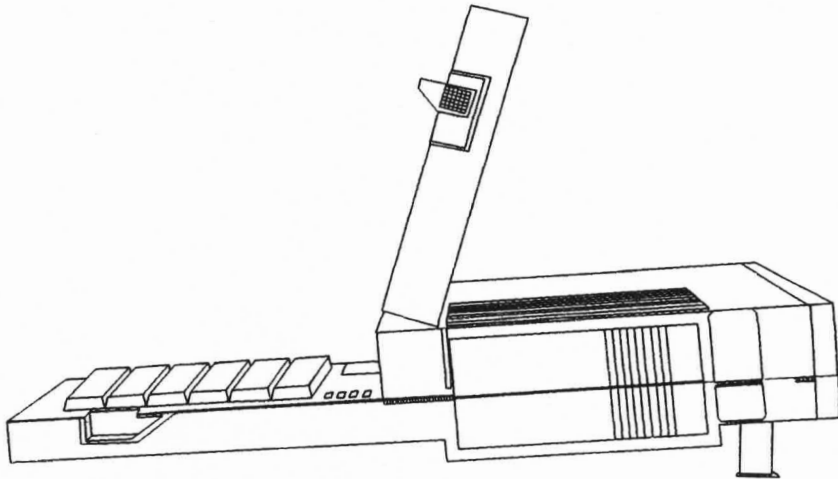
Side views of variously configured GRiDCase 1500 Series computers are shown in figures 2-4, 2-5, and 2-6.



*Figure 2-4. GRiDCase 1500 Series Computer Equipped with Two Floppy Diskette Drives*



*Figure 2-5. GRiDCase 1500 Series Computer Equipped with One Floppy Diskette Drive and an Optional 10- or 20-Megabyte Hard Disk*



*Figure 2-6. GRiDCase 1500 Series Computer Equipped with Optional 40-Megabyte Hard Disk*

## Diskette Drive

The internal diskette drive uses 3 1/2-inch double-sided, high-density floppy diskettes capable of storing 1.4 megabytes of data each. This drive can also read, write, and format double-density 720K diskettes. Chapter 1, Setting Up the Computer, contains a brief description of how to insert diskettes in the drive. For more detailed information about the drive and about floppy diskettes, refer to Chapter 5, Using the Internal Diskette and Hard Disk Drives.

## Diskette Eject Button

The diskette eject button, below and to the right of the diskette slot, is used to eject the floppy diskette currently in the diskette drive. To remove a diskette, push in the diskette eject button until the floppy diskette pops out.

## Optional Hard Disk

GRiDCase 1500 Series computers can be equipped with any of three optional hard disks: a 10-megabyte hard disk, a 20-megabyte hard disk, or a 40-megabyte hard disk. For more information about the internal hard disks, see Chapter 5, Using the Internal Diskette and Hard Disk Drives.

## THE REAR VIEW

The rear view of a GRiDCase 1500 is shown in Figure 2-7. You will use many of the items shown here when setting up your computer. Each item is explained on the following pages. To help you with setting up, a label containing all the connector names appears in the middle of the rear panel of the computer on the handle.

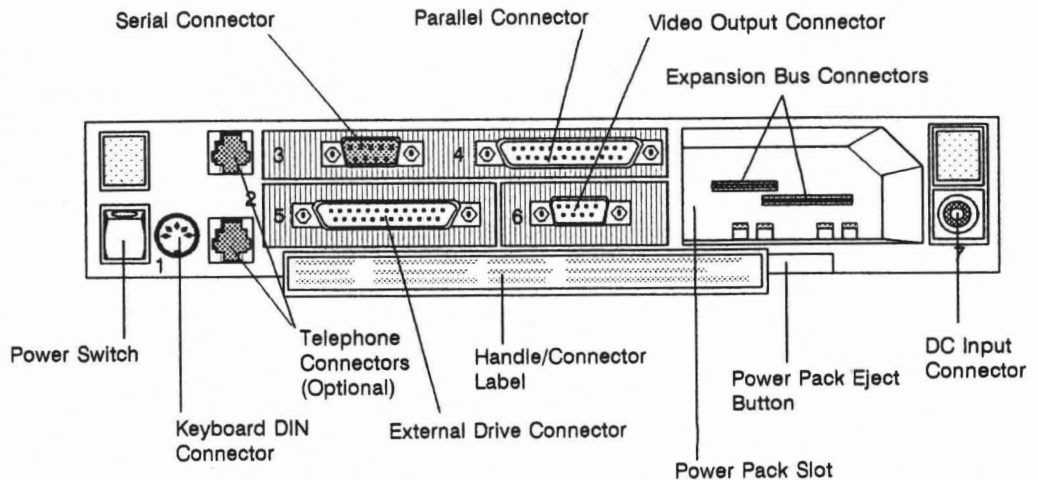


Figure 2-7. Rear View of a GRiDCase 1500 Series Computer

### Power Switch

The power switch, on the far left, turns the computer on and off. To turn on the computer, press the top of the switch. To turn it off, press the bottom of the switch. You can also use this switch to restart the computer. See the section Warm Start-Up in Chapter 1 for details.

### CAUTION

Never turn off the computer when the in-use light for an internal drive or any other storage device is on. The in-use light means that file access may be taking place; turning off the computer at this time can destroy data.

## Keyboard DIN Connector

The keyboard DIN connector connects the GRiDCase to an external IBM PC/AT keyboard or keypad.

### Connecting a Keyboard or Keypad to the DIN Connector

You can connect an IBM PC/AT keyboard or a GRiD-supplied keypad to your GRiDCase 1500 Series computer.

1. Turn off the computer and any other peripherals.

### CAUTION

Before connecting or disconnecting a keyboard, keypad or any other external device, turn off the power to both the computer and (if applicable) the external device. Failure to do so may damage your unit.

2. Plug the keyboard or keypad cord into the keyboard DIN connector on the back of the computer. The cord fits into the connector in only one way. Be sure to correctly match up the end of the cord with the connector pins.
3. Turn on the computer and any peripherals.

You can now use either the external keyboard, the keypad, or the GRiDCase keyboard.

## Telephone Connectors (Optional)

The telephone connectors let you access the optional internal modem. The connectors are standard RJ-11 jacks. One jack is for the cord that ordinarily plugs into the back of your telephone. The other jack is for an optional cord to connect your telephone to the computer. That is, one jack connects the modem to the phone system, and the other connects the modem to your telephone. If you can use both jacks, you can switch back and forth between modem and telephone use without moving the cord from the modem to the telephone and vice versa. You cannot, however, use the modem and the telephone at the same time. It does not matter which connector you use for which cord. For more information on using the internal modem, see Chapter 3.

## Serial Connector

The serial connector allows you to connect your computer to external modems, serial printers, and other serial devices. Only one peripheral at a time can be connected to the computer through the serial connector. This connector is a 9-pin RS-232C connector.

You can use the MS-DOS MODE command to change the serial port's default settings. For instructions on using the MODE command, refer to Chapter 9, Using MS-DOS on a GRiDCase 1500 Series computer.

## Connecting an External Modem to the Serial Connector

You can connect an external modem (using a Model 6400 serial cable) to the serial connector on the rear panel of the computer.

You can connect any modem that is compatible with the software you are using. Consult the manual that accompanies the software for the correct switch settings for your modem.

After the switches are set, you are ready to connect your modem to the computer. Follow the steps listed below.

1. Turn off the computer, modem, and any other peripherals.

#### **CAUTION**

Before connecting or disconnecting a modem or any other external device, turn off the power to both the computer and the external device. Failure to do so may damage your unit.

2. Attach the Model 6400 serial cable into the serial connector on the back of your modem.
3. Attach the other end of the cable to the serial connector on the back of the computer.
4. Plug in the power cord from the modem into a wall outlet.
5. Turn on the modem (and any other peripherals), and then turn on the computer.

### **Connecting a Printer to the Serial Connector**

You can connect a serial printer (using a Model 6400 serial cable) to the serial connector on the rear panel of the computer.

Before using a printer for the first time with a particular software program, you must make sure that the software is properly configured for your printer (refer to the documentation for the software program and the printer for configuration details). Generally, software configuration consists of installing the appropriate printer driver software for your printer. A printer driver is a program that allows the computer to communicate with a particular make and model of computer. Most application programs include printer drivers for a variety of different printers.

Before connecting the printer, make sure that the configuration switches on the printer are set properly. These switches determine how the printer operates.

After the switches are set correctly and the appropriate printer driver is installed, you are ready to connect the printer to the computer. To connect a serial printer to the computer, follow the steps listed below.

1. Turn off the computer, the printer, and any other peripherals.

#### CAUTION

Before connecting or disconnecting a printer or any other external device, turn off the power to both the computer and the external device. Failure to do so may damage your unit.

2. Attach the serial cable to the serial connector on the back of the computer.
3. Attach the other end of the serial cable to the serial connector on the back of the printer.
4. Check your printer manual for instructions on loading the ribbon, paper, and other supplies into the printer.
5. Position your paper so that the print head is at the top of the page.
6. Make sure all power cords are plugged in.
7. Turn on the printer (and any other peripherals), and then turn on the computer.

## Parallel Connector

The parallel connector connects the computer to printers and other parallel devices using a Model 6220 Centronics cable. Note the trapezoidal or "D" shape; it makes an improper connection impossible. Only one peripheral at a time can be connected to the computer through the parallel connector.

**NOTE:** The parallel connector is physically similar to the external drive connector. **Do not connect an external drive to the parallel connector.** A drive so connected will not work.



## Connecting Printers to the Parallel Connector

Read the previous section, Connecting a Printer to the Serial Connector. You must follow the same prerequisites before connecting a printer to the parallel connector. To connect a parallel printer to the computer, follow the steps listed below.

1. Turn off the computer, the printer, and any other peripherals.

### CAUTION

Before connecting or disconnecting a printer or any other external device, turn off the power to both the computer and the external device. Failure to do so may damage your unit.

2. Attach the Centronics cable to the parallel connector on the back of the computer.
3. Attach the other end of the Centronics cable to the Centronics connector on the back of the printer.
4. Check your printer manual for instructions on loading the ribbon, paper, and other supplies into the printer.
5. Position your paper so that the print head is at the top of the page.
6. Make sure all power cords are plugged in.
7. Turn on the printer (and any other peripherals), and then turn on the computer.

## External Drive Connector

The external drive connector is where you connect a pocket (external 3 1/2-inch) or pouch (external 5 1/4-inch) diskette drive, or an external 40MB streaming tape backup drive. Though this port looks like the parallel port, it supports only the pocket and pouch diskette drives. You cannot plug the cable for any other device into this connector — one of the pin holes not used by the drive cable connector is blocked to prevent an improper connection. Do not attempt to force any cable onto this connector. For more information on connecting the external drives, see Chapter 6, Connecting External Diskette Drives.

## Video Output Connector

The video output connector connects your GRiDCase 1500 Series computer to a color monitor or video projector.

## Connecting a Color Monitor to the Video Output Connector

You can connect any IBM PC color monitor to your GRiDCase 1500 Series computer, provided it is compatible with the IBM Color Graphics Adapter (CGA) standard. To Connect the color monitor to the computer, follow the steps listed below.

1. Turn off the computer, the monitor, and any attached devices.

### CAUTION

Before connecting or disconnecting a color monitor or any external device, turn off the power to both the computer and the external device. Failure to do so may damage your unit.

2. Attach the cable from the monitor to the video output connector on the back of the computer.
3. Plug the power cord from the monitor into a properly grounded outlet.

Note that you cannot display data simultaneously on the built-in screen and on an external monitor. To switch back and forth between internal and external displays, press the **Ctrl**, **Alt**, and **Tab** keys simultaneously.

## **Power Pack Slot**

The internal/external AC power pack or battery pack fits into the power pack slot. See Chapter 4 for a description of these items and how to use them.

This slot also contains the expansion bus connectors that allow you to add 1500 Series expansion products to your GRiDCase 1500 Series computer. You can use the expansion bus connectors to attach either a single GRiD-supplied expansion cartridge or the GRiD-supplied five-card expansion chassis. XT-compatible expansion cards from any manufacturer can be installed in the expansion chassis.

The expansion bus connectors are accessible only when you power the computer externally.

## Power Pack Eject Button

The power pack eject button, immediately below the power pack slot, ejects the battery pack or the internal/external AC power pack. (Expansion products are equipped with their own pull knobs for easy ejection from the power pack slot.)

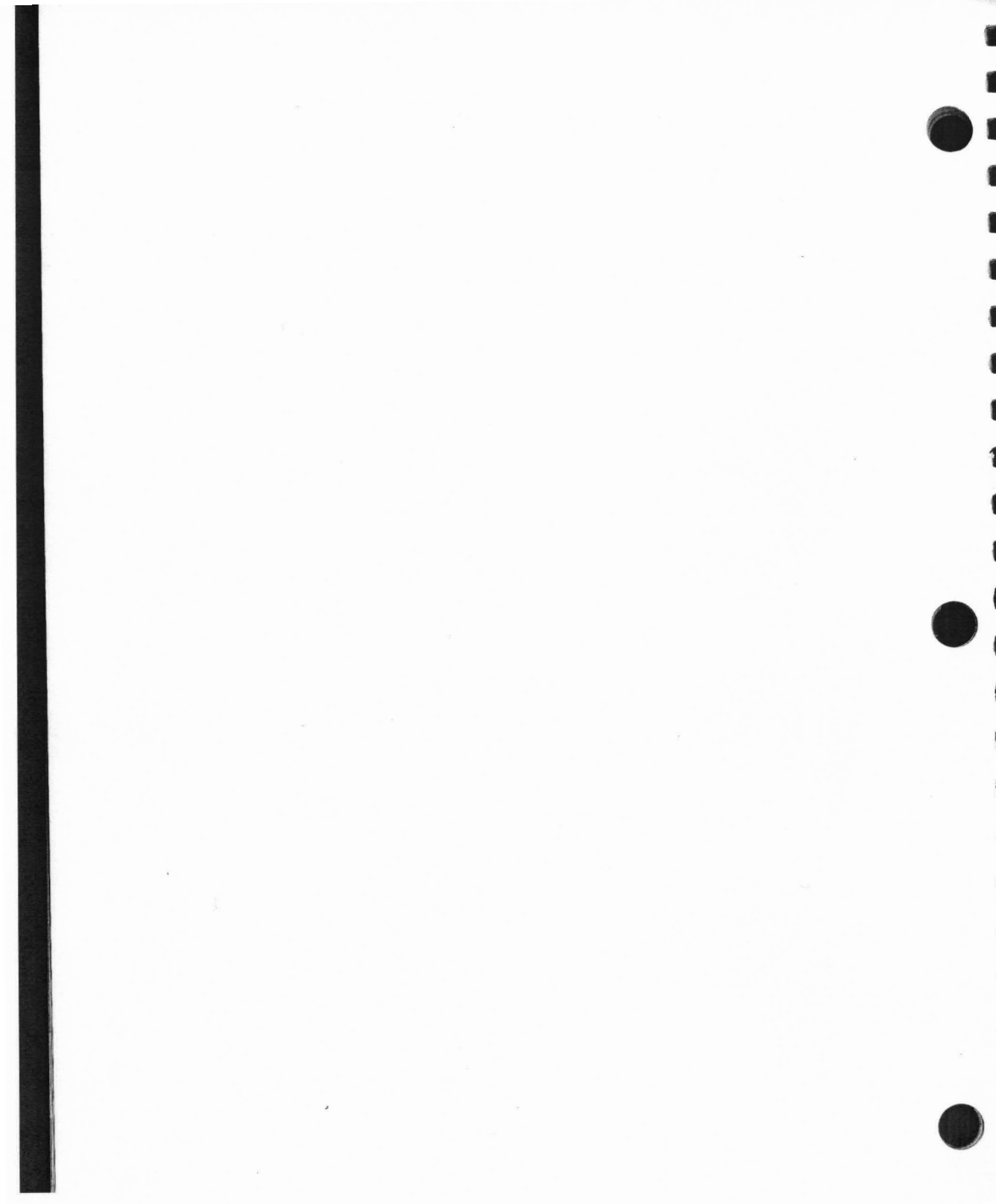
### CAUTION

Always save your work and turn the computer off before ejecting the battery pack from the power pack slot; any data in RAM (main memory) is lost if there is no other source of power to the computer.

Also, never remove the battery pack when the in-use light for an internal drive or any other storage device is lit. The in-use light means that file access may be taking place; removing power at this time can destroy data.

## DC Input Connector

The DC input connector connects the computer to an internal/external AC power pack as described in Chapter 4.



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## CHAPTER 3: BUILT-IN OPTIONS

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This chapter describes the built-in options available for your GRiDCase 1500 Series computer.

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### THE OPTIONS

The built-in options are listed in Table 3-1.

*Table 3-1. Available Options for Your GRiDCase 1500 Series Computer*

<b>Option/Option Number</b>	<b>Description</b>
<b>Displays:</b> Plasma Display Option 281	This display replaces the standard backlit LCD and provides a 640-pixel by 200-pixel light-emitting gas plasma display. Measures 9.4" diagonally.
Plasma Display Option 282	This display replaces the standard backlit LCD and provides a 640-pixel by 400-pixel light-emitting gas plasma display. Measures 10" diagonally.
<b>System Ram:</b> 2 MB System RAM Option 302	Two megabytes of main memory in place of the standard one megabyte.
4 MB System RAM Option 304	Four megabytes of main memory in place of the standard one megabyte.
8 MB System Ram Option 308	Eight megabytes of main memory in place of the standard one megabyte.

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<b>Mass Storage:</b> 10 MB Hard Disk Option 320	Ten-megabyte hard disk drive replaces one of the standard floppy diskette drives.
20 MB Hard Disk Option 321	Twenty-megabyte hard disk drive replaces one of the standard floppy diskette drives.
40 MB Hard Disk Option 324	Forty-megabyte hard disk drive replaces both of the standard floppy diskette drives.
MS-DOS ROM Option 370	Version 3.2.1 of the MS-DOS operating system stored in a single 128K Read-Only Memory (ROM) chip. The operating system is always available, but requires no disk storage.
MS-DOS/ CrossTalk ROMs Option 371	Like Option 378, but also provides the popular CrossTalk communications program on a second ROM.
<b>Modems:</b> 1200 Baud Modem Option 330	Built-in Hayes-compatible modem allows data transmission at either 300 or 1200 baud.
2400 Baud Modem Option 331	Built-in Hayes-compatible modem allows data transmission at 300, 1200, or 2400 baud.
<b>Coprocessors:</b> 80287 Numeric Coprocessor Option 340	Available on the GRiDCase 1520 only. Provides faster operation for math-intensive applications (e.g., spread sheets, vector graphics, etc.).
80387 Numeric Coprocessor Option 341	Available on the GRiDCase 1530 only. Provides faster operation for math intensive applications (e.g., spread sheets, vector graphics, etc.).

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## Displays

Two gas plasma displays are available in place of the standard backlit LCD screen. Gas plasma displays, unlike LCDs, are light emitting and may therefore be more appropriate when ambient lighting conditions are poor or variable.

The Model 281 display measures 9.4 inches diagonally. It displays 80 columns by 25 lines in character mode. Its graphics resolution is 640 by 200 pixels, and its aspect ratio is 1:1.4.

The Model 282 display measures 10 inches diagonally. It can display characters in either 80 x 25 mode or 80 x 40 mode. Its graphics resolution is 640 by 400 pixels, and its aspect ratio is 1:1.

Both gas plasma displays have contrast ratios of 20:1.

## Additional System RAM

GRiDCase Series 1500 computers are available in 1-megabyte (standard), 2-megabyte, 4-megabyte, and 8-megabyte system RAM configurations. All RAM above 640K is user configurable as either EMS RAM (Lotus/Intel standard) or IBM PC/AT extended RAM (refer to the section on the MODE command in Chapter 9 for RAM-configuration information).

## Mass Storage

### Internal Hard Disk Options

The internal hard disk options provide 10 megabytes, 20 megabytes, or 40 megabytes of permanent storage. All hard disks are preformatted for use with MS-DOS.



## ROM Cartridges

The Read Only Memory (ROM) cartridges are a permanent storage device for programs. By using programs in ROM, you no longer need to carry these programs on floppy diskettes or any other storage device. ROM cartridges are also the most rugged storage medium available.

You can install ROM cartridges in the ROM sockets located just above the keyboard (see Figure 2-2). You can install either one or two ROM cartridges, giving you up to 512K characters of additional space for programs. For information on installing and removing ROM cartridges, see the Read Only Memory (ROM) Installation and Use guide that comes with your ROM package.

### CAUTION

Always turn off the power before attempting to install or remove ROM cartridges.

## Internal Modems

Two different internal modems are available for GRiDCase Series 1500 computers. Either internal modem transmits and receives data through the telephone system. Because the internal modem resides inside the computer, it provides greater convenience than an external modem when you are traveling or moving your equipment. The internal modem operates through most standard telephone systems in the U.S.A. or Canada.

The Option 330 modem can transmit and receive data at 300 or 1200 baud. The Option 331 modem can transmit and receive data at 300, 1200, or 2400 baud.

## Notifying the Telephone Company

The Federal Communications Commission (FCC) may ask that you contact your local telephone company before using telephone lines to transmit data. If you are asked to notify your local telephone company, they will need the following information.

### 300/1200 Baud Modem (Option 330)

- Manufacturer – GRiD Systems Corporation
- Equipment model number – 1253
- FCC registration number – B468 NR-68618-DM-E
- Modem model number – Cermetec Model 1750
- Ringer equivalence – 0.4B

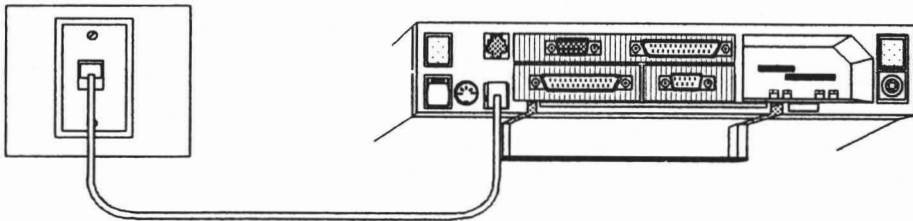
### 300/1200/2400 Baud Modem (Option 331)

- Manufacturer – GRiD Systems Corporation
- Equipment model number – 1263
- FCC registration number – CJE794-72748-MD-E
- Modem model number – US Robotics Model GRATE1
- Ringer equivalence – 0.4B

## Connecting the Telephone Line

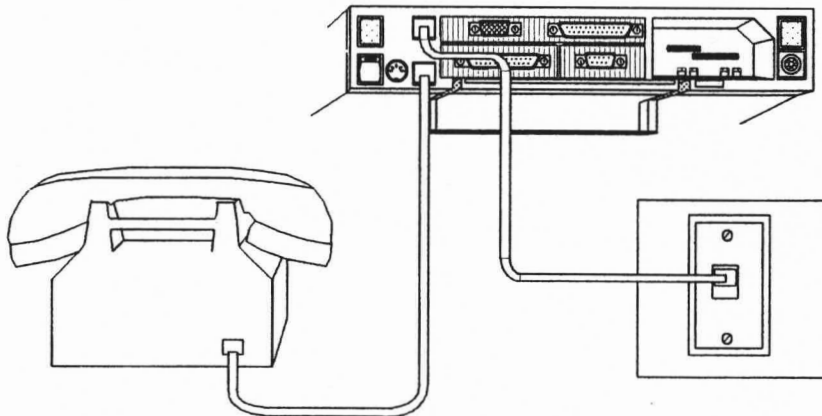
Your phone cord plugs into the telephone connector on the back of the computer (see Figure 3-2). Most offices and residences now use the standard plug-in jack connector (RJ-11).

To connect a GRiDCase 1500 Series computer to the telephone system, unplug the cord from the back of your telephone and plug it into either of the telephone connectors on the back of the computer (see Figure 3-1).



*Figure 3-1. GRiDCase 1500 Series Computer Connected to Phone Jack*

To use your telephone while your computer is connected to the same phone line, you will need another telephone cord. Connect the computer to the phone jack as shown in Figure 3-1, and then use the second telephone cord to connect the telephone to the other connector, as shown in Figure 3-2.



*Figure 3-2. Modem Connected to Telephone System and Phone*

With the appropriate software, you can now use the same telephone line either to speak on the phone or to transmit and receive data from another computer (you cannot talk and send data at the same time).

**NOTE:** When connecting to a remote computer, the modem speaker is turned off immediately after the connection is made.

If your internal modem is not working properly, see Appendix A, Testing the Modem, to determine if it is your modem or the telephone line that is causing the problem.

**NOTE:** The computer modem will not function with digital PBX telephone systems that use digital telephone sets. If you are unsure whether or not your computer will work with your PBX telephone system, contact your local GRiD representative.

## Alternative Telephone Connections

There are some telephone systems that do not use the RJ-11 plug-in jack connector. Some use different types of connectors, and others are permanently wired. Read this section if you find that there is no RJ-11 connector available to plug into your computer's telephone connector.

Some older telephone systems use four-prong connectors. These require an adapter available from any electronics store. (One such adapter is the Radio Shack Model 279-351.)

Some offices use large Amphenol connectors for phones that have several lines coming in. Many adapters are available to tap into these connectors. (Radio Shack Models 43-271 and 43-270 are two commonly available adapters.)

In situations where the telephones are permanently wired, the simplest solution is to use a special coupler that attaches to the handset of the telephone and provides an RJ-11 connector for plugging into your computer. The two following couplers are available at many electronics dealers or computer stores. (These couplers may not function in all situations.)

- The GRiD Acoustic Modem Adapter (Model 32180), which attaches to almost any size and shape handset. This adapter supports 300 baud communications and, in some cases, can be used in 1200 baud communications.
- The Black Jack (from the Microperipheral Corporation), which attaches to telephone handsets with round mouthpieces.

There are also many models of acoustic couplers available with built-in modems. These attach to the serial connectors of the computer. Most can transmit at 300 baud, and some can transmit at 1200 baud. These are available at many computer stores.

## Using the Modem

Your MS-DOS application program may require you to change the modem switch settings. Because the modem is internal, there are no physical switches to set, however, the Hayes Smartmodem switch settings are emulated in software.

The switch settings are automatically set as follows whenever the modem is turned on: switches 1, 5, 6, and 7 up (on), and switches 2, 3, 4, and 8 down (off). These are the settings required for the CrossTalk application.

**NOTE:** These are not the Hayes factory default switch settings.

If your application requires settings different from these, you can use the MODE command to change them. For details on using the MODE command to change the switch settings or the baud rate, refer to Chapter 9, Using MS-DOS on the GRiDCase 1500 Series Computer.

## Modem Command Set

This section documents the internal modem's built-in command set. The commands documented here are available to you whenever the computer is in the terminal mode and the modem is in the command state, regardless of what communication software you are running.

You will require a communications software package of some sort to put your computer in terminal mode. Virtually all commercially available communications packages not only put the computer in terminal mode, but also take direct control of the modem. This means that, in most cases, you will not need to learn the modem command set. Instead, you learn to use your own communications software and let the software command the modem. The modem command set is nevertheless documented here for those users who find they need it.

### Putting the Modem in the Command State

When the computer is in terminal mode, and your communications software is running, the software intercepts your keyboard entries. To issue commands directly to the modem, you must first put the modem in the command state by entering the escape command. The escape command consists of three pluses (+++). The first + must be separated from any previous keystroke by at least one second, and the last + must be separated from any following keystroke by at least one second.

### Issuing Modem Commands

Once the computer is in the command state, you issue a command to the modem by typing the appropriate command characters on a single line and then pressing **Return**.

In the following explanations, each command is followed by one or more examples of its use.

**AT (attention command)**

Except as otherwise noted, all modem commands must begin with the characters *AT*. These characters stand for *attention*; and they tell the modem that subsequent characters constitute a command to the modem rather than data to be transmitted.

Example: *AT command characters*

**D (dial command)**

Instructs the modem to dial the number specified by subsequent digits. Spaces, hyphens, and parentheses can be omitted; if present, they are ignored.

Example: *ATD4085551212*

**X<sub>n</sub> (result code command)**

Every operation the modem performs has one of several possible results. The modem reports the actual result of each operation in the form of a result code from 0 to 12. Each result code has an associated text message. Whether or not a particular result code appears on the screen depends on the result code command you have entered. Your choice of a result code command also determines whether or not certain modem functions are enabled, as explained later in this section.

The result codes and their associated messages are shown in Table 3-2.

Table 3-2. Result Codes

Code	Message
0	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5	CONNECT 1200
6	NO DIAL TONE
7	BUSY
8	NO ANSWER (Replaces NO CARRIER if a @ is present in the dial string.)
9	<i>reserved for future use</i>
10	CONNECT 2400
11	RINGING
12	VOICE



Table 3-3 lists the result code commands and indicates which result codes are reported according to which command is in effect.

Table 3-3. Result Code Commands

Command	Codes Reported												
	0	1	2	3	4	5	6	7	8	9	10	11	12
X0	•	•	•	•	•								
X1	•	•	•	•	•	•					•		
X2	•	•	•	•	•	•	•				•		
X3	•	•	•	•	•	•		•	•		•		
X4	•	•	•	•	•	•	•	•	•		•		
X5	•	•	•	•	•	•		•	•		•	•	•
X6	•	•	•	•	•	•	•	•	•		•	•	•

If you do not enter a result code command, X0 is assumed by default.

Whether reported codes appear on the screen as numbers or as messages depends on what V command is in effect, as explained later in this section.

Example: ATX3

**P (pulse dialing command)**

Instructs the modem to use pulse dialing. Can be used alone or with a dial command. Pulse dialing is the default when power is first supplied to the modem.

Example: ATP

Example: ATDP4085551212

**T (touch tone dialing command)**

Instructs the modem to use touch-tone dialing. Can be used alone or with a dial command.

Example: ATT

Example: ATDT4085551212

**Adaptive dialing**

When any of the result code commands X2 through X6 is in effect, the modem checks the phone line to see which type of dialing is required and then uses the appropriate type.

**R (reverse frequency command)**

Reverses the modem's originate and answer frequencies. This is necessary when you want to call an originate-only modem. The R command can immediately precede or follow the number to be dialed.

Example: ATDR4085551212

Example: ATD4085551212R

**, (pause command)**

Each comma inserted in a dial command causes a two-second delay at that point in the dialing sequence. Delays are necessary when you need to dial part of a number, wait for dial tone or signal of some sort, and then resume dialing. In the example, a four-second delay is inserted after dialing 9 to get an outside line.

Example: ATD9,,4085551212

**; (return to command state after dialing)**

Causes the modem to dial the specified number and then return to the command state (OK prompt) without hanging up. Ordinarily, the modem goes on-line as soon as it makes a connection. When the modem is on-line, you cannot issue any modem commands except the escape command. When you end a dial command with a semicolon (;), the modem dials the number, but does not go on-line when the connection is made.

Example: ATD4085551212;

**"string"  
(alpha-numeric  
convert command)**

You can enclose an alphabetic string within quotation marks in a dial command. The modem converts the alpha characters to the corresponding numeric digits shown on a standard telephone (i.e., A, B, or C = 2; D, E, or F = 3; etc.). You can use the command to enter phone numbers mnemonically, just as they are frequently advertised. If the string to be converted falls at the end of the dial command, only the opening quotation marks are necessary. Alpha characters can be upper- or lowercase.

Example: ATD1800"HOTLINE"

Example: ATD1800"HOTLINE

**! (flash switch hook command)**

Causes the modem to "depress" the switch hook<sup>1</sup> for half a second, then "release" the switch hook for half a second before continuing to dial. On some telephone systems, you can use this command to transfer an incoming call to another line. The example below transfers a call and then hangs up (H command, discussed later in this section).

Example: ATD!1507;H

1 The term "switch hook" refers to whatever mechanism your telephone uses to distinguish between a raised and a lowered receiver. On the most common types of telephone, the two buttons on which the handset rests constitute the switch hook. On a wall-mounted phone, the switch hook is the bracket from which the receiver hangs when the phone is not in use.

**W (wait for second dial tone command)**

Causes the modem to wait for a second dial tone at this point in the dial command before proceeding to dial any remaining digits. Use this command when you access a telecommunications service that requires you to dial an access number, wait for a dial tone and then dial another number or enter a code. You can use the W command only when the result code command currently in effect is X3 or higher. The W command can be used more than once in a single dial command.

**Example:**

```
ATD9501022W04085551212W86455478853064
```

**@ (wait for answer command)**

Causes the modem to wait for five seconds of silence at the other end of a completed call before proceeding to dial. This is useful if you need to wait for a recorded message to complete before entering digits in response to that message. In the example below, assume that the @ command corresponds to a recorded message asking you to enter your access code. The dialing operation stops while the message is played. Five seconds after the message completes, the digits of the access code are dialed.

**Example:** ATD4085553825@32863

**A/ (repeat last command)**

Causes the modem to repeat whatever command was last entered. This command is **not** preceded by the AT (attention command), and it is not terminated with the **Return** key. Just type A/ and the modem performs **one** repetition of the last command entered. In the example, A/ is used to redial a busy phone number.

Example: ATD4085551212  
NO CARRIER  
A/

**(repeat current command) > (repeat current command) command[greater-than sign] >**

Entered as part of a dial command, > causes the modem to repeat that command until 1) a connection is made, 2) the number has been dialed 10 times without making a connection, or 3) you press any key to cancel the command.

You can also use > in commands other than the dial command. Non-dial commands containing the > are repeated indefinitely, until you press any key to cancel the command.

Example: ATD4085551212 >

**+ + + (escape command)**

Use this command to take the modem off-line and return it to the command state. The escape command is **not** preceded by the AT (attention) command, and it is not terminated with the **Return** key. The first + must be separated from any previous keystroke by at least one second, and the last + must be separated from any following keystroke by at least one second. Otherwise, the modem interprets the three +s as part of the data stream instead of the escape command.

Example: *data keystrokes* [1 sec. pause] + + +  
[1 sec. pause] *command keystrokes*

**H0 (hang up command)**

Causes the modem to hang up.

**O (on-line command)**

Takes the modem from the command state back to the on-line state when a connection is still open.

Example: ATO

**Mn (speaker control command)**

The number you enter to replace *n* determines when the modem's built-in speaker is on and when it is off. The four possible values are shown below. M1 is the default.

ATM0      disable speaker

ATM1      ON through dialing and carrier detect, OFF at connection

ATM2      ON continuously, even during data transmission

ATM3      ON after last digit dialed, OFF at connection

**Cn (transmitter command)**

C0 turns the modem's transmitter off, making it a receive-only device. C1 (the default setting) turns the transmitter on.

Example: ATC0

**En (command-state echo command)**

E0 turns local echo off. In this state, commands you type at the keyboard are not echoed to your screen. E1 (the default setting) turns local echo off.

Example: ATE0

**F*n* (on-line echo command)**

F0 (half duplex) turns on-line echo on. That is, the data your modem is transmitting is also sent to your screen. F1 (the default, full duplex, setting) turns on-line echo off. In this state, your modem does not echo transmitted data to your screen<sup>2</sup>.

Example: ATF0

**Q*n* (quiet command)**

This command determines whether or not result codes are displayed on the screen. Q0 (the default setting) causes the codes to be displayed. Q1 causes the codes to be suppressed.

Example: ATQ1

**V*n* (verbose command)**

Determines whether result codes are displayed as numbers or text. V0 causes codes to be displayed as numbers. V1 (the default setting) causes codes to be displayed as text.

Example: ATV0

**Z (reset command)**

Resets the modem to all its default settings.

Example: ATZ

**S (register command)**

You can use this command if you need to change the values stored in any of the modem's 15 registers. (It is unlikely that you will need to do this — do not change register values unless you are sure of what you are doing.) The general form of the register command is shown below. In an actual command, you would replace *r* with the register number and *n* with the value to be set.

ATS*r* = *n*

The registers and their values are listed in Table 3-4.

<sup>2</sup> The data you send may still appear on your screen, but it is being echoed by the remote modem that is receiving it.

*Table 3-4. Modem Registers and Values*

Register Number	Function	Default Value
0	sets number of rings before automatic answering	1
1	counts and stores number of rings from incoming call	na
2	sets ASCII value of escape code sequence	43
3	sets ASCII value of carriage return	13
4	sets ASCII value of line feed	10
5	sets ASCII value of backspace	8
6	number of seconds modem waits for dial tone	2
7	number of seconds modem waits for carrier tone	30
8	duration of pause for comma (,) command	2
9	carrier detect time, in tenths of a second	6
10	duration, in tenths of a second, that modem waits after loss of carrier before hanging up	7
11	duration, in milliseconds, of spacing between touch-tones during dialing	70



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Register Number	Function	Default Value
12	duration, in 50ths of a second, of guard time required in escape code sequence	50
13	<i>there is no register 13</i>	
14	holds the modem's product code; must be reset to 120 if you use your modem with Smartcom 2.0	24n
15	<i>there is no register 15</i>	
16	determines modem self-test mode, as follows: 0 = data mode (no testing) 1 = analog loopback 2 = dial test 4 = test pattern 5 = analog loopback and test pattern	

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Register Number	Function	Default Value
<i>n</i> (user inquiry command)	Returns various information, depending on the value of <i>n</i> :  0: returns modem product code  2: performs a RAM test and returns the result, either OK or ERROR  3: returns the duration of the last call, or the actual time, depending on the current setting of the K (clock) command:  K0 (the default setting) causes the modem clock to act as a call-duration timer. In this state, the clock stores the time that elapsed between the last CONNECT and NO CARRIER result codes.  K1 causes the modem clock to act as a real-time clock. Use user-inquiry I3 to set the real-time clock, as shown in the example.  Example: AT I3 = 12:00:00K1	
	4: returns all current modem settings  Example: AT I0	

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## **Numeric Processors**

An 80287 numeric coprocessor is available with the GRiDCase 1520.

An 80387 numeric coprocessor is available with the GRiDCase 1530.

Both coprocessors are designed for faster calculations of graphs, worksheets, and other kinds of files.

Check your MS-DOS application documentation to see if an 8087 is supported and/or required.

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## CHAPTER 4: POWER OPTIONS

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This chapter describes the options available for powering your GRiDCase 1500 Series computer and the external devices attached to it. You may already have some of these items. If not, you can obtain them by contacting a GRiD representative.

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### THE POWER OPTIONS

Table 4-1 provides a summary of the available power options. Each option is explained in greater detail below.

*Table 4-1. Power Options for Your GRiDCase 1500 Series Computer*

<b>Power Source</b>	<b>Description</b>
Internal/External AC Power Pack	When used externally, powers computer from an AC wall outlet and simultaneously recharges the battery pack currently in the power pack slot. A cord connects the AC power pack to the DC input connector on the back of the computer and to an ordinary wall outlet. When used externally, the AC power pack provides adequate power for the computer and for an external drive if attached.

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Power Source	Description
	<p>When used internally, the AC power pack fits into the power pack slot on the back of the computer and powers the computer, the internal drive(s), and an external 3 1/2-inch drive (optional). When used internally, the AC power pack <b>cannot</b> power a 5 1/4-inch diskette drive or a tape drive.</p> <p>There is no voltage switch—the AC power pack automatically senses the voltage (110 or 220) your AC wall outlet supplies and sets it for you.</p>
Internal Battery Pack Model 32111	<p>Powers computer from rechargeable battery pack. Provides 20 watt hours of power to the computer, the internal drive(s), and an external 3 1/2-inch floppy drive (optional). Actual battery life depends on your GRiDCase model and system configuration (refer to Table 4-2 for power-consumption figures associated with various components and options). You must use an internal/external AC power pack to provide power for an external 5 1/4-inch floppy drive or an external tape drive. The battery pack fits into the power pack slot on the back of the computer. See Recharging Your Battery Pack below for methods of recharging the battery pack.</p>
External Battery Pack Model 32135	<p>Provides 54 watt hours of power. Actual battery life depends on your GRiDCase model and system configuration (refer to Table 4-2 for power-consumption figures associated with various components and options).</p>
Auto/Boat Adapter Model 32136	<p>Powers computer from the cigarette-lighter socket of a car or boat, or from the external battery pack.</p>
External Battery Charger Model 32115	<p>Recharges internal battery pack in about 12 hours.</p>

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## POWER CONSUMPTION FIGURES

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Table 4-2 lists approximate power consumption figures for GRiDCase 1500 Series computers and GRiD-supplied devices.

You can use these figures to estimate how long a charged battery pack will power your system. A fully charged internal battery pack (Model 32111) will power the system for 20 watt hours. Divide this figure by the number of watts your system actually draws to determine how long the charge will last. Suppose, for example, that your system is a GRiDCase 1520 equipped with an LCD screen and a 40-megabyte hard disk drive. The system draws approximately 11 watts. 20 divided by 11 equals 1.82—a charged battery should last you approximately one hour and 49 minutes.

*Table 4-2. Approximate Power Consumption Figures*

Component	Power Consumption (watts)
GRiDCase 1520 Base Configuration	4.0
80287 Coprocessor	2.0
GRiDCase 1530 Base Configuration	4.0
80387 Coprocessor	1.5
LCD Back Light	2.0
Plasma Display (Option 281)	4.5-11.3 <sup>1</sup>
Plasma Display (Option 282)	6.0-12.0 <sup>1</sup>
2 MB System RAM	1.0 <sup>2</sup>
4 MB System RAM	0.6 <sup>2</sup>
8 MB System RAM	2.2 <sup>2</sup>
1200 Baud Modem	2.8
2400 Baud Modem	0.5
3.5" Diskette Drive (Internal or External)	1.4 <sup>3</sup>
10 MB Hard Disk	3.5
20 MB Hard Disk	3.5
40 MB Hard Disk	7.0

- 1 Low figure applies when display is at minimum intensity. High figure applies when display is at maximum intensity.
- 2 These are net figures, that is, the amount by which power consumption for these configurations exceeds power consumption of the standard 1 MB of RAM included in the base configuration.
- 3 This figure applies only when the drive is actually in use.

## Connecting the AC Power Pack Externally

The AC power pack provides power for the your GRiDCase 1500 Series computer from both 110-volt and 220-volt wall outlets and recharges the battery pack (if installed). Recharging the batteries takes about 12 hours and occurs whether or not your computer is turned on. When used externally, the AC power pack power will adequately support the computer, its internal drive(s) and an external drive attached to the external drive connector.

A power cord is included with the power pack for connecting it to the wall outlet.

To install the AC power pack externally, follow the steps listed below.

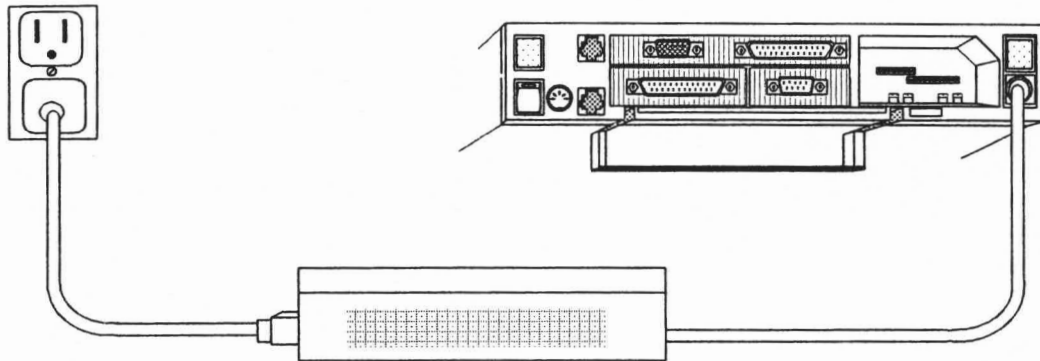
1. Turn off the computer.

### CAUTION

Before connecting or disconnecting the AC power pack or any other external device, turn off the power. Failure to do so may damage your unit.

2. Attach one end of your power pack cord to the power pack.
3. Attach the other end of your power pack cord to the DC input connector on the back of the computer.
4. Attach one end of the power cord to the power cord socket on the back of the power pack.
5. Plug the other end of the power cord into a wall outlet that accepts a three-prong plug (see Figure 4-1). If a plug adapter is used, make sure it is properly grounded. Ensure that the power pack is resting on its bottom so that none of the air vents on the sides or top are blocked.
6. Turn on the computer.





*Figure 4-1. Installing the AC Power Pack Externally*

## Connecting the AC Power Pack Internally

The AC power pack, when used internally, provides power for your GRiDCase 1500 Series computer from either a 110-volt or 220-volt wall outlet. When used internally, the AC power pack will supply power adequate for the computer, its internal drive(s), and a pocket floppy diskette drive (if attached).

To install the internal/external AC power pack internally, follow the steps listed below.

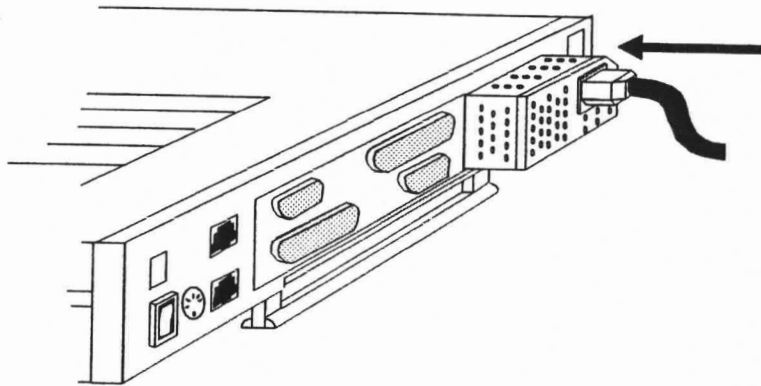
1. Turn off the computer.

### CAUTION

Before connecting or disconnecting the power pack or any external device, turn off the power. Failure to do so may damage your unit.

2. Remove the DC power pack cord from the power pack.
3. Hold the power pack with the socket for the power cord facing you.
4. Plug one end of the AC power cord into the socket on the power pack.

5. Insert the power pack into the power pack slot on the back of the computer until it clicks into place (see Figure 4-2).
6. Plug the other end of the AC power cord into a wall outlet that accepts a three-prong plug. If an adapter is used, make sure it is properly grounded.
7. Turn on the computer.



*Figure 4-2. Installing the AC Power Pack Internally*

To remove the power pack, push the power pack eject button (below and to the right of the power pack slot) until the power pack pops out.

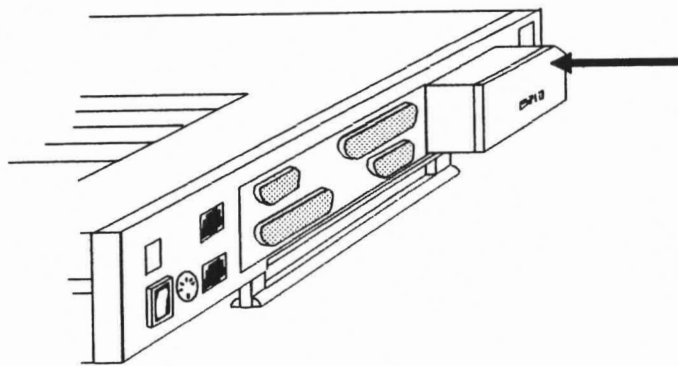
#### CAUTION

During use, the AC power pack can become quite warm, particularly when it is installed internally. When you eject the power pack, touch it lightly to test its temperature before you grasp it firmly to remove it. You may have to let it sit for several minutes before you can handle it comfortably.

## Using the Internal Battery Pack

The internal battery pack provides power to your GRiDCase 1500 Series computer from rechargeable batteries permanently sealed inside the battery pack. To install the battery pack, follow the steps listed below.

1. Turn off the computer.
2. Hold the battery pack with the label facing you.
3. Insert it into the power pack slot on the back of the computer until it clicks into place (see Figure 4-3).
4. Turn on the computer.



*Figure 4-3. Installing the Battery Pack*

To remove the battery pack, push in the power pack eject button (below and to the right of the power pack slot) until the battery pack pops out.

## The Life of Your Battery Pack

The battery life you can expect varies, depending on the configuration of your system (refer to Table 4-2). You will get the fullest capacity out of your battery pack after you have fully discharged and recharged it about three times. Thereafter, the life of your battery pack depends on the following factors:

- The type of screen—if your computer has a plasma screen, you can increase battery life by lowering the intensity of the display. This decreases the power drain on the battery. If your computer has an LCD screen, you can increase battery life by dimming or turning off the back light when you don't need it (contrast of an LCD screen has no effect on battery life). Overall, computers with plasma screens consume more power than those with LCD screens.
- Display mode—if your computer has the optional 10-inch diagonal plasma screen, it draws about 20% more power when in the 640 x 400 graphic display mode than when in the 640 x 200 mode. The graphic display mode is controlled by the software you run; you cannot explicitly control it.
- The number of processors—if your computer has an optional numeric processor, it requires more power than if it has only the standard 80C286 or 80C386.
- The use of the internal diskette drive(s): power consumption increases when an internal diskette drive runs.
- The use of the internal hard disk option: the hard disk uses more power than an internal diskette drive.
- Storing the battery pack in high temperatures (over 90° F) for two months or longer without any recharging: note that it might take a few rechargings for the battery pack to return to normal after such storage conditions.
- Restarting the computer by using the power switch to turn the computer off and then on again: this uses more power. Instead, try using the warm start-up method—**CTRL-ALT-DEL**.

**NOTE:** Do not use any operating system other than those supplied for your GRiDCase 1500 Series computer. Other operating systems are not designed to optimize battery life.

## Recharging Your Battery Pack

You should always wait for the battery to become fully discharged before recharging your battery pack. The battery-low/charging indicator turns red when it is time for you to recharge the battery. If you frequently recharge your battery pack before it is fully discharged, the batteries may lose some of their capacity.

When the battery-low/charging indicator turns red, indicating the power in your battery pack is low, don't immediately remove the battery pack. First, save any data you are working with and then remove the battery pack or supply AC power, if available. (Removing the battery pack cuts off the power; any data currently in main memory is lost.)

If you do not have access to AC power, you can install a fresh battery pack.

Once you have supplied dependable power to the computer, you should recharge your battery pack. The method you use to recharge the battery pack depends on the power options available to you, as summarized below:

**If you have an:**

**Then:**

Internal/External AC  
Power Pack

Leave the discharged battery pack in the power pack slot and connect the AC power pack to the computer externally, as explained above. The batteries recharge in about 12 hours regardless of whether the computer is on or off. While the battery pack is charging, the battery-low/charging indicator turns green. When the battery pack is fully charged, the battery-low/charging indicator turns off.

External Battery  
Charger

Insert the battery pack into the charger as explained below in the section Using the External Battery Charger. The batteries recharge in about 12 hours.

## Connecting the External Battery Pack

The external battery pack provides 54 watt hours of power (refer to Table 4-2 for power-consumption figures associated with various system components and options). The auto/boat adapter is used to connect the battery pack to the computer, and is provided with the battery pack.

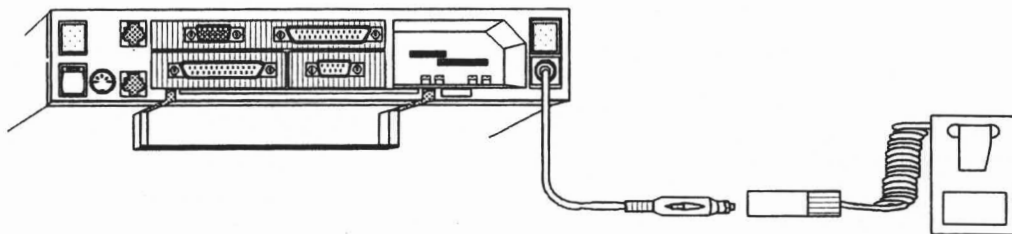
To connect the external battery pack, follow the steps listed below.

1. Turn off the computer.

### CAUTION

Before connecting or disconnecting the battery pack or any external device, turn off the power. Failure to do so may damage your unit.

2. Plug the cigarette-lighter end of the auto/boat adapter into the socket at the end of the battery pack power cord (see Figure 4-4).
3. Plug the other end into the DC input connector on the back of the computer.
4. Turn on the computer.



*Figure 4-4. Installing the External Battery Pack*

To conserve battery pack power, follow the guidelines given in the earlier section on the internal battery pack. When the external battery pack begins to lose power it will produce a beeping sound. When this happens, save your data immediately. Then supply external power to your computer or use an internal battery pack. Refer to the information provided with the external battery pack for recharging instructions.

## Connecting the Auto/Boat Adapter

The auto/boat adapter lets you power your computer from the cigarette-lighter socket of a car or boat, or from the external battery pack (see Figure 4-5).

To connect the adapter, follow the steps listed below.

1. Turn off the computer.

### CAUTION

Before connecting or disconnecting the auto/boat adapter or any external device, turn off the power. Failure to do so may damage your unit.

2. Plug the cigarette-lighter end of the adapter cable into the cigarette-lighter socket.

3. Plug the other end into the DC input connector on the back of the computer.
4. Turn on the computer.

### CAUTION

Many automobiles cause power surges or depressions to the cigarette-lighter socket when the engine is started. If the computer is connected to the cigarette-lighter socket when you start the engine, the computer may reboot. This causes the loss of any data currently in main memory.

We recommend having a battery pack installed in your computer to ensure continuous power while operating from a car cigarette-lighter socket. Note that the auto/boat adapter will not completely recharge a battery pack installed in the computer, it supplies much less power than the internal/external AC power pack.

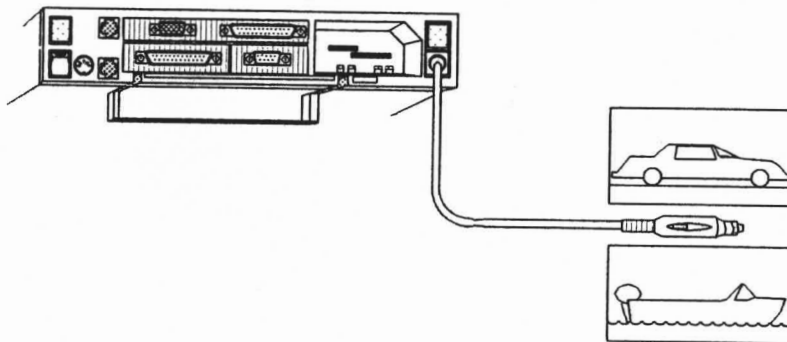


Figure 4-5. Installing the Auto/Boat Adapter



## Using the External Battery Charger

The external battery charger recharges your battery pack in about 12 hours. The external battery charger comes with a Y cable that has three DC jacks, two male and one female. The third connector on this cord allows you to run your computer while the battery is recharging. To recharge the battery pack, follow the steps listed below.

1. Place the battery pack inside the charger and secure it in place with the elastic strap.
2. Connect one male connector of the Y cable to the battery charger.
3. Plug the female connector of the Y cable into the internal/external AC power pack.
4. If you want to run your computer while the battery is recharging, plug the second male connector into the back of the computer.

In about 12 hours the battery pack is fully recharged.

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## CHAPTER 5: USING THE INTERNAL DISKETTE AND HARD DISK DRIVES

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This chapter describes how to use the internal diskette and hard disk drives. The diskette drive(s) is located on the side of your computer and accepts double-sided, double-density, 3 1/2-inch floppy diskettes. The hard disk is also located on the side of the computer.

---

### TAKING CARE OF THE DISKETTE DRIVE(S)

Observe the following rules for taking care of the diskette drive(s):

- Only use high-quality double-sided, high-density 135 track-per-inch (TPI) 3 1/2-inch floppy diskettes or double-sided, double density 135 TPI 3 1/2-inch floppy diskettes. High-density diskettes store 1.4 megabytes of data per diskette. Double-density diskettes store 720 kilobytes of data each. Diskettes from the following manufacturers are recommended:

Sony

Fuji

- Never put a damaged or dirty diskette into a drive.
- Never put foreign objects into a drive.

## FLOPPY DISKETTES

Floppy diskettes are plastic disks that have been coated with a magnetic material (much like the coating on audio recording tape). The diskette spins inside a protective plastic case. One 3 1/2-inch floppy diskette stores up to 1.4 megabytes of data<sup>1</sup>.

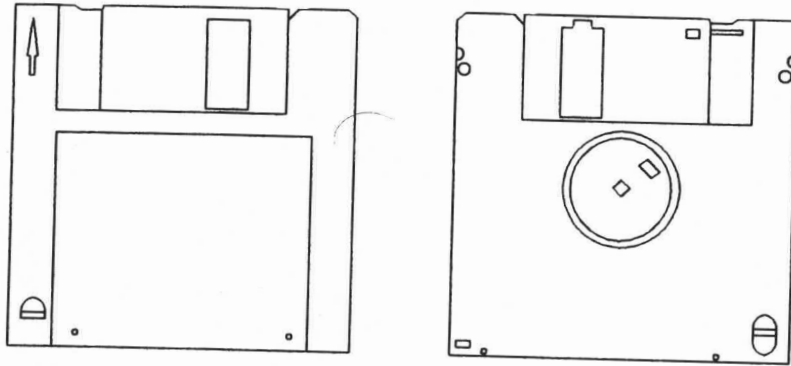
Floppy diskettes should be removed from the drive when not being used. By changing diskettes you can store and retrieve information for many different applications.

All diskettes you use in your GRiDCase 1500 Series computer must have the following characteristics:

- Double sided
- High density or double density
- Soft sectored
- 135 TPI

Figure 5-1 shows the front and back side of a 3 1/2-inch floppy diskette. An arrow on the front side shows you the direction in which to insert the diskette into the drive. The write-protect tab is used to protect your floppy diskettes from being overwritten (see description below).

1 Two kinds of 3 1/2-inch floppy diskettes are available: double-density diskettes and high-density diskettes. High-density diskettes have a storage capacity of 1.4 megabytes. The diskette drives used in GRiDCase 1500 Series computers can read, write, and format diskettes of both kinds. You must be careful, however, not to try to format a 720K diskette as a 1.4M diskette—see FORMAT in Chapter 9.

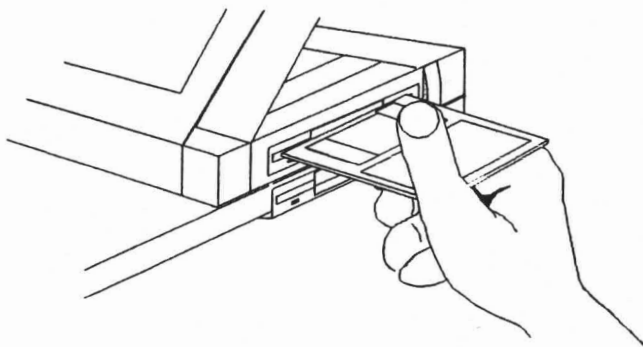


*Figure 5-1. Front and Back Sides of Floppy Diskette*

## Inserting and Removing Floppy Diskettes

To insert a floppy diskette in a drive, follow the steps listed below.

1. If you do not want to inadvertently write over the floppy disk, write protect the diskette by sliding the write-protect tab on the back-side of the diskette until it uncovers the hole.
2. Hold the diskette with the larger label side up. An arrow on the diskette points in the direction you should insert the diskette: the metal part goes in first (see Figure 5-2).
3. Push the diskette into the drive until it clicks into place.



*Figure 5-2. Inserting a Floppy Diskette into the Drive*

To remove your diskette, push the diskette eject button until the floppy diskette pops out.

#### CAUTION

Never release a floppy diskette when the in-use light is on, unless prompted to do so. The in-use light indicates that file access may be taking place. Releasing the floppy diskette at this time, when not prompted to do so, could destroy files.

### Write-Protecting Floppy Diskettes

If you have data stored on a floppy diskette that you want to protect from being inadvertently written over, you can write protect it by sliding the write-protect tab on the back-side of the diskette until it uncovers the hole (see Figure 5-1).

### Formatting Floppy Diskettes

The diskette drive expects floppy diskettes to have their data organized in a particular format. To ensure that a new diskette can be read and written to by a diskette drive, you must format each diskette before the diskette drive can use it.

### CAUTION

Formatting any medium erases all data on it. Therefore, use extreme caution when formatting diskettes.

To format a diskette, run the `FORMAT` command as described in Chapter 9.

## Taking Care of Floppy Diskettes

To prevent loss of data on your floppy diskettes, treat them with care. Below are a few tips for handling floppy diskettes:

- Do not touch the surface of the diskette by moving the metal slide. This slide protects the recording surface while the diskette is not being used.  
  
An invisible scratch on the surface of the diskette, or even a fingerprint, can cause errors.
- Keep diskettes away from magnetic office items such as paper clip dispensers, magnetic paper holders, telephones, etc.
- Do not set the diskette on top of a TV, color monitor, speaker, or CRT.
- Do not carry a diskette and a calculator together in your pocket.
- Do not expose diskettes to microwaves or infrared rays.
- Do not expose diskettes to temperatures below 50° F (10° C) or above 140° F (60° C).
- Keep diskettes away from wall adapters.
- For optimum long-term storage, keep diskettes at a temperature between 60° and 70° F (15° to 20° C).
- Never use a damaged diskette.
- Do not remove a diskette from the drive while the in-use light is on, unless prompted to do so by the computer. Removing the diskette at this time, when not prompted to do so, can destroy data.

- Do not leave your data diskette in the drive while traveling. Doing so may seriously damage the diskette.
- Keep your diskettes away from cigarette smoke.
- Label and date all diskettes. This is especially important when making back-up copies.

## Backing Up Files on Floppy Diskettes

It is very important that you make back-up copies of your important diskettes in case you lose or damage them. You can then make another copy from the back-up diskette.

You can make back-up copies using the COPY or DISKCOPY commands as described in the *MS-DOS Reference* manual.

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## TAKING CARE OF YOUR HARD DISK

Although the internal hard disk in your GRiDCase 1500 Series computer is ruggedly built to withstand the shocks that come with transporting your system, you should treat the hard disk with the same care you would give any valuable piece of equipment.

The hard disk has an auto "parking" mechanism that moves the disk heads to a part of the disk that does not contain data. This safety feature ensures that neither your data nor the disk is damaged when the computer is moved. Whenever the hard-disk activity indicator (the indicator light for the lower drive) is off, the disk heads are parked, and it is then safe to turn off and move your computer.

### CAUTION

Never move your computer when the hard-disk activity indicator is on.

## Backing Up Files on the Hard Disk

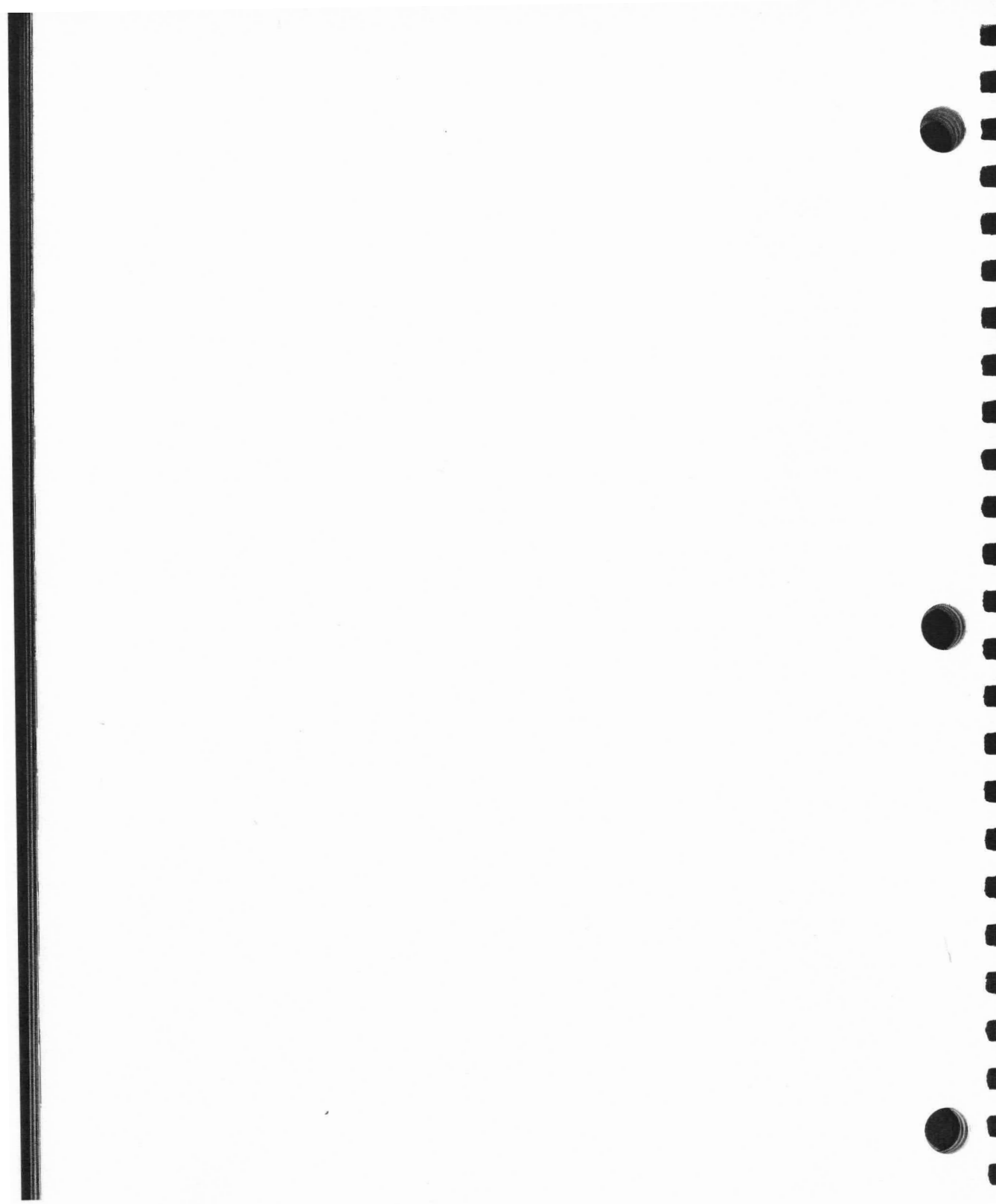
It is a good idea to make back up copies of important files that you use on your computer no matter what storage device you use. Because a hard disk can hold so much information, it is even more important to regularly back up the files on the hard disk.

To copy the files to diskettes, use the MS-DOS COPY, XCOPY, or BACKUP command. Unless you use XCOPY, you will need to build the same directory structure on the diskette as you have on the hard disk before copying the files. If you have many files, keep in mind that you will need to monitor the copying process so that you can insert a new diskette as one becomes full. See the *MS-DOS Reference* manual for information about the COPY, XCOPY, and RESTORE commands.

GRiD supplies the software to simplify hard disk drive backup with diskettes. Call your GRiD representative for more information.

An external tape drive is also available from GRiD. Using a tape drive greatly speeds the backup process. Contact your GRiD representative for more information.





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## CHAPTER 6: CONNECTING EXTERNAL DISKETTE DRIVES

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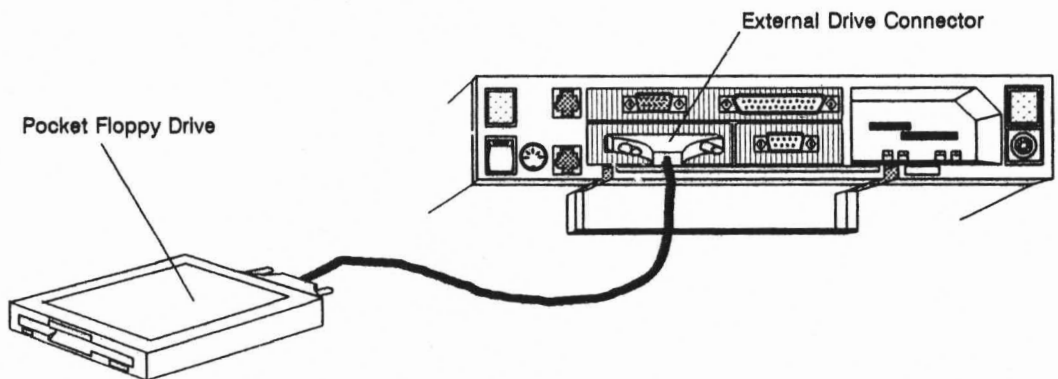
This chapter describes how to connect optional external diskette drives to your GRiDCase 1500 Series computer and describes how to set the correct switch settings for these devices. For more detailed information on how to use these drives, consult the manual that accompanies each device.

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### CONNECTING THE 3 1/2-INCH DISKETTE DRIVE

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You must connect the external 3 1/2-inch diskette drive (also called the “pocket floppy”) to the external drive connector (located on the back of the computer) using the special cable that is provided. The drive receives its power through the drive cable from the computer. Figure 6-1 shows this connector.



*Figure 6-1. Connecting the 3 1/2-Inch External Diskette Drive*

The pocket diskette drive works with any power option; an AC power source is not necessary to use the pocket diskette drive. To connect a pocket diskette drive to the computer, follow the steps listed below.

1. Turn off the computer, the external diskette drive, and any other devices.

#### CAUTION

Before connecting or disconnecting any external device, always turn off the computer and all external devices. Failure to do so may damage your equipment.

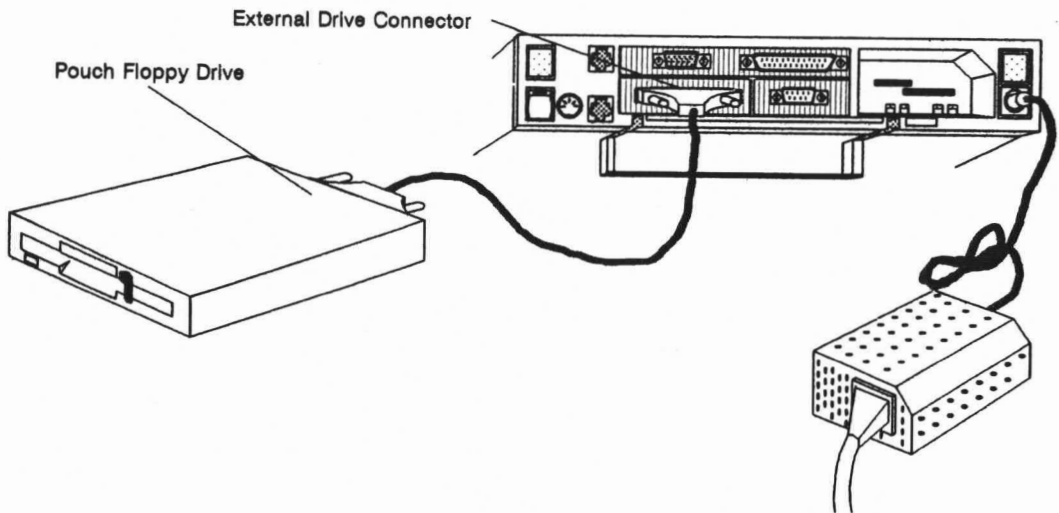
2. Set the two DIP switches on the back of the drive to the correct setting for the configuration you want. These switches set the device's address, allowing the computer to exchange data with it. Refer to the section Switch Settings for the External Diskette Drive at the end of this chapter to determine the correct switch settings for your diskette drive.
3. Attach one end of the pocket diskette drive cable to the external drive connector on the back of the computer. If it doesn't fit in easily the first time, turn the end of the cable upside-down. Tighten the thumbscrews on each side of the connector to firmly attach the cable to the computer.
4. Attach the other end of the pocket diskette drive cable to the pocket diskette drive.
5. Turn on the computer.

For instructions on how to use the pocket diskette drive, consult the manual that accompanies the drive.

## CONNECTING THE 5 1/4-INCH DISKETTE DRIVE

The external 5 1/4-inch diskette drive (also called the “pouch floppy”) is equipped with its own diskette drive cable. You must connect the drive to the external drive connector (located on the back of the computer) using the special drive cable. The drive receives its power through the drive cable from the computer. Figure 6-2. shows how to properly connect the pouch diskette drive to the computer.

**NOTE:** When a 5 1/4-inch external drive is connected to your computer, you must power the computer with an AC power pack connected externally. 5 1/4-inch drives draw more power than can be supplied by an internally installed AC power pack or by a battery pack.



*Figure 6-2. Connecting the 5 1/4-Inch External Diskette Drive*

To connect the external 5 1/4-inch diskette drive to the computer, follow the steps listed below.

1. Turn off the computer, the external drive, and any other devices.

#### CAUTION

Before connecting or disconnecting any external device, always turn off the computer and all external devices. Failure to do so may damage your equipment.

2. Set the two DIP switches on the back of the drive to the correct setting for the configuration you want. These switches set the device's address, allowing the computer to exchange data with it. Refer to the section Switch Settings for the External Diskette Drive at the end of this chapter to determine the correct switch settings for your diskette drive.
3. Attach one end of the drive cable to the external drive connector on the back of the computer. Tighten the thumbscrews on each side of the connector to firmly attach the cable to the computer.
4. Attach the other end of the drive cable to the drive.
5. Make sure the computer is powered by an externally connected AC power pack.
6. Turn on the computer.

For instructions on how to use the external 5 1/4-inch diskette drive, consult the manual that accompanies the drive.

**NOTE:** The instructions given in this section for connecting the external 5 1/4-inch diskette drive also apply to the external tape drive.

## SWITCH SETTINGS FOR THE EXTERNAL DISKETTE DRIVES

The external diskette drives' address switches are located on the back of the drive to the left of the cable connector. The drives have only two valid switch settings when used with a GRiDCase 1500 Series computer equipped with one or two internal diskette drives, and only one valid setting when used with a GRiDCase 1500 equipped with a 40-megabyte internal hard disk drive.

*Table 6-1. Switch Settings for the External Diskette Drives*

Internal Drive(s)	Address Switch 1	Address Switch 2	External Drive Designator	Internal Drive Designator(s)
2 Floppies	off	off	A	B&C
	on	off	C	A&B
1 Floppy/1 Hard Disk	off	off	A	B&C
	on	off	B	A&C
Hard Disk only	off	off	A	C

In addition to a primary drive designator, MS-DOS assigns a secondary, or dummy, device designator to the first two diskette drives on the system. You can address each of these diskette drives by either its primary or its secondary designator. In effect, you have up to five logical diskette drives (three physical drives, plus two more logical drives).

The letter used as the secondary designator depends on the number of drives present, as shown in Table 6-2.

*Table 6-2. Secondary Drive Designators*

<b>Configuration</b>	<b>Secondary Designator, Drive A</b>	<b>Secondary Designator, Drive B</b>
Two floppies, no hard disk	C	D
Two floppies, one hard disk	D	E
Three floppies, no hard disk	D	E
One floppy, one hard disk	B	na
One hard disk only	na	na

---

## CHAPTER 7: TROUBLESHOOTING

---

This chapter describes problems that might arise as you use your GRiDCase Series 1500 computer, and provides tips on how to resolve them.

---

### IDENTIFYING THE PROBLEM

There are generally two types of problems: problems with computer hardware or software, and problems due to user errors.

#### Problems in Setting Up the Computer

Table 7-1 lists common problems you might encounter when setting up your computer system. To use the table, look for your problem under the heading Symptom, identify the Cause, and follow the suggested Remedy.

*Table 7-1. Troubleshooting Chart*

Symptom	Cause	Remedy
No response when computer is turned on	External AC power pack	Check that AC power pack is firmly connected to the computer and to a live wall outlet.
	Batteries need recharging	Recharge batteries using AC power pack or battery recharger.
Computer boots, but battery low indicator is lit	Batteries need recharging	Recharge batteries using external AC power pack or external battery recharger.



Symptom	Cause	Remedy
No response from external diskette drive	Incorrect switch settings	Check to see that the configuration switch settings are correct. (See Chapter 6.)
	Bad cable	Call the GRiD Resource Center.
No response when printer is turned on	Not plugged in	Plug in power cord.
	Hardware not functioning	Run a self-test. (Refer to printer manual.)
	Cables not hooked up correctly	Connect cables securely and properly. (See Chapter 2.)
	Switches set incorrectly	Check that configuration switches are set properly. (See Appendix B and/or printer manual.)
Printer won't print	Printer not supported	Check the software manual to make sure the program is configured for and supports the attached printer.
	Switches set incorrectly	Check that configuration switches are set properly. (See Appendix B.)
Computer slow to respond	It takes MS-DOS about 20 seconds to load from a floppy	Be patient.
Installed ROMs don't show up in directory or title list	ROMs not seated properly	Turn off the computer and peripherals, leaving power cord plugged in. Make sure that ROMs are seated correctly, or try a different socket.

Symptom	Cause	Remedy
Incorrect date or time on screen	Time-of-day clock set incorrectly	Set correctly. (Refer to the <i>MS-DOS Reference</i> manual).
Internal modem doesn't function	Telephone line bad	Check telephone line by making a phone call on that line (see Appendix A) or connect computer to another outlet.
	Switch settings are incorrect under MS-DOS	MS-DOS users set software switches correctly using <i>MODE</i> command (refer to the <i>MS-DOS Reference</i> manual).
External modem doesn't function	Telephone line bad	See remedy above.
	Switches set incorrectly	Check that modem configuration switches are set properly. (See modem manual.)
External keyboard doesn't function	Not connected to computer	Check that cord is firmly connected to computer's rear panel. (See Chapter 2.)
	Not IBM PC/AT keyboard	Connect an IBM PC/AT keyboard only.

Symptom	Cause	Remedy
Monitor screen blank	Not plugged in	Check that cable is firmly connected to computer and monitor's power cord is plugged into wall outlet.
	Not turned on	Check that monitor's power switch is on.
	Output is switched to external monitor.	Press the <b>Ctrl</b> , <b>Alt</b> , and <b>Tab</b> keys simultaneously to switch output back to the internal screen.
	Brightness control knob turned down	Check that brightness control knob is turned up sufficiently.
	Not RGB color monitor	Connect an IBM PC RGB color monitor only.
Computer unable to boot	Diskette in internal diskette drive	If booting from floppy, check the diskette to see if it has correct operating system software.
	Diskette in pocket or pouch drive	If booting from pocket or pouch drive, make sure operating system software is correct.
	Insufficient power	Provide sufficient power to the computer and peripherals (see chapters 4 and 6).

---

Symptom	Cause	Remedy
Bad or Missing Command Interpreter error message	Booting from MS-DOS ROM with non-DOS diskette in internal drive	Remove the non-DOS diskette from the drive.

---

If, after consulting the troubleshooting chart, you've determined the problem is not due to a user error, try to determine whether it is a software or hardware problem.

---

## SOFTWARE OR HARDWARE PROBLEMS

If the troubleshooting techniques listed in Table 7-1 do not solve your problem, and if you have ordered a GRiD Customer Support Service (CSS) contract with your GRiDCase 1500 Series computer, call the GRiD Resource Center at (415) 656-2100 between 8:00 and 4:00 Pacific time. Make sure you know the tracking number of your computer; it is located on the back of the computer, under the handle (i.e., it is visible only when the handle is pulled out).

If you decide your problem is not a set-up or software problem, then it may be a hardware problem. Call the GRiD Resource Center for help with diagnosing the problem.

### Required MS-DOS Files

If your system does not include a hard disk, you need the MS-DOS boot diskette, which contains the hidden system files and the file `COMMAND.COM`. For communications with GRiD Server, you need the following additional files:

`SERVER.EXE`

`PHONELNK.EXE` (If using the modem)

---

## THE GRIDSCAN PROGRAM

The GRiDScan program is a utility program that reports the status of input/output devices attached to your computer and lists the factory-installed hardware options present. Use GRiDScan under the following circumstances:

- When you need to provide information to GRiD personnel responsible for analyzing a possible malfunction in your system.
- When you want to find out if your GRiDCase 1500 Series computer is equipped with the options your application programs require.

GRiDScan is provided on the MS-DOS system diskette or on the optional hard disk. To invoke GRiDScan, enter the command GRIDSCAN in response to the system prompt.

The information provided by the GRiDScan program is summarized below:

### ROM BIOS Date

ROM BIOS (Read-Only Memory Basic Input-Output System) is the basic operating system component installed in your GRiDCase 1500 Series computer when it is manufactured. The date indicates when the BIOS code for your computer was written.

### Processor

Reports what central processor chip is installed in your computer. In the case of the GRiDCase 1520, this line should read "80286." In the case of the GRiDCase 1530, this line should read "80386."

### 80287/80387

Reports whether or not an 80287 (GRiDCase 1520) or 80387 (GRiDCase 1530) numeric coprocessor is installed in your computer.

### **Available RAM**

Reports the amount of main memory installed in your computer.

### **Extended RAM Size**

Reports the amount of extended memory configured in your computer.

### **EMS RAM Size**

Reports the amount of expanded (EMS) memory configured in your computer.

### **Hard Disk Status**

If your computer is configured with an internal hard disk its capacity and drive designator is reported.

### **Internal Floppy**

Reports whether or not your computer contains one or more internal floppy diskette drives and, if it does, the current drive designator(s).

### **External Floppy**

If an external floppy device is attached to your computer GRiDScan will report its type, capacity and drive designator.

### **External Tape**

If a Model 3403 Tape Backup Drive is attached to your computer its drive designator will be reported.

## **Keyboard Firmware Version**

Reports the release date of the keyboard controller firmware.

## **Modem**

Reports whether or not a modem is installed, what kind of modem is installed (either 1200 baud or 2400 baud), and what the checksum of the modem is.

## **Serial Port**

Reports the MS-DOS designation of the serial port. This line should read "COM2."

## **Color Map**

Reports the current color mapping mode. Initially, this is method 1. Can be method 2, 3, 4, 5, or 6 if you have changed the color mapping mode.

## **Application ROMs**

Reports various information about any ROM cartridges installed in your computer.

---

## DEALING WITH RADIO FREQUENCY INTERFERENCE

---

If you suspect that your computer is interfering with another electronic device (such as a TV or radio), do the following:

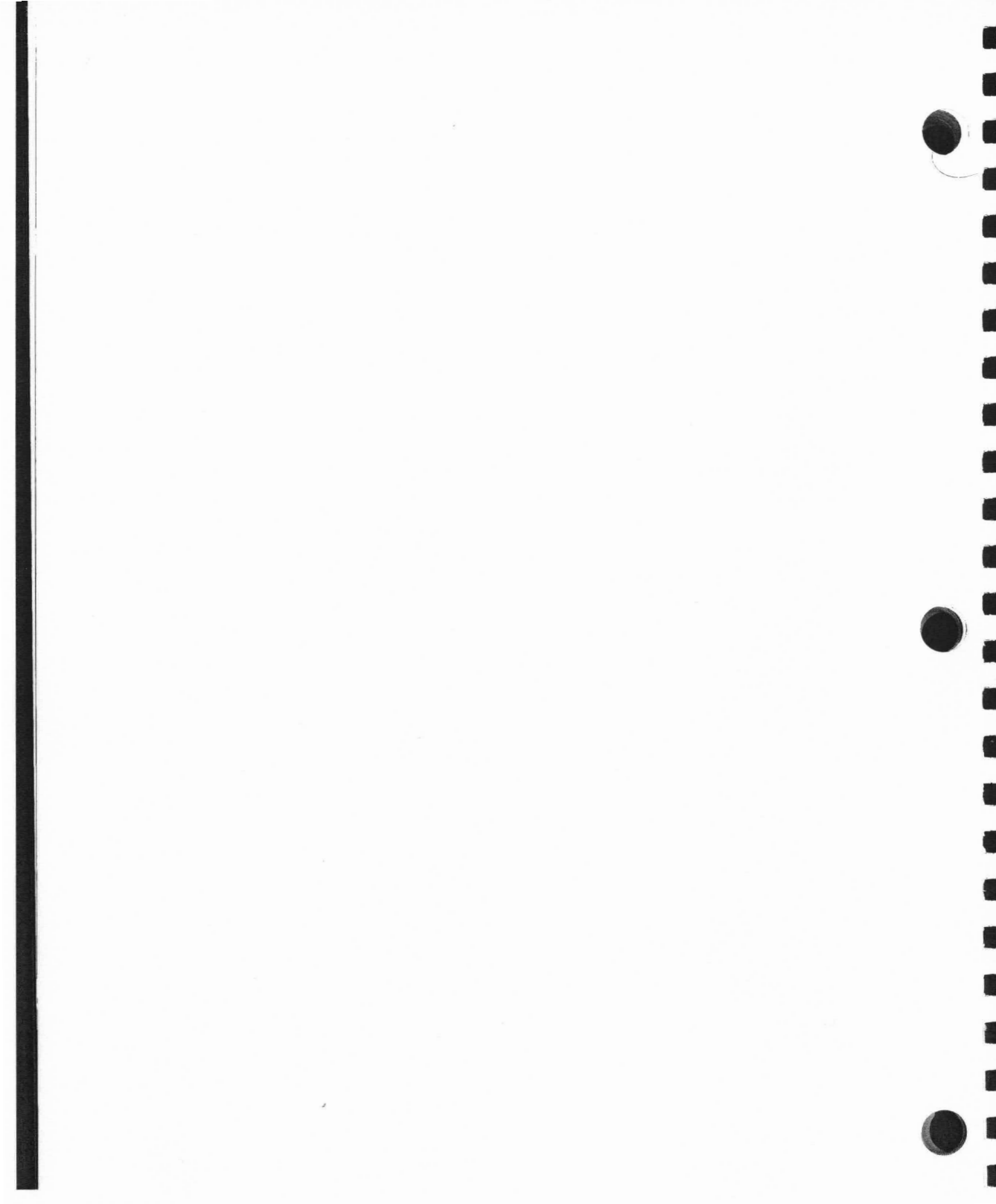
With the system turned on, watch and/or listen to the device that seems to be picking up radio frequency interference. Turn off the computer. If interference subsides significantly, you may confidently trace your problems to the computer. If no change occurs, the problem lies elsewhere (possibly in the other electronic device itself).

If the computer seems to be the cause, try these methods for lessening interference. Make sure the computer and the other electronic device are turned on to determine if one or more of these suggestions work.

- Change the position of the electronic device's antenna. In the case of radios, this may mean moving the radio itself.
- Move the computer around so it faces a new direction.
- Move the computer farther away from the other electronic device. If this means unplugging the computer, be sure to turn it off before you unplug it.
- Plug either the computer or the electronic device into a different wall outlet. If possible, plug the two instruments into outlets on different wiring circuits.
- If peripherals are connected to the computer, be sure to use shielded cables.

If these solutions still do not produce satisfactory reception, contact your GRiD representative.





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## CHAPTER 8: MAINTENANCE

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This chapter describes how to care for your GRiDCase 1500 Series computer. Although the GRiDCase 1520 and the GRiDCase 1530 are basically durable, you should treat them as you would any precision instrument – with care.

---

### WARNINGS

Observe the following warnings. Ignoring these warnings could lead to physical injury.

- Do not operate the computer in a dirty or dusty environment.
- Do not get the computer wet; electrical equipment should not be operated in a moist environment.
- Do not operate your computer in any potentially flammable atmosphere.
- Do not attempt to open the computer case; it contains no user-serviceable parts. Such action voids your warranty and service contract and can damage the computer.
- Arrange any power cords or other cords so they can't be pulled out or tripped over when the computer is in use.
- Make sure you properly ground any power-plug adapter.
- Do not eject the internal/external AC power pack without first removing the power cord from the wall socket, as a shock could result.
- Always turn off the computer before unplugging it.

## CAUTIONS

Observe the following cautions. Ignoring these cautions could damage your unit.

- Operate the computer only when the surrounding temperature is from 41° to 95° F (5° to 35° C).
- Operate the computer only when the relative humidity level is from 20% to 80% noncondensing.
- Store the computer where the surrounding temperature is from -4° to 149° F (-20° to 65° C).
- Do not store or set up the computer (or its peripherals) in direct sunlight.
- Do not subject the computer to unnecessary shock or vibration.
- When cleaning the computer, never use any cleaning agent such as dust wax, spray cleaner, or any abrasive substance.
- Never turn off the computer when the in-use light for any diskette or hard disk drive is lit. Turning off the computer at these times can destroy data.

---

## CLEANING YOUR GRIDCASE 1500 SERIES COMPUTER

Before cleaning your computer, turn it off and disconnect the power cord from the outlet.

To clean the case, use a slightly damp, soft cloth and, if necessary, a mild, nonabrasive detergent.

### CAUTION

Never use any cleaning agent such as dust wax, spray cleaner, or any abrasive substance.

Wipe the case clean and then dry it.

To clean the screen, slightly dampen a soft cloth with an ammonia-based glass cleaner and gently wipe the screen. Use the cleaner sparingly so that no fluid runs down the screen and into the frame.

If necessary, dust the rear panel of your computer with a dry cloth.

### WARNING

To prevent shock hazard, never apply any liquid to the rear panel or inside a diskette drive opening.

---

## STORING YOUR GRIDCASE 1500 SERIES COMPUTER

Always store your computer between the temperatures -4° and 149° F (-20° to 65° C). To keep it free from dust and dirt, store it in a protected location.

---

## TRAVELING WITH YOUR GRIDCASE 1500 SERIES COMPUTER

When traveling with your computer, keep it in a protective case and carry it instead of checking it as luggage. Many transportation carriers do not cover the replacement cost of your computer should they lose or damage it. If you do check it as luggage, always pack it in the original shipping carton and packing materials that came with your computer. Any damage incurred due to improper shipping is considered abuse and will not be covered under your computer's warranty.

It should be safe to x-ray the computer or any peripherals in airport security checks, but you can have it hand-checked, if you wish.

### CAUTION

If you are carrying the battery pack inside the computer, make sure that the main power switch is off. If it is left on, the battery pack will discharge during transportation. As an extra precaution, you may want to remove the battery pack from the computer and carry it separately.

---

## UPDATING THE CLOCK

The time-of-day clock, which displays the time and date on your screen, is not intended to replace your wristwatch. The precision of its time-measuring electronics may vary because of temperature changes. Check the time and date of your clock periodically. Also note that you must change the year when going from December to January.

Refer to the TIME and DATE commands in the *MS-DOS Reference* manual for instructions on setting the clock.

---

## CHAPTER 9: USING MS-DOS ON GRiDCASE 1500 SERIES COMPUTERS

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This chapter explains how operating a GRiDCase 1500 Series computer and an IBM PC/AT differ; how the GRiD version of MS-DOS differs from PC-DOS; how to move and then run applications currently in use on the IBM PC, PC/XT, or PC/AT to the GRiDCase 1500 Series computer; and how to create a CONFIG.SYS file.

This chapter is not a tutorial for the novice. You may not understand the information in this chapter unless you've operated a personal computer using an MS-DOS application. If you require training in basic MS-DOS skills, inquire at a local computer store on the availability of MS-DOS classes, and about the many tutorials and computer-based training programs available for purchase.

---

### WHAT'S DIFFERENT ABOUT GRiDCASE 1500 SERIES COMPUTERS?

You should be aware of the following differences between operating a GRiDCase 1500 Series computer and an IBM PC/AT before starting up your system.

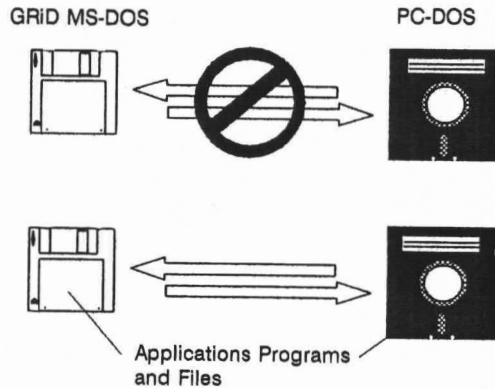
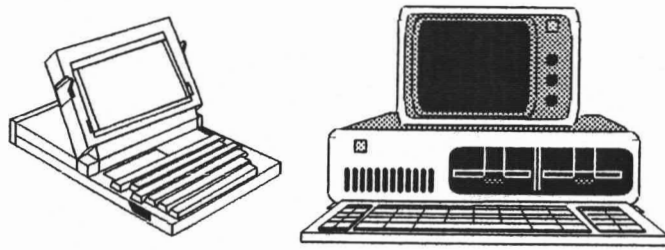
- The GRiDCase 1500 Series computers use a different operating system – you must use GRiD MS-DOS on GRiDCase 1500 Series computers – not PC-DOS or an MS-DOS operating system made for other computers.
- You can plug in an IBM color monitor and keyboard to your GRiDCase 1500 Series computers, and use it just as you would an IBM PC/AT. When you travel, simply disconnect the monitor and keyboard, and use the GRiDCase display and keyboard instead.

- The GRiDCase 1500 Series computers keyboard have fewer keys, but all the functions of an IBM PC/AT keyboard.
- The GRiDCase 1500 Series computers display text and images in blue and yellow, or black and red (depending on the configuration); many monitors connected to an IBM PC/AT display text and images in full color, if the software supports color.
- MS-DOS and CrossTalk software is available on ROM cartridges for GRiDCase 1500 Series computers.

---

## **WHY ONLY GRID MS-DOS ON THE GRIDCASE 1500 SERIES COMPUTERS?**

GRiD MS-DOS is the only MS-DOS operating system that should be run on GRiDCase. Although the GRiDCase 1500 Series computers are fully compatible with the IBM PC/AT, it is neither legal nor desirable to run PC-DOS on GRiDCase 1500 Series computers.



*Figure 9-1. GRiDCase 1500 Series Computers Require GRiD MS-DOS*

PC-DOS is licensed to run only on an IBM personal computer, and GRiD MS-DOS to run only on GRiDCase models. Although you can interchange application programs, subject to the licensing agreement you have with the software publisher, you cannot interchange operating systems (Figure 9-1).



Moreover, GRiD MS-DOS offers the following facilities not available in PC-DOS:

- Only the GRiD MS-DOS MODE command supports GRiD input/output devices and allows you to control unique GRiD hardware features. The PC-DOS MODE command cannot control GRiDCase hardware features.
- GRiD MS-DOS supports Read Only Memory (ROM). ROM increases the amount of permanent storage available for data files and programs. Use of programs in ROM also somewhat increases battery life by reducing disk accesses.
- GRiD MS-DOS has the HELP command for instant, on-line reference information on system commands and facilities.
- GRiD MS-DOS provides the PCMASTER and PCSLAVE commands for easy file transfer between GRiDCase 1500 Series computer and an IBM PC, PC/XT or PC/AT.
- GRiD MS-DOS has the SERVER command, which allows GRiD Server users to gain access to a central device and share storage, printing, and other input/output functions.
- GRiD MS-DOS includes the GRiDSCAN command, which shows the status of input/output devices attached to your GRiDCase 1500 Series computer and lists the factory-installed hardware options.
- GRiD MS-DOS includes the device driver file LOWPOWER.SYS. If you reference LOWPOWER.SYS in your CONFIG.SYS file, the computer will beep when battery power is low.

You'll learn more about these facilities throughout this chapter.

---

## USING AN EXTERNAL MONITOR AND KEYBOARD

The GRiDCase 1500 Series computers work like an IBM PC/AT. You can use the GRiDCase 1500 Series computers keyboard, or you can plug in an IBM keyboard. You can also plug an IBM color monitor in to your GRiDCase 1500 Series computer.

With both the IBM keyboard and IBM color monitor connected, you can operate your GRiDCase 1500 Series computer just as you would an IBM PC/AT. When you travel or take your work elsewhere, simply unplug the IBM keyboard and the monitor, and use the GRiDCase keyboard and display. This arrangement gives you a desktop and a portable computer in one.

---

## INTERNAL HARD DISK OPTION

If your GRiDCase 1500 Series computer has an internal hard disk, the hard disk is already formatted for use with MS-DOS, and version 3.2 of MS-DOS has been loaded onto the disk. If your computer is equipped with either the 10-megabyte or the 20-megabyte hard disk, you can load additional programs onto the hard disk from the built-in floppy diskette drive. If your computer is equipped with the 40-megabyte hard disk, you do not have a built-in floppy diskette drive, and you must use one of the following GRiD products to load programs onto the hard disk:

- **Model 3401 3 1/2-inch Pocket Diskette Drive.** The pocket diskette drive can be attached to the external drive connector on the back of your computer, allowing access to files stored on 3 1/2-inch diskette.
- **Model 3402 5 1/4-inch Pouch Diskette Drive.** If your programs are stored on 5 1/4-inch floppy diskettes, this drive can be used to access them.
- **Model 6401 PCMaster/PCSlave Serial Cable.** This cable can be used to connect a GRiDCase 1500 Series computer to an IBM PC through the serial ports on each computer. Working with software supplied on your GRiDCase MS-DOS Version 3.2 system diskette you can transfer files from storage devices on an IBM PC, PC/XT, or PC/AT to your hard disk.

---

## THE GRIDCASE 1500 SERIES KEYBOARD

The GRiDCase keyboard contains fewer keys than the IBM PC/AT keyboard. Consequently, you press slightly different GRiDCase keys to invoke equivalent IBM PC/AT functions. GRiDCase keys with green keycaps correspond to function and other special keys on the IBM keyboard – **PgUp**, **PgDn**, **Break**, **Home**, etc. For additional information on the GRiDCase keyboard, refer to Chapter 2.

---

## THE GRIDCASE 1500 SERIES DISPLAY

There are two notable exceptions in how the GRiDCase 1500 Series display functions in relation to an IBM color monitor:

- On the GRiDCase display, text and images appear in blue and yellow, or black and red, depending on the configuration of your computer. The color monitor displays text and graphics in full color.
- On the GRiDCase display, text and images cannot be highlighted by your application as they can on a color monitor. Text designated as bold by a word processor command appears highlighted on the color monitor, but appears in a different type font on the GRiDCase display.

Other differences are hardly noticeable and rarely seen.

---

## THE INTERNAL MODEM AND THE SERIAL (RS-232C) PORT

The internal modem of a GRiDCase 1500 Series computer so equipped is the MS-DOS COM1 device. The serial (RS-232C) port is the MS-DOS COM2 device. For more information on MS-DOS COM1 and COM2 devices, refer to the *MS-DOS Reference* manual.

---

## READ ONLY MEMORY (ROM)

GRiDCase 1500 Series computers have sockets for removable Read Only Memory (ROM) cartridges, which give permanent storage for MS-DOS programs. (The two ROM sockets are under a removable cover above the keyboard.)

A single ROM cartridge containing the MS-DOS operating system and its utility files is available from GRiD. Also available is a two-cartridge set containing the MS-DOS operating system, its utility files, and the popular CrossTalk communications program.

**NOTE:** You should carefully read the booklet that comes with each cartridge before inserting or removing a ROM cartridge.

MS-DOS treats files on the ROM cartridge as though they reside in floppy diskette drive A, and thus as an extension of the diskette in drive A (if your computer has a 40-megabyte hard disk and does not have a floppy diskette drive attached, ROM files are treated as an extension of drive C). If you use an MS-DOS system ROM, you needn't include the MS-DOS system files on the diskette with your application and data files. This increases the space available for data files on your diskettes.

When you install an application program on a GRiDCase 1500 Series computer that has an MS-DOS ROM, note the following:

- There is no need to specify the /S option when using the FORMAT command. (This option copies the MS-DOS system files to the diskette after completing the formatting process.)
- There is no need to use the SYS command to copy the MS-DOS system files to an application diskette, or to the hard disk.

ROM files differ from diskette files in the following ways:

- You cannot delete programs from ROM; nor can you store additional programs or data in ROM.
- You cannot specify a ROM file as a target file in an MS-DOS COPY command. MS-DOS issues the message "File Creation Error" and the command fails.
- If the diskette in drive A contains a file with the same name as a file in ROM, MS-DOS always uses the file on the diskette.
- When copying files, you cannot specify a target file for drive A that has the same name as a ROM file, unless you either remove the ROM cartridge or temporarily rename the ROM file. The power must be off before you remove the ROM cartridge.

The next procedure shows how to copy a file from a diskette in drive B to a diskette in drive A, when the file in drive B has the same name as an existing ROM file.

To copy a duplicate ROM file from drive B to drive A, follow the steps listed below.

1. If the diskette in drive A already contains a file with the same name as the file you want to copy from drive B, remove the diskette from drive A. Otherwise you will inadvertently rename and diskette file instead of the ROM file.
2. Rename the ROM file: for example, the following command

```
A>REN COMMAND.COM COMMAND.TMP
```

temporarily renames the COMMAND.COM file in ROM to COMMAND.TMP. (The temporary name remains in effect until the system is restarted or the file is renamed again.)

3. Insert the desired diskette in drive A, and then copy the file. For example

```
A>COPY B:COMMAND.COM A:
```

copies the COMMAND.COM file from the diskette in drive B to the diskette in drive A.

After the next start-up, the COMMAND.TMP file in ROM resumes the name of COMMAND.COM. A directory listing will now show two COMMAND.COM files in drive A, one on disk and one in ROM.

---

## WHAT'S DIFFERENT ABOUT GRiD MS-DOS?

GRiD MS-DOS is an operating system specifically written for GRiDCase 1500 Series computers. If you are accustomed to using PC-DOS or MS-DOS on another computer, you must learn how using GRiD MS-DOS differs from those operating systems. This section discusses these differences under the following points:

- How GRiD MS-DOS commands and PC-DOS commands differ.
- How to run BASICA programs on a GRiDCase 1500 Series computer.
- Special procedures when using the internal modem.

---

## HOW COMMANDS DIFFER

Several DOS commands provide functions not available in PC-DOS. Let's look at these commands.

### **FC (File Comparison)**

The functions of the COMP command available with PC-DOS are performed by the File Comparison (FC) utility in GRiD MS-DOS. The FC utility is described in Chapter 10 of the *MS-DOS Reference* manual.

### **FORMAT**

The FORMAT command provided with GRiD MS-DOS is functionally identical to the PC-DOS FORMAT command provided with newer IBM machines that use high-density, 1.4 megabyte, 3 1/2-inch floppy diskette drives. It is documented here, however, because many users moving to a GRiDCase 1500 Series computer will not be familiar with using FORMAT on such drives.

When you issue a **FORMAT** command for a high-density, 3 1/2-inch drive like those used in GRiDCase 1500 Series computers, the drive formats the diskette for 1.4 megabytes. **If the diskette in the drive is not a high-density diskette, it cannot reliably be formatted for 1.4 megabytes.** The format operation itself may fail, or, worse, the format operation may seem to succeed, resulting in a completely unreliable diskette.

### WARNING

Do not format a diskette for 1.4 megabytes unless you are sure it is a high-density diskette. Failure to heed this warning may result in the irretrievable loss of your data.

\*You can format 720 Kilobyte, double-density diskettes in a high-density drive, but you must use the following special form of the **FORMAT** command to do so:

```
A>FORMAT A:/N:9 /T:80
```

A special batch file called **FORMATLD.BAT** is supplied on your GRiD MS-DOS diskette or on your hard disk. This batch file contains the necessary switches to perform a low-density (i.e., double-density) format. It also allows you to use any additional switches (e.g., /S) just as you would with the standard **FORMAT** command. To use this batch file, just enter **FORMATLD** in response to the MS-DOS system prompt.

### PCMASTER/PCSLAVE

The **PCMASTER** and **PCSLAVE** commands (also called the PC file transfer utilities) transfer files from IBM PC, PC/XT, or PC/AT storage devices to GRiDCase 1500 Series storage devices and vice versa. The transfer takes place over a cable attached to the serial port of each computer. More information on **PCMASTER** and **PCSLAVE** is presented later in this chapter.



## MODE

The GRiD MS-DOS MODE command offers the same functions as the PC-DOS MODE command, plus the ability to control GRiD devices that can't be used with an IBM PC/AT. GRiD-specific MODE command options are described below.

In the examples that follow, curly brackets ({} ) indicate that you must select **one** of the items inclosed within the brackets. A vertical bar (|) separating two items indicates an either/or choice between the two items. Two dots (..) indicate a range of choices (e.g., "1..6" means that you can enter any number from 1 to 6).

### MODE MEM={EMS|EXT}

This command allows you to select how any extra memory installed in your computer is configured. If you select EMS, then all the extra memory in the system will be accessible as EMS memory following the Lotus/Intel specification. If you select EXT, memory above 1 megabyte will be configured as extended memory.

**NOTE:** You must reboot the computer after changing the memory configuration to get the new configuration to take effect.

### MODE SPEED={FAST|SLOW}

This command allows you to select between the two processor speeds available on GRiDCase 1500 Series computers. The fast speed is 10 MHz for the GRiDCase 1520 and 12.5 MHz for the GRiDCase 1530. The slow speed is 6 MHz for both models.

**MODE COLORMAP={1..6}**

This command allows you to set the current video-to-LCD/plasma color mapping mode. Six color maps are predefined. You can select any one of the six by specifying the color map number with this MODE option.

**MODE FONT={1..4}**

This command allows you to specify the current active alpha-mode font. Four fonts are available:

- 1 = English
- 2 = French Canadian
- 3 = Norwegian
- 4 = Hebrew

**MODE BACKLITE={1..60|ON|OFF}**

This command allows you to control the back light on GRiDCase 1500 Series computers equipped with LCD screens. A number from 1 to 60 specifies the time, in minutes, that the system will wait after the last keyboard access before it turns off the back light. The default is 2 minutes. After the back light is off, any keyboard input will turn it back on. Specifying OFF will leave the back light off until you give the ON command.

**MODE DISPLAY={ON|OFF}**

This command allows you to disable and enable the display hardware inside the computer. It may be necessary to disable the internal display if you connect a different display adapter to the computer through the bus connectors in the power pack slot.

## HELP

The HELP command displays immediate answers to many questions you might have about MS-DOS commands and functions. Normally, you find such information only in a reference manual. Instead, using GRiD MS-DOS, you can type in the following command:

```
A>HELP
```

and press **RETURN**. The Help menu (Figure 9-2) is then displayed.

```
MS-DOS Help Utility (version 3.2D)
Copyright (c) 1985,86 GRiD Systems Corporation

Topics Available:

APPEND      ASSIGN     ATTRIB     BATCHFILES  BREAK      CHDIR
CHKDSK     CLS       CONFIG.SYS COPY         CTTY      DATE
DEL         DIR       DISKCOMP   DISKCOPY    EDLIN     EXEZBIN
EXIT        FDISK     FC         FIND        FORMAT    GRAFTABL
GRAPHICS    EMM       HELP       JOIN        KEYBOARD  LABEL
LINK        LOGICALDRIVE MKDIR      MODE        MODEM     MORE
PATH        PCMASTER  PCSLAVE    PRINT       PROMPT    RAMDRIVE
RECOVER     REN       REPLACE    RMDIR      SERVER    SET
SHARE       SORT      SUBST     SYS         TIME      TREE
TYPE        VER       VERIFY     VOL         XCOPY

HELP (Enter topic or Esc to exit)>
```

*Figure 9-2. The Help Menu*

From this menu, you pick out the name of the command or function you want information on, and type it in. "MODE" was typed in to display the information shown in Figure 9-3.

The MODE command provides 17 options for configuring your computer. The options are summarized below. See the option topic for information on a specific option.

- Option1 - Controls output to the printer.
- Option2 - Sets display mode for the screen and external monitor.
- Option3 - Determines serial port's communications protocol.
- Option4 - Changes parallel printer output to serial printer output.
- Option5 - Sets the PRN device.
- Option6 - Switches power on or off to the serial port.
- Option7 - Switches power on or off to the internal modem and controls modem parameters.
- Option8 - Determines the blink and shape of the cursor.
- Option9 - Controls power to the internal disk drive.
- Option10 - Sets font size and reverse video.
- Option11 - Determines which device letter ROM files are appended to.
- Option12 - Switches from internal display to external monitor.
- Option13 - Switches between EMS and Extended memory over 640K.
- Option14 - Switches between fast and slow processor speeds.
- Option15 - Determines how colors are mapped to a monochrome display.
- Option16 - Controls how long screen backlighting stays on.
- Option17 - Switches on or off the internal display hardware.

\*\*\*\*\*Press Any Key To Continue\*\*\*\*\*

Additional Topics:

OPTION1	OPTION2	OPTION3	OPTION4	OPTION5	OPTION6
OPTION7	OPTION8	OPTION9	OPTION10	OPTION11	OPTION12
OPTION13	OPTION14	OPTION15	OPTION16	OPTION17	

HELP (Enter topic or Esc to exit)>

*Figure 9-3. MODE Help Information*

The MODE help menu displays subtopics that you can select to retrieve more specific information. From this menu (Figure 9-3), the subtopic "OPTION13" was typed in. Figure 9-4 shows a display of the additional information.

This option of the MODE command provides the capability to configure memory beyond 640K as EMS memory or Extended memory for GRiD computers using an 80286 microprocessor. Specify option 13 as follows:

```
MODE MEM = EMS | EXT
```

If you select EMS, memory beyond 640K is configured as EMS memory. If you select EXT, memory beyond 640K is configured as Extended memory. After changing the memory configuration, you must reboot your computer for it to take effect. The setting you choose is maintained even when the computer power is off.

Additional Topics:

NONE

*Figure 9-4. MODE Option 13 Information*

To get back to the main help menu shown in Figure 9-2, press **RETURN**.

To learn more about **HELP**, try using it or read about it in Chapter 7 of the *MS-DOS Reference* manual.

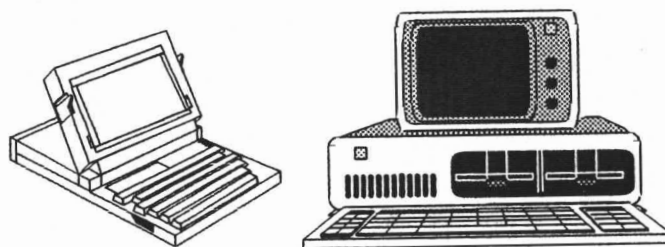
## SERVER

The **SERVER** command gives authorized users access to a GRiD Server either through a telephone line or a GRiDLink cable. GRiD Server is a powerful modular system that allows up to 58 users to share storage, printing, and other input/output devices. Both GRiDCase 1500 Series computer users and IBM users can connect to a GRiD Server. For details on using GRiD Server, refer to the GRiD Server User's Guide for MS-DOS and PC-DOS Users.

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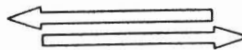
## RUNNING BASIC PROGRAMS

Programs written in IBM's BASIC or BASICA run on your GRiDCase 1500 Series computer if you use GRiD'S GW-BASIC instead of IBM's BASIC (refer to Figure 9-5). If you use a batch file that references BASIC or BASICA, rename the GWBASIC.EXE file to BASIC.EXE or BASICA.EXE, depending on the name specified in the batch file.



GW-BASIC

BASIC or BASICA



BASIC Programs  
and Files

Figure 9-5. Running BASIC Programs on a GRiDCase 1500 Series Computer

The GRiDCase 1500 Series computer doesn't support light-pens, joy sticks, and cassettes; consequently, BASIC programs that require those devices cannot run on a GRiDCase 1500 Series computer.

## THE INTERNAL MODEM

The GRiDCase 1500 Series internal modem (an optional feature) permits communications through the telephone system. The internal modem behaves just like a Hayes 1200 baud or 2400 baud Smartmodem (Options 330 and 331, respectively); it has symbolic software switches that correspond to the Hayes hardware switches. You can change the symbolic switches to match any setting of the Hayes switches.

## Changing Hayes Switch Settings

If your application requires different settings from those required by CROSSTALK, you can reset the switches using the GRiD MS-DOS version of the MODE command. For example, the following command activates the internal modem and sets the switches to the Hayes factory setting:

```
MODE MODEM = ON,DUDUDDUD
```

The *D*'s and *U*'s in the above command stand for "down" and "up" respectively, indicating the position of the switch. The switches in the internal modem now indicate the following settings:

Switches 1, 3, 5, 6, and 8 are down (off)

Switches 2, 4, and 7 are up (on).

The meaning of each of the switch settings is given in Table 9-1.

*Table 9-1. Internal Modem Switch Settings (Defaults Shown in Bold)*

Switch	Position	Meaning
1	Up	Modem requires DTR active
	Down	Modem does not require DTR active
2	Up	Result codes sent as English words
	Down	Result codes sent as single digits
3	Up	No result codes are sent
	Down	Result codes are sent
4	Up	Echo characters when in command mode
	Down	No echo
5	Up	Auto answer on first ring
	Down	Don't answer
6	Up	Carrier detect real
	Down	Carrier detect forced
7	Up	Always up
8	Up	Disables command recognition
	Down	Enables command recognition

MS-DOS restores the the initial (default) settings when you restart the operating system (either by pressing **Ctrl-Alt-Del** or by turning the computer off and back on).



---

## MOVING APPLICATION PROGRAMS TO A GRIDCASE 1500 SERIES COMPUTER

If you run application programs on an IBM PC, PC/XT, or PC/AT using 5 1/4-inch diskettes and want to run these same programs on your GRiDCase 1500 Series computer there are two methods of moving the programs and data files:

- Executing programs you currently use on an IBM PC, PC/XT, or PC/AT from the original diskettes placed in the GRiD external 5 1/4-inch pouch diskette drive.
- Copying programs and files from IBM PC, PC/XT, or PC/AT 5 1/4-inch diskette drives to a GRiDCase internal 3 1/2-inch diskette drive using the PC File Transfer Utilities (PCMASTER/PCSLAVE) — for use when an external 5 1/4-inch diskette drive isn't available.

Before using either procedure, read the caution about copy-protected application programs below.

---

### A CAUTION ABOUT COPY-PROTECTED APPLICATION PROGRAMS

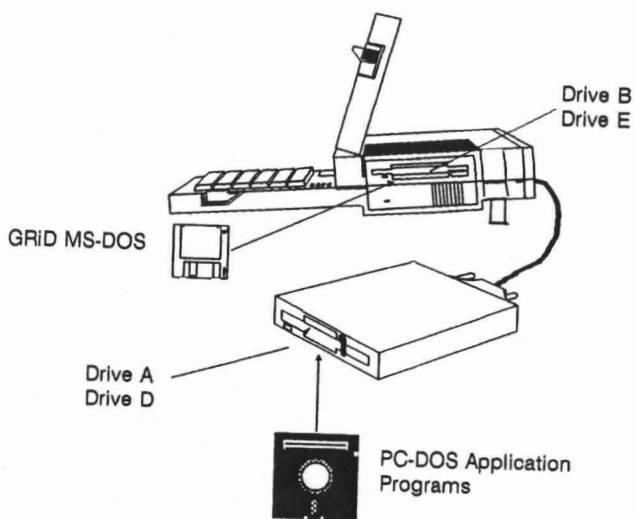
You can take greatest advantage of the full portability of your GRiDCase 1500 Series computer when your application programs and data files reside on 3 1/2-inch diskettes. This allows you to operate from an internal drive, and leave your pouch floppy diskette drive behind when you leave your work area.

You can make a backup copy of an application program from a 5 1/4-inch to a 3 1/2-inch diskette if the program isn't copy-protected. A copy-protected program contains an encoded lock that makes duplication impossible. Attempting to duplicate a copy-protected program results in an error.

To find out if an application is copy protected, read the installation documents that come with it. If it is protected, either try running the program diskette from a pouch floppy diskette drive, as described below, or contact a GRiD representative to find out if a version of the program is available on 3 1/2-inch diskettes.

## USING THE GRiD 5 1/4-INCH EXTERNAL DISKETTE DRIVE

This procedure shows how to run IBM PC, PC/XT, or PC/AT application programs on 5-1/4-inch diskettes from an external diskette drive. This procedure requires one external 5 1/4-inch diskette drive with the device letter assignments shown in Figure 9-6. Other combinations of devices with different device letter assignments are, however, possible.



*Figure 9-6. Running a Program from the GRiD Model 3402 5 1/4-inch External Diskette Drive*

To run an application program from a GRiD 5 1/4-inch pouch diskette drive, follow the steps listed below.

1. Set the switches on the back of the external drive to 00 (both switches are in the "down" position); this causes the external drive to be assigned device letter A.

### CAUTION

Be sure to turn off power to the external drive and the computer before changing the switch settings; otherwise, damage to your equipment could result. In addition, MS-DOS recognizes the new settings only after a "cold" start — when you turn on the power switch of the computer.

2. Insert the application program diskette into the pouch drive and the MS-DOS system diskette into the internal drive.
3. Press the **F** key as you start up (boot) MS-DOS. Pressing the **F** key ensures that the computer uses the MS-DOS system diskette in the internal diskette drive — not PC-DOS, which might be on the application diskette in the external drive. If your system has a hard disk, there is no need to press any key — MS-DOS is automatically loaded from the hard disk.

After start-up, the system prompt appears, indicating the internal drive:

B > (or C >, if your system has a hard disk)

The following device letters, assigned by MS-DOS, are now in effect:

External drive: A, D (or A, B, if your system has a 40-megabyte hard disk)

Top internal drive: B, E (or na, if your system has a 40-megabyte hard disk)

Bottom internal drive: C

Have a formatted 3 1/2-inch diskette ready if you intend to copy program or data files to the internal diskette drive.

4. Change the default device to Drive A by entering:

B > A:

5. The system prompt appears, indicating the external drive:

A>

Enter the name you normally use to invoke your application program and try using it.

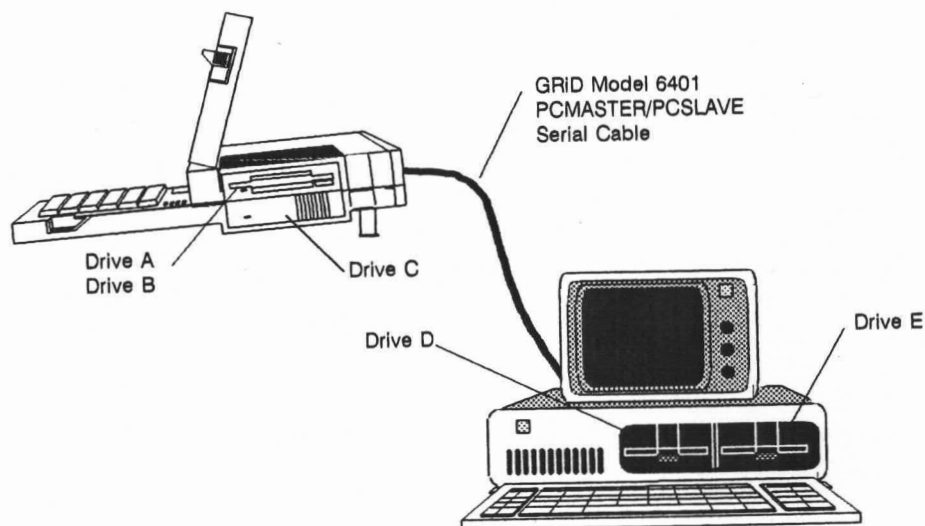
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## USING THE PC FILE TRANSFER UTILITIES

This procedure uses the PC file transfer utilities (described in detail in Chapter 12 of the *MS-DOS Reference* manual) to move files from storage devices on an IBM Personal Computer to GRiDCase 1500 Series storage devices. These utilities are most useful for transferring files when a 5 1/4-inch external diskette drive is unavailable. You can also transfer files from your GRiDCase 1500 Series computer to an IBM PC, PC/XT, or PC/AT.

The PC File Transfer utilities consist of two programs, PCMASTER and PCSLAVE. The programs run concurrently, one on a GRiDCase 1500 Series computer and one on an IBM PC, PC/XT, or PC/AT connected by a cable attached to a serial port of each computer.

Figure 9-7 shows a typical PCMASTER/PCSLAVE configuration; the procedure that starts below assumes this configuration of storage devices, although many others are possible.



*Figure 9-7. Moving Files Using the PC File Transfer Utilities*

As shown in Figure 9-7, GRiD MS-DOS assigns the letters A and B to the GRiDCase internal diskette drive, C to the GRiDCase hard disk, and D and E respectively to the drives on the IBM PC. (Normally, PC-DOS assigns A and B to these two drives.)

If the PC had one diskette drive (instead of two as shown in Figure 9-7) and a hard disk, GRiD MS-DOS would have assigned drive D to the diskette drive and drive E to the hard disk.

To use the transfer procedure, you need the following:

- Access to the GRiD MS-DOS PCMASTER.SYS file, which can be on diskette, in ROM, or on the hard disk.
- The GRiD-supplied 5 1/4-inch diskette that contains the PCSLAVE.COM file.
- A PC-DOS boot diskette for your IBM PC, PC/XT, or PC/AT.
- One or more formatted 3 1/2-inch diskettes, for copying files to the GRiDCase internal drive.

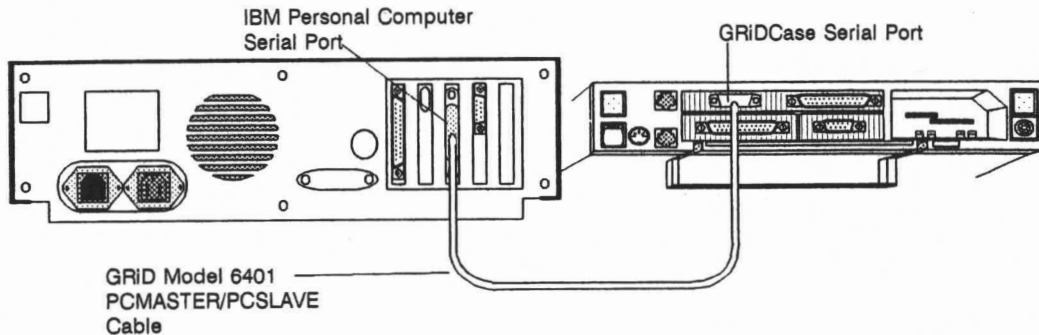
- The GRiD Model 6401 PCMASTER/PCSLAVE Serial Cable, which connects the serial port of the two computers. (If a null-modem cable is available, you can try to use it instead, though not all null modem cables will work. See Chapter 12 of the *MS-DOS Reference* manual for details.)
- If you are using the standard serial port on an IBM PC/AT, you will need a 9-pin-to-25-pin adapter cable, included with your PC/AT or available from your computer dealer.

#### CAUTION

The computer system that is running the most current version of MS-DOS must be the master station. For example, if you are using an IBM PC/AT running PC-DOS 3.1 and a GRiDCase 1500 Series computer running MS-DOS 3.2, then the GRiDCase must be the master station.

Below are the steps to follow in transferring files from an IBM Personal Computer with two diskette drives, to diskettes in a GRiDCase internal drive. In this example, the GRiDCase is the master station and the IBM is the slave station. To reverse the master/slave stations, follow the same steps listed below, except perform all of the actions that you would normally perform at the GRiDCase station on the IBM, and vice versa.

1. Turn off the power to both the IBM and the GRiDCase.
2. Connect the serial ports of the two computers using the GRiD 6401 cable or your own null modem cable as shown in Figure 9-8.



*Figure 9-8. PCMASTER/PCSLAVE Cable Connection*

3. At the IBM:

- Insert the PC-DOS boot diskette into drive D (i.e., the IBM's drive A—see Figure 9-7) and start up PC-DOS by turning on the power.
- Replace the boot diskette with the 5 1/4-inch diskette that contains PCSLAVE.COM.
- To indicate transfer through the COM1 serial port, enter the following command:

A > PCSLAVE

If you already have a device attached to the COM1 serial port, you can use the COM2 serial port. To indicate transfer through the COM2 serial port, enter the following command:

A > PCSLAVE 2

The following messages are displayed after you enter the command in either format:

Slave station ready

Enter commands at master station

Enter Ctrl-C upon completion

**NOTE:** It may take several seconds for the above messages to appear. Don't go to the next step until you see these messages.

4. At the GRiDCase:

- Insert the MS-DOS system diskette into internal drive A and start up MS-DOS by turning on the power, or start MS-DOS from the hard disk.

**NOTE:** Always start up MS-DOS at the master station **after** start-up of the slave station (Step 3). This allows MS-DOS to accurately assign letters to the storage devices at the slave station.

- Create a CONFIG.SYS file on the GRiDCase start-up device that contains the following statement (or add the statement to an existing CONFIG.SYS file):

```
DEVICE = PCMASTER.SYS 2
```

(If this statement is already in CONFIG.SYS, disregard this step and go to Step 5.) Instructions on creating or modifying a CONFIG.SYS file are given later in this chapter.

**NOTE:** If the IBM is the master station and you want to use the COM1 serial port, use the statement `DEVICE = PCMASTER.SYS`.



- Restart MS-DOS by turning the power off, then on.
5. At the IBM, insert into drive E the source diskette containing the files to be copied (see Figure 9-7). If you have a fixed disk rather than a second diskette drive, drive D refers to the fixed disk. Steps 6 and 7 that follow assume that drive D is a diskette drive.
  6. At the GRiDCase, you can specify any device on either the GRiDCase (drives A, B and C) or the IBM (drives D and E) in all MS-DOS commands **except** the following:

FORMAT  
DISKCOPY  
DISKCOMP  
FDISK

You can execute the above commands successfully only when they relate to devices at the master station.

For example, if you wish to look at the directory of drive E (see Figure 9-7), enter

```
A> DIR E:
```

and the directory of files appears on the GRiDCase screen.

To copy **all** the files from the diskette in drive D to the 3 1/2-inch diskette in the GRiDCase internal diskette drive, insert, if necessary, a formatted target diskette, and then enter the following command:

```
A> COPY E:.* A:
```

7. Continue copying files as required from drive E. Upon completion of file transfer operations, go to the next step to disconnect the two computers.
8. At the IBM, press **Ctrl-C** after completing the file transfer.
9. At the GRiDCase, continue normal operations. If you don't intend to use PCMASTER/PCSLAVE again, you may want to delete CONFIG.SYS or, if applicable, restore the original CONFIG.SYS file.

If you do reinstall a former CONFIG.SYS file, you must restart MS-DOS before it takes effect.

### File Transfer Error Messages

During a file transfer, messages that require action on your part may appear. Here are the messages you can receive and what you should do about them.

**Message:** Serial port specified does not exist on system

**What to Do:** You issued a PCSLAVE command. Either the serial port you specified doesn't exist, or your computer doesn't have a serial port. To use the COM1 serial port, enter either of the following commands:

PCSLAVE

or

PCSLAVE 1

To use the COM2 serial port, enter the following command:

PCSLAVE 2

- Message:** Data error reading drive *x*
- Abort, retry, ignore?
- What to Do:** First, make sure that the null modem cable connecting the serial ports of the two computers is firmly attached and try again (enter *R*, for *retry*).
- Message:** Not ready error reading drive *x*
- What to Do:** (*x* is a letter indicating the storage device.) Check the following:
- Make sure the diskette is properly inserted.
  - Make sure the diskette is in the drive that corresponds to the device letter you specified in command.

## File Transfer Troubleshooting

If you have problems with the file transfer utilities, be sure to check the following items.

- Make sure that you have the most current versions of PCMASTER.SYS and PCSLAVE.COM.
- Make sure that the system running the highest numbered version of MS-DOS or PC-DOS is the master station.
- Make sure that you are using a GRiD Model 6401 cable, or equivalent, such as an INMAC null modem serial cable. Refer to Chapter 12 of the *MS-DOS Reference* manual for cable details.
- If more than one serial port exists on the IBM PC system, make sure that the card switches are set correctly and the cable is plugged into the correct serial port.
- Make sure that the serial port specified in the PCSLAVE command is the port that the cable is plugged into.

- At the PCMASTER station, make sure that the CONFIG.SYS file on the boot device contains the statement `DEVICE = PCMASTER.SYS [1|2]`. Also, make sure that the serial port configuration hasn't been changed from the system default. (This can be changed by the `MODE` command, printer drivers, or communications programs.) You can reset the serial port by rebooting.
- Some programs bypass the file system and access disks directly. Trying to access a slave device from the master station does not work when using one of these programs. For example, `FORMAT`, `FDISK`, `DISKCOPY`, and `DISKCOMP` will not recognize devices at the slave station.

---

## CREATING A CONFIG.SYS FILE

This section gives a procedure for creating a CONFIG.SYS file using the `COPY` command.

To create a CONFIG.SYS file using the `COPY` command, follow the steps listed below.

1. If you have an existing CONFIG.SYS file, save it as follows:

```
A> COPY CONFIG.SYS CONFIG.TMP
```

2. Enter the `COPY` command as shown below and press **RETURN**.

```
A> COPY CON CONFIG.SYS
```

This statement makes MS-DOS place all characters you enter from the keyboard in the CONFIG.SYS file.

3. Enter any statements that you want to insert into the CONFIG.SYS file (note that the system prompt will **not** appear after Step 2). Press **RETURN** after each statement, including the last one.

Examples are:

```
FILES = 20  
BUFFERS = 15  
DEVICE = PCMASTER.SYS
```

4. Enter **Ctrl-Z** (or press **F6**) and press **RETURN**.

Step 4 halts the insertion of characters into the CONFIG.SYS file, saves the file, and returns you to the system prompt.

After you complete the above steps, you can display the CONFIG.SYS file using the TYPE command to check the accuracy of your entries.

**NOTE:** The CONFIG.SYS file must be present in the root directory of the diskette or hard disk you boot the computer from. You must restart your system for the new statements in the CONFIG.SYS file to be recognized.

---

## APPENDIX A: TESTING THE MODEM

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If you suspect that your modem is not working properly, run the Scancase program (see Chapter 7) to ensure that your computer recognizes the modem as a valid device. If the modem is recognized, do the following test to see whether your modem or your telephone line is causing the problem.

MS-DOS users can use any data communications software that runs under MS-DOS to perform the test. You cannot perform this test if you need telephone operator assistance to make a phone call.

To test your modem, follow the steps listed below.

1. Run your communications software according to the instructions supplied with it. Enter the phone number (415) 657-2448 to connect to a loopback modem at the GRiD Resource Center. This modem is used for testing; any data you send to it is automatically transmitted back to you.
2. Set the Baud Rate to its maximum value (1200 for the Option 330 modem, 2400 for the Option 331 modem).

It should take less than 30 seconds to connect to the modem at the GRiD Resource Center. If you don't connect, disconnect and call again. You may have a bad phone line. If you still can't connect to the modem after trying about five more times, your modem probably needs service. To confirm whether or not your phone line is bad, try the test using a different phone line.

If you do connect to the modem at the GRiD Resource Center, you will see a message on the screen indicating that you have made a successful connection.

To make sure your modem is working properly, follow the next step.

3. Type a few characters on the keyboard. If you get an error message, or you see characters other than those you typed, or a different number of characters than you typed, disconnect and try again. You may have a bad phone line. If you still can't connect to the modem after trying about five more times, your modem probably needs service. Again, to be absolutely sure, you should try the test with a different phone line.

If you complete all of the above steps successfully, you can be fairly sure your modem functions properly. If you have any trouble with the test and you have ordered a GRiD support service contract with your GRiDCase 1500 Series computer, phone the GRiD Resource Center at (415) 656-2100. Make sure you know the tracking number of your computer; it is stamped on the back of the computer, under the handle.

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## **APPENDIX B: PRINTER SWITCH SETTINGS**

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This appendix gives the switch settings for two printers commonly used with GRiDCase 1500 Series computers.

**NOTE:** The switch settings on external devices are read when the computer starts up. If you change the switch settings after your computer has started up, you must restart it for the new settings to take effect.

---

### **SETTINGS ON DICONIX 150 PORTABLE PARALLEL PRINTERS**

The switch settings for the mother board in the Diconix 150 printers are as follows:

Switches 1 through 10 down (0)

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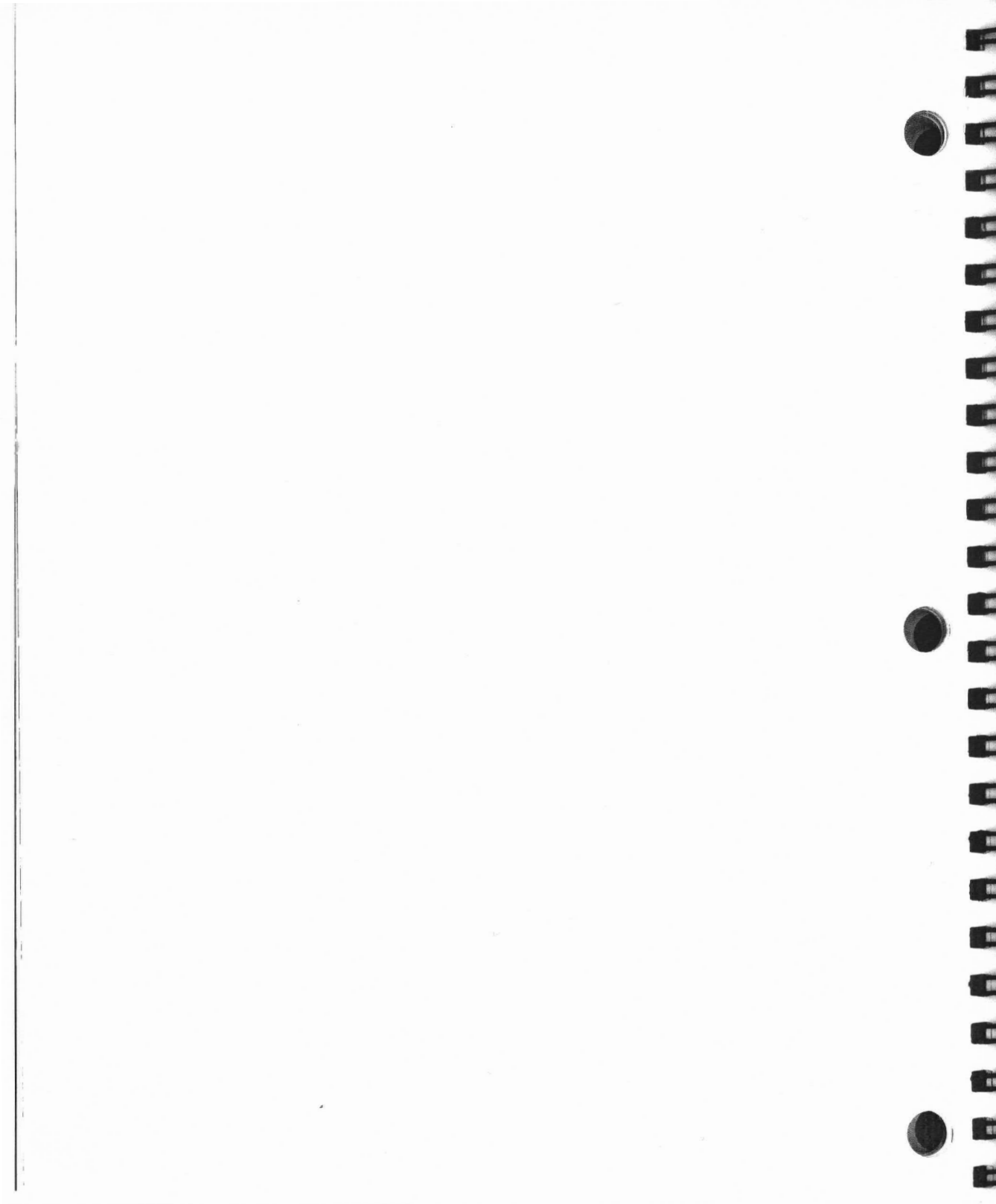
### **SETTINGS ON HEWLETT-PACKARD 2225C THINKJET PARALLEL PRINTERS**

The switch settings for the Hewlett-Packard 2225C ThinkJet printer are as follows:

2, 5, 6 up (on)

1, 3, 4, 7, 8 down (off)





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## APPENDIX C: GRIDCASE 1500 SERIES SPECIFICATIONS

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### Microprocessors

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GRIDCase 1520	80C286 CPU operating at 10 MHz Included in base configuration
	80287 numeric coprocessor, operating at 10 MHz (optional)
GRIDCase 1530	80C386 CPU, operating at 12.5 MHz (included in base configuration)
	80C387 numeric coprocessor, operating at 12.5 MHz (optional)

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### Display

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Enhanced LCD (standard)	10" diagonal, backlit LCD; 80 x 25-line (or 80 x 40-line), 640 x 400-pixel PC- compatible display, with an aspect ratio of 1:1 and a contrast ratio of 11:1
Gas Plasma (Option 281)	9.4" diagonal, 80 x 25-line, 640 x 200- pixel PC-compatible display, with an aspect ratio of 1.4:1 and a contrast ratio of 20:1
Gas Plasma (Option 282)	10" diagonal, 80 x 25-line (or 80 x 40- line), 640 x 400-pixel PC compatible display, with an aspect ratio of 1:1 and contrast ratio of 20:1

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**System RAM**

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1 Megabyte (standard)	32 256KBit chips; speed = 120 ns
2 Megabytes (Option 302)	64 256KBit chips; speed = 120 ns
4 Megabytes (Option 304)	32 1MBit chips; speed = 120 ns
8 Megabytes (Option 308)	64 1MBit chips; speed = 120 ns

---

**Modems**

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1200 Baud (Option 330)	300/1200 bit-per-second Hayes Smartmodem compatible; auto dial, auto answer
2400 Baud (Option 331)	300/1200/2400 bit-per-second Hayes Smartmodem compatible; auto dial, auto answer

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**Mass Storage**

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Internal Diskette Drives (standard)	Two 3 1/2" high-density (1.4 megabyte capacity) diskette drives included in base configuration; drives can read, write, and format both 1.4M and 720K diskettes
3 1/2-Inch External Diskette Drive (Option 3401)	3 1/2" high-density (1.4 megabyte capacity) diskette drive connected by cable to computer's external drive connector; drive can read, write, and format both 1.4M and 720K diskettes

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**Mass Storage (continued)**

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5 1/4-Inch External Diskette Drive (Option 3402)	5 1/4" 360K diskette drive connected by cable to computer's external drive connector
10-Megabyte Hard Disk (Option 320)	78 ms average-access-time hard disk replaces one internal diskette drive
20-Megabyte Hard Disk (Option 321)	78 ms average-access-time hard disk replaces one internal diskette drive
40-Megabyte Hard Disk (Option 324)	29 ms average-access-time hard disk replaces both internal diskette drives
Read Only Memory (ROM)	Two 32-pin ROM sockets provided in base configuration; MS-DOS operating system and CrossTalk communications program optionally available in ROM

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**Interfaces**

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Serial	RS-232C 9 pin, 9600 baud, PC-compatible
Parallel	Centronics 25 pin, PC-compatible
External drive connector	Access to external diskette and tape drives
Video Output	RGB output, 9 pin, CGA compatible
Keyboard	5 pin DIN plug for PC keyboard or 10-key pad
Phone jacks (optional)	Two RJ-11s for internal modem and telephone

---

**Other Features**

---

Audio	Built-in speaker
Keyboard	73 keys (alphanumeric), PC-compatible, tactile feedback
Clock/calendar	Internal lithium battery

---

**Power Source**

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Internal/external AC power supply	35 W at 110 VAC or 220 VAC
Internal battery pack (optional)	Removeable NiCad rechargeable pack provides 20 watt hours of power
External battery pack (optional)	3.5 lb NiCad rechargeable pack provides 54 watt hours of power

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**Physical Characteristics**

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Case	Magnesium
Weight	11.25-13.25 lbs, depending on configuration
Height	2.3 inches (9 cm)
Width	11.5 inches (29 cm)
Length	15 inches (38 cm)
Operating temperature	41° to 95° F (5° to 35° C)
Storage temperature	-4° to 149° F (-20° to 65° C)
Operating humidity	20% to 80% non-condensing
Storage humidity	5% to 95%
Shock tolerance, operating	5 Gs
Shock tolerance, nonoperating	80 Gs
Vibration tolerance, operating	3-200 Hz @ 1.0 G
Vibration tolerance, nonoperating	3-200 Hz @ 1.5 G

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