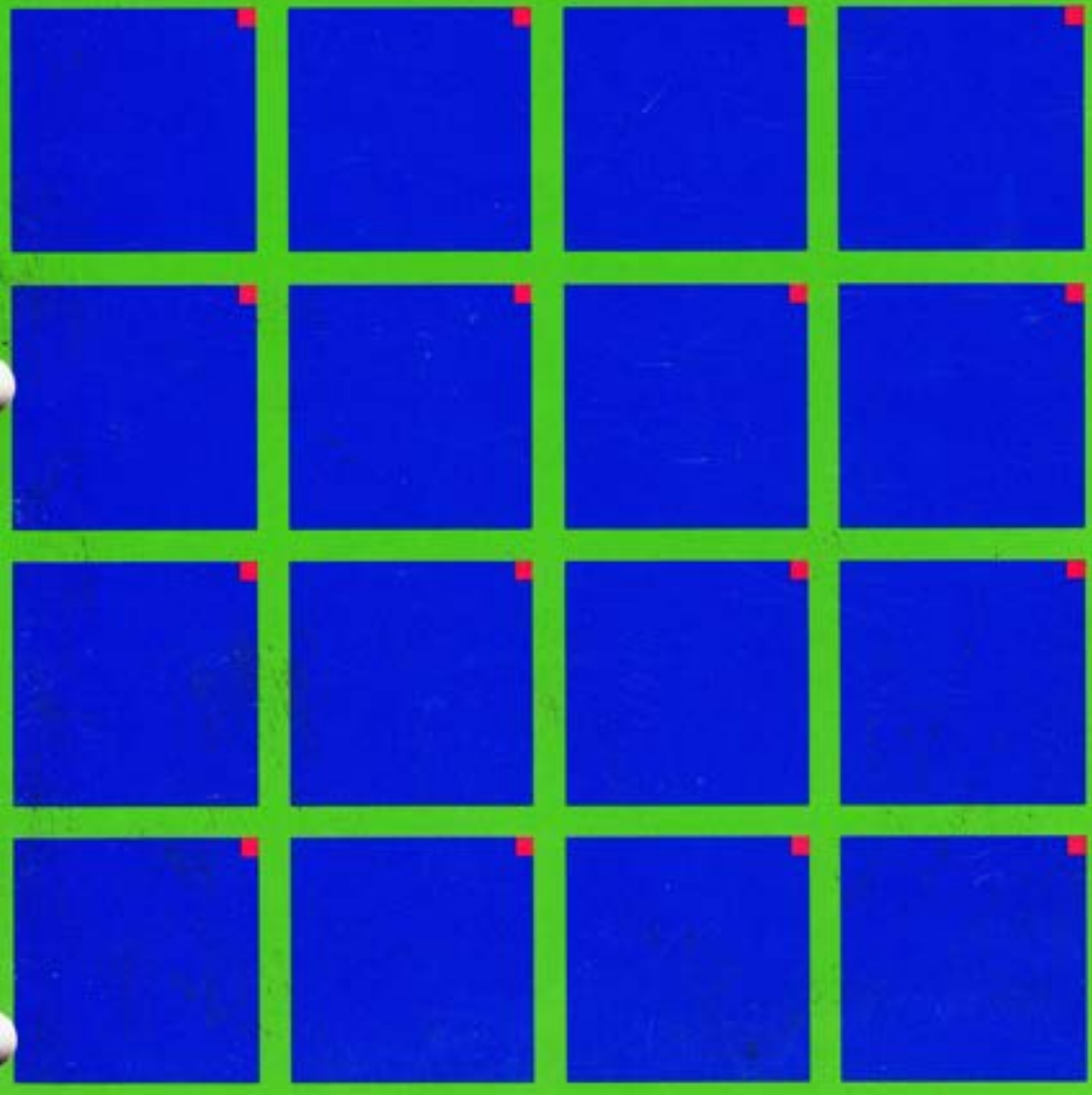
GRiD

Using MS-DOS on the TEMPEST GRiDCase



Using MS-DOS on the TEMPEST GRiDCase

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About This Book

The purpose of this manual is to facilitate a quick and smooth transition from the personal computer you currently use to your new TEMPEST GRiDCase. The manual introduces the TEMPEST GRiDCase version of MS-DOS™ that operates the computer. It also provides information about transferring files from 5¼-inch diskettes to 3½-inch diskettes and provides some guidelines for installing new—or reinstalling old—MS-DOS application programs on the TEMPEST GRiDCase.

Who This Book is For This book is primarily for users of the IBM® Personal Computer who want to run their programs on the TEMPEST GRiDCase. However, the booklet contains vital information for all users; all new TEMPEST GRiDCase owners should benefit from reading this book.

This book is not a tutorial for the novice. You may not understand the information in this book 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.

How the Book is Organized Here's a glance at the information covered in each chapter:

Chapter 1: GRiD MS-DOS for the TEMPEST GRiDCase vs Other PC-Compatible Operating Systems
This chapter explains significant differences between the version of MS-DOS 3.2 implemented for the TEMPEST GRiDCase and other versions of MS-DOS or PC-DOS you may already be familiar with. It explains differences in commands, how BASIC programs operate, how MS-DOS assigns device letters, etc.

Chapter 2: Moving Application Programs to the TEMPEST GRiDCase
This chapter describes how to move applications currently in use on an IBM PC, PC/XT, PC/AT, or compatible computer to the TEMPEST GRiDCase.

Chapter 3: Notes on Program Installation
This chapter describes procedures that may be necessary before you can run certain application programs on the TEMPEST GRiDCase.

How to Use This Book All readers should read Chapter 1 for important points on using the TEMPEST GRiDCase and the GRiD MS-DOS operating system.

IBM PC, PC/XT, and PC/AT users and users of compatible computers should read Chapter 2 for information on moving their current application programs to the TEMPEST GRiDCase.

Any reader wishing to install or reinstall a commercial MS-DOS application program on the TEMPEST GRiDCase should read Chapter 3.

Related Publications You may want to refer to the following related publications for further information:

- *TEMPEST GRiDCase Owner's Guide* (Order Number: 001307-40) Describes the optional and standard hardware features of the TEMPEST GRiDCase; how to connect external storage devices, printers, power supply, etc., to the TEMPEST GRiDCase; and how to start up (boot) MS-DOS. This manual comes with all TEMPEST GRiDCase computers.
- *TEMPEST GRiDCase MS-DOS Reference* (Order Number: 29557-40) Describes in detail the commands and functions of GRiD MS-DOS. This manual comes with GRiD MS-DOS.
- *MS-DOS GW-BASIC 3.2 Reference* (Order Number: 023130-40) Describes the BASIC language available with the GW-BASIC interpreter that runs on the TEMPEST GRiDCase. This manual comes with GW-BASIC.
- *TEMPEST GRiDCase Technical Reference* (Order Number: 001307-50) A reference manual for programmers that describes the TEMPEST GRiDCase hardware and system interface. Using the information in this manual, the MS-DOS programmer should be able to (1) modify existing PC-DOS/MS-DOS application programs so that they run under GRiDCase MS-DOS, and (2) write new application programs. Contact a GRiD representative for information on ordering this manual.

Chapter 1: GRiD MS-DOS for the TEMPEST GRiDCase vs Other PC-Compatible Operating Systems

GRiD MS-DOS 3.2 is an operating system specifically written for the TEMPEST GRiDCase computer. 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 chapter discusses these differences under the following points:

- Why you should use only GRiD MS-DOS 3.2 on the TEMPEST GRiDCase.
- Availability of PC-DOS commands under GRiD MS-DOS.
- GRiD MS-DOS commands that improve upon PC-DOS commands or add new functions to the operating system.
- The limitations of the DISKCOPY command when copying 5¼-inch diskettes to 3½-inch diskettes, and vice versa.
- TEMPEST GRiDCase and IBM PC Keyboard Equivalents.
- Procedures for activating the TEMPEST GRiDCase numeric keypad.
- The assignment of drive letters to your storage devices by GRiD MS-DOS.
- Using the DRIVER.SYS device driver to add more physical or logical drives to your system.
- Formatting 5¼-inch diskettes on an external 2107 diskette drive.
- Running BASIC programs on the TEMPEST GRiDCase.
- Color Mapping.

Why You Should Use Only GRiD MS-DOS

GRiD MS-DOS is the only MS-DOS operating system that you should run on the TEMPEST GRiDCase. Although the TEMPEST GRiDCase is fully compatible with the IBM PC and PC/XT, running PC-DOS on the TEMPEST GRiDCase is neither legal nor desirable.

NOTE: The version of GRiD MS-DOS supplied for the TEMPEST GRiDCase is not interchangable with versions of GRiD MS-DOS for GRiD Compass computers. You should use only version 3.2 or a higher-numbered version of GRiD MS-DOS on the TEMPEST GRiDCase.

PC-DOS is licensed to run only on IBM personal computers. GRiD MS-DOS is licensed to run only on GRiD computers. Although you can interchange application programs, subject to your software licensing agreements, you cannot interchange operating systems.

Legal considerations aside, it is very much to your advantage to run GRiD MS-DOS on your TEMPEST GRiDCase. GRiD MS-DOS includes a number of features not found in PC-DOS or other implementations of MS-DOS:

- GRiD MS-DOS supports devices attached to the General-Purpose Interface Bus (GPIB). PC-DOS and other versions of MS-DOS do not support GPIB devices.
- Only the GRiD MS-DOS MODE command supports GRiD input/output devices. For example, this command controls access to the 19-pin RS-232C/RS-422 serial port, as described later in this chapter. The PC-DOS MODE command cannot control the RS-232C/RS-422 serial port.
- GRiD MS-DOS supports Read Only Memory (ROM). When operating system and/or application program files reside in ROM, instead of on a floppy diskette, the amount of diskette storage available for your data files and programs is increased. Use of programs in ROM also increases battery life. ROM is described in detail in Chapter 6 of the *TEMPEST GRiDCase Owner's Guide.*
- GRiD MS-DOS has a 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 the TEMPEST GRiDCase and an IBM PC, PC/XT, or other PC-compatible computer.
- GRiD MS-DOS includes the SERVER command, which allows GRiD Server and TEMPEST GRiD Server users to gain access to a central file server device and share storage, printing, and other input/output functions.
- GRiD MS-DOS includes the SCANCASE command, which shows the status of input/output devices attached to your computer and lists any factory-installed hardware options.

PC-DOS Commands Available Under GRiD MS-DOS

GRiD MS-DOS includes all PC-DOS commands except the COMP command. 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 *TEMPEST GRiDCase MS-DOS Reference* manual.

Commands Added or Enhanced Under GRiD MS-DOS

GRiD MS-DOS includes some commands that are not available under PC-DOS. Some commands available under PC-DOS are enhanced under GRiD MS-DOS. The commands listed below fall into both categories. Refer to the *TEMPEST GRiDCase MS-DOS Reference* manual for full documentation of all GRiD MS-DOS commands.

DEVICES

The DEVICES command displays a report of all the devices recognized by the system, including any devices such as RAMDRIVE installed in the CONFIG.SYS file. DEVICES is an external command. This means that the file DEVICES.EXE must be in the current directory when you enter the command. With DEVICES.EXE in the current directory, just enter `DEVICES`; no parameters are required:

```
DEVICES
```

Figure 1-1 shows the DEVICES display for a system that includes one external floppy diskette drive in addition to the internal drive.

Figure 1-1. *Sample DEVICES Display*

```
DRIVE     TYPE                    LOCATION

A:        3.5 Diskette            Local
B:        5.25 Diskette           Local
C:        Logical Diskette A:     Local
D:        Logical Diskette B:     Local
```

HELP

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

```
HELP
```

and press Return. The Help menu then appears. The Help menu lists all the topics for which on-screen help is available. The Help menu is shown in Figure 1-2.

Figure 1-2. *The Help Menu*

```
MS-DOS Help Utility (version 3.20)
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       EXE2BIN
EXIT            FDISK       FC          FIND          FORMAT      GRAFTABL
GRAPHICS        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)>
```

From this menu, you select the name of the command or function you want information on, and enter that name. The screen then displays the requested information. If more than one screen of information on a given topic is available, you are prompted to press any key to continue to the next screen.

Sometimes, information is available on a range of subtopics in addition to the topic you initially select. When this is the case, additional topics are listed at the bottom of the help screen for the initial topic. To view information on an additional topic, enter the name of that topic.

Pressing Return in response to the prompt

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

causes the original Help menu to be redisplayed. Pressing Esc returns you to the MS-DOS command level.

You can customize the help facility by adding topics of your own and text to explain those topics. This is a useful feature if, for example, several people at your location use the same application program and could benefit from on-line help for that application. Procedures for customizing the help facility are fully explained in Chapter 7 of the *TEMPEST GRiDCase MS-DOS Reference* manual.

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

MODE

The GRiD MS-DOS MODE command offers the same functions as the PC-DOS MODE command, plus the ability to control additional ports provided by the TEMPEST GRiDCase. Proper use of the MODE command also extends battery life, as explained below under "Turning the Serial Ports Off."

The use of the MODE command on the TEMPEST GRiDCase is as described in the *TEMPEST GRiDCase MS-DOS Reference* manual, with the exceptions listed below:

- **Option 1—Controlling the Printer:** On the TEMPEST GRiDCase, LPT1 refers to a printer connected to the Centronics parallel port. LPT2 refers to a printer connected to the GPIB port. LPT3 is not applicable to the TEMPEST GRiDCase. Printer output to the serial ports is discussed at "Redirecting Printer Output to a Serial Port" below.
- **Option 2—Setting Display Mode:** On the TEMPEST GRiDCase, this option applies **only** to the built-in screen. The TEMPEST GRiDCase does not support external monitors. Therefore, the parameters 40, BW40, and CO40 are indistinguishable from one another on the TEMPEST GRiDCase, as are 80, BW80, and CO80. Using the MONO parameter results in an "Invalid Parameter" error. The L, R, and T parameters have no effect.
- **Option 4—Changing Parallel Printer Output:** LPT3 is not applicable to the TEMPEST GRiDCase.
- **Option 5—Change PRN Device:** LPT3 is not applicable to the TEMPEST GRiDCase.
- **Option 6—Switch On Serial Port:** The TEMPEST GRiDCase has two serial ports.

  The 25-pin RS-232C serial port is Serial Port 1. You can turn it on with either of the following MODE commands:

```
MODE SERIAL = ON
MODE SERIAL 1 = ON
```

In many of the examples in this section, SERIAL 1 is used to refer to the 25-pin serial port. In any command that uses SERIAL 1, you can instead enter SERIAL1—the two forms are equivalent. Likewise, SERIAL 2 and SERIAL2 are equivalent.

To turn the 25-pin serial port off, use either of the following MODE commands:

```
MODE SERIAL = OFF
MODE SERIAL 1 = OFF
```

The 19-pin RS-232C/RS-422 port is Serial Port 2. You turn it on with the following MODE command:

```
MODE SERIAL 2 = ON
```

To turn the 19-pin serial port off, use the following MODE command:

```
MODE SERIAL 2 = OFF
```

Note that turning either serial port on also sets certain communications parameters for that port. The default configuration of the serial ports is shown in Table 1-1, under "Activating and Using the Serial Ports," below.

- **Option 7—Switch On Internal Modem:** This option is not applicable to the TEMPEST GRiDCase; no internal modem is available for the TEMPEST GRiDCase.
- **Option 10—Setting Font and Reverse Video:** The 1 and 2 font parameters are not applicable on the TEMPEST GRiDCase; they have no effect. The RVON and RVOFF parameters work on the TEMPEST GRiDCase as documented in the *TEMPEST GRiDCase MS-DOS Reference*.

MODE Command: TEMPEST GRiDCase Port Assignments

You must use the MODE command to direct output to the TEMPEST GRiDCase's communications ports, as described below.

The TEMPEST GRiDCase has four communications ports:

Centronics parallel port

General Purpose Interface Bus (GPIB) parallel port

25-pin, PC-compatible RS-232C port

19-pin RS-232C/RS-422 port

You direct the computer's output to a particular port by using the MODE command.

Sending Printer Output to the Centronics Port By default, MS-DOS sends printer output to the port it identifies as LPT1. On the TEMPEST GRiDCase, LPT1 is the Centronics port. It is therefore not necessary to issue any MODE command to send printer output to the Centronics port.

If, however, you have previously redirected printer output to the GPIB port, as described below, you can return ouput to the Centronics port with the following command:

```
MODE PRN = 1
```

Sending Printer Output to the GPIB Port MS-DOS identifies the GPIB port as LPT2. To send printer output to a printer attached to the GPIB port, you must first redirect printer output to LPT2 with the following MODE command:

```
MODEL PRN = 2
```

All subsequent printer output is sent through the GPIB port until you explicitly redirect the output or reboot the machine.

Activating and Using the Serial Ports To conserve power and prolong battery life, GRiD MS-DOS turns off both serial ports every time you load the operating system. Before you can send any output to a serial port, you must first turn the port on using the MODE command.

You can use the MODE command in either of two ways to turn a serial port on. You can issue a MODE command that explicitly turns the port on and provides a default configuration for the port. Or, you can issue a MODE command to configure the port to your specific needs; using the MODE command to configure the port also turns the port on.

Table 1-1 shows the default serial port configuration in effect when you explicitly turn a serial port on with a "MODE SERIAL *n* = ON" command, as described below. **Note that these defaults are different from the default values provided when you use the MODE command to configure a serial port.**

Table 1-1. *Default Serial Port Configuration: MODE SERIAL n = ON*

Parameter	Default Value
baud rate	2400
parity	N (none)
databits	8
stopbits	1

If the default configuration shown in Table 1-1 suits your needs, or if you use application software that performs its own port configuration, use the MODE command to explicitly turn the serial port(s) on.

The discussion below explains how to turn either or both serial ports on. The two ports are entirely independent of each other—both can be on simultaneously, both can be off, or one can be on and the other off.

MS-DOS identifies the 25-pin port as COM1. To explicitly turn the 25-pin port on, issue **either** of the following MODE commands:

```
MODE SERIAL = ON
MODE SERIAL 1 = ON
```

Both commands cause the following message to be displayed:

```
COM1 status — serial power ON, modem power OFF
```

Ignore the last part of the message; the TEMPEST GRiDCase does not have a modem.

MS-DOS identifies the 19-pin port as COM2. To explicitly turn the 19-pin port on, issue the following MODE command:

```
MODE SERIAL 2 = ON
```

This command causes the following message to be displayed:

```
Second serial port power ON
```

If the default serial port configuration doesn't suit your needs, you must use the MODE command to configure the port.

The form of the MODE command used to configure the serial ports is shown below:

MODE COM*n*:baud[,parity][,databits][,stopbits][,P][,DTR + | -][,RTS + | -]

In the MODE command shown above, *n* is either 1 or 2, depending on which serial port you are configuring. With this form of the MODE command, *baud* is the only parameter that you **must** specify. You can omit any or all of the parameters shown in brackets. Any parameter you do not specify is replaced by a default value, as explained below. Note that the default values for this form of the MODE command are **not** the same as the defaults shown in Table 1-1. Therefore, if you issue a "MODE SERIAL *n* = ON" command, and then decide to change, for example, the baud rate, **you will in fact have changed all the defaults shown in Table 1-1.**

baud: Required. Permitted values are 110, 150, 300, 1200, 2400, 4800, and 9600. This specifies the rate at which data is transmitted or received through the port. The leftmost two digits of each value are sufficient to specify that value. Entering a baud value of 11, for example, specifies 110 baud.

parity: Optional. Permitted values are N (none), O (odd), and E (even). The default value is E. This specifies whether or not one bit of each byte sent or received will be used for error checking and, if so, whether the parity bit will be set to make the byte odd or even. If you specify 8 databits, you cannot specify a parity bit; the two are mutually exclusive.

databits: Optional. Permitted values are 7 and 8. The default value is 7. If you specify 8 databits, you cannot specify a parity bit; the two are mutually exclusive.

stopbits: Optional. Permitted values are 1 and 2. The default value for 110 baud is 2. The default value for other baud rates is 1.

P: Optional; for use with serial printers. Specifies that the system automatically retry printing requests until the printer is active or you press Ctrl-Break. By default, automatic retry is **not** in effect, but once it is set, you must reenter the MODE command without the P parameter to disable automatic retry.

DTR: Optional. Specify DTR + to enable Data-Terminal-Ready handshaking. The default value is DTR – .[1] DTR handshaking is not normally required.

RTS: Optional. Specify RTS + to enable Request-To-Send handshaking. The default value is RTS – .[1] RTS handshaking is not normally required.

To accept the default values for some parameters and specify others, enter only a comma for any parameter you don't want to specify; enter a comma and a value for any parameter you do want to specify. The following MODE command, for example, specifies a baud rate of 1200 and RTS handshaking, but leaves the default values for the other parameters unchanged:

```
MODE COM1:1200,,,,,,RTS+
```

Once you have turned on and/or configured one or both of the serial ports, you can direct output to the port(s).

Redirecting Printer Output to a Serial Port To redirect printer output to a serial port, issue the MODE command as shown below:

```
MODE LPTn = COMn
```

The first *n* stands for the number of the line printer (1 or 2). The second *n* stands for the number of the COM port (1 or 2).

The commands for redirecting Centronics and GPIB printer output to either of the serial ports are shown in Table 1-2.

[1]DTR and RTS are special cases. They do not have default values in the same sense that the other MODE command parameters do. If you specify **neither** DTR nor RTS in the MODE command, their values remain unchanged from their previous state—if either was high (+) before you entered the MODE command, it stays high. If, however, you specify **either** DTR or RTS, **both** are set. If you specify both, they are set as specified. If you specify only one, it is set as specified, and the other is set **low.** Whenever you specify either or both of these parameters in a MODE command, the operating system reports the values of both upon completion of the command.

Table 1-2. *Directing Printer Output to a Serial Port*

Printer to	Serial Port	Command
Centronics →	25-pin	MODE LPT1 = COM1
Centronics →	19-pin	MODE LPT1 = COM2
GPIB →	25-pin	MODE LPT2 = COM1
GPIB →	19-pin	MODE LPT2 = COM2

To return printer output to a Centronics or GPIB printer, enter the form of the MODE command shown below:

```
MODE LPTn
```

where *n* is either 1 or 2.

Use 1 if you initially redirected printer output from the Centronics port. Use 2 if you initially redirected printer output from the GPIB port.

Turning the Serial Ports Off If you operate your TEMPEST GRiDCase from a battery pack, you should always turn the serial ports off when you have finished using them. This will conserve battery power and allow you to operate longer before changing or recharging batteries.

To turn off the 25-pin RS-232C port, issue either of the following MODE commands:

```
MODE SERIAL = OFF
MODE SERIAL 1 = OFF
```

To turn off the 19-pin RS-232C/RS-422 port, issue the following MODE command:

```
MODE SERIAL 2 = OFF
```

Using a Batch File to Activate or Deactivate the Serial Port(s) Instead of entering a series of MODE commands as described in this section each time you want to configure your system for a particular application, you can put the commands you need in a batch file. A batch file is a file containing a list of executable commands that you would ordinarily have to enter manually. You can assign any name you want to a batch file, but you must assign the filename extension .BAT. Refer to the *TEMPEST GRiDCase MS-DOS Reference* for detailed information on batch files.

To issue all the commands contained in a batch file, you simply enter the name of the batch file in response to the MS-DOS system prompt. The individual commands contained in the batch file are then executed sequentially.

Suppose, for example, that you print most of your documents on a dot-matrix printer attached to the Centronics parallel port, but that you occasionally want to print on a letter-quality printer attached to the 25-pin serial port. Assuming that your letter-quality printer accepts data at 1200 baud and accepts the default values for parity, databits, and stopbits, you would need to issue the following MODE commands before you could begin printing to the letter-quality printer:

```
MODE COM1:1200,,,,P
MODE LPT1 = COM1
```

Rather than remember these two MODE commands, you can simply put them into a batch file called, for example, LQ.BAT. Then, every time you want to switch from Centronics parallel to 25-pin serial output, you need enter only LQ.

You might then want to create a second batch file to switch back to Centronics output and turn the 25-pin serial port off. You could call that file DM.BAT and put the following MODE commands in it:

```
MODE LPT1
MODE SERIAL 1 = OFF
```

You can create a batch file with your word-processing application program, with the MS-DOS line editor, EDLIN, or by using the COPY command to copy console output to a disk file, as illustrated below.

The following input creates the file LQ.BAT on drive A:

```
COPY CON A:LQ.BAT
MODE COM1:1200,,,,P
MODE LPT1 = COM1
F6
```

Press Return after each line shown above. Press the F6 key at the end of the list of commands; do not enter the characters F and 6. Pressing Ctrl-Z has the same effect as pressing F6.

After you create the batch file, you can check it for accuracy by using the TYPE command to display the file's contents on the screen. To do so, enter

```
TYPE filespec
```

where *filespec* is the name of the batch file—LQ.BAT in the example above.

PCMASTER/PCSLAVE

The PCMASTER and PCSLAVE commands (also called the PC file transfer utilities) transfer files from IBM PC, PC/XT, PC/AT, or PC-compatible system storage devices to TEMPEST GRiDCase storage devices and vice versa. The transfer takes place over a cable attached to one of the serial ports of each computer. See Chapter 2 for more information on PCMASTER and PCSLAVE.

SCANCASE

The SCANCASE command displays the status of input/output devices attached to your TEMPEST GRiDCase and lists the factory-installed hardware options. Use the command to find out if your computer has the built-in options your applications require, and to provide troubleshooting information to GRiD Systems service personnel. Refer to the *TEMPEST GRiDCase Owner's Guide* or the *TEMPEST GRiDCase MS-DOS Reference* manual for more information.

SERVER

The SERVER command gives authorized users access to a GRiD Server or TEMPEST GRiD Server either through an encrypted modem or by direct wire. GRiD Server or TEMPEST GRiD Server is a powerful modular system that allows up to 58 users to share storage, printing, and other input/output devices. Both TEMPEST GRiDCase and IBM PC or PC/XT users can connect to a GRiD Server or TEMPEST GRiD Server. For details on using GRiD Server, refer to the *GRiD Server User's Guide for MS-DOS and PC-DOS Users.*

When to Use XCOPY Instead of DISKCOPY

The XCOPY command is in some respects an improvement on both the COPY and DISKCOPY commands. Unlike COPY, XCOPY can copy subdirectories. Unlike DISKCOPY, XCOPY can copy efficiently from 5¼-inch diskettes to 3½-inch diskettes. XCOPY is fully documented in the *TEMPEST GRiDCase MS-DOS Reference.*

Always use the XCOPY command instead of DISKCOPY when you duplicate files from a 5¼-inch diskette to a 3½-inch diskette. When duplicating from a 5¼-inch diskette, DISKCOPY uses space inefficiently on a 3½-inch diskette; it reduces by half the available space for files.

Use the XCOPY command with the /S parameter to copy an entire diskette, including any subdirectories, from a 5¼-inch diskette to a 3½-inch diskette. The following command copies from a 5¼-inch diskette in external drive B to a 3½-inch diskette in internal drive A:

```
XCOPY B: A: /S
```

This command copies all files from the diskette in Drive B to the diskette in Drive A, including files in any subdirectories. It does not, however, copy any **empty** subdirectories. To include any empty subdirectories in the copy operation, use both the /S and the /E parameters, as shown below:

```
XCOPY B: A: /S /E
```

When to Use COPY *.* Instead of DISKCOPY DISKCOPY cannot duplicate from a 3½-inch to a 5¼-inch diskette because a 3½-inch diskette can store twice as much information as a 5¼-inch diskette. MS-DOS issues an error message if you try to use DISKCOPY in this way. This is true even if the files actually stored on the 3½-inch diskette take up less than 360K—the maximum for 5¼-inch diskettes. However, if the files on the 3½-inch diskette actually require 360K or less of storage, you **can** copy them to a 5¼-inch diskette by using the COPY command with wildcard characters. The following command, for example, copies all files from the current directory of the 3½-inch diskette in internal drive A to the root directory of the 5¼-inch diskette in external drive B:

```
COPY A:*.* B:
```

Note: If the files on a 3½-inch diskette occupy more than 360K of storage, it is physically impossible to copy all of those files to a 5¼-inch diskette.

TEMPEST GRiDCase and IBM Keyboard Equivalents

Table 1-3 lists IBM PC, PC/XT, and enhanced PC special keys and their TEMPEST GRiDCase equivalents. Any key sequence shown in parentheses is an alternative sequence and accomplishes the same function as the primary key sequence that precedes it.

Table 1-3. *IBM PC, PC/XT, and Enhanced PC Special Keys and TEMPEST GRiDCase Equivalents*

Function Keys

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

Cursor-Control Keys

IBM Key	TEMPEST GRiDCase Key
→	→
←	←
↓	↓
↑	↑
End	Fn-End
Home	Fn-Home
PgDn	Fn-PgDn
PgUp	Fn-PgUp

›

Typewriter Keyboard Keys

IBM Key	TEMPEST GRiDCase Key
Alt	Alt
Backspace	BkSp
Break	Fn-Break
Caps Lock	CpLk
Ctrl	Ctrl
Ctrl-C	Ctrl-C
Ctrl-PrtSc (Ctrl-P)	Fn-Echo (Ctrl-P)
Ctrl-S	Ctrl-S
Echo	Fn-Echo
Enter	Return
Esc	Esc
Pause	Fn-Pause
Shift-PrtSc	Fn-PrtSc
Right Shift	Right Shift
Left Shift	Left Shift
Tab	Tab
Shift-Tab	Shift-Tab

Numeric Keypad Keys

IBM Key	TEMPEST GRiDCase Key
Del	Del
Ins	Ins
Num Lock	Fn-NmLk (Fn-N)
Gray +	numeric keypad + key (;)[1]
Gray -	numeric keypad—key (P)[1]
Gray *	numeric keypad * key (0)[1]
1	numeric keypad 1 (J)[1]
2	numeric keypad 2 (K)[1]
3	numeric keypad 3 (L)[1]
4	numeric keypad 4 (U)[1]
5	numeric keypad 5 (I)[1]
6	numeric keypad 6 (O)[1]
7	numeric keypad 7 (7)[1]
8	numeric keypad 8 (8)[1]
9	numeric keypad 9 (9)[1]
0	numeric keypad 0 (M)[1]
Scroll Lock	Fn-ScrLk (Fn-S)

[1]To enter a keypad number, you must first set the numeric lock function by pressing Fn-NmLk. To restore the keys to their non-numeric-keypad functions, release the numeric lock function by pressing Fn-NmLk a second time. See "The NUMPAD.COM and NUMPAD.SYS Files" and "Temporary Numeric Keypad Access" below for more information on using the numeric keypad keys under MS-DOS.

Special Characters

IBM Key	TEMPEST GRiDCase Key
[	Fn-[
]	Fn-]
{	Fn-Shift-{
}	Fn-Shift-}
~	Fn-Shift-~
`	Fn-`

A Note on Sending Screen Output to a Printer

Fn-Echo and Ctrl-P both act as toggle switches. Pressing either of these key combinations once turns on printing of screen output. Pressing either combination again turns off printing of screen output. After you toggle printing on, the computer sends all output normally displayed only on the screen to the screen **and** to the current printer. Screen printing remains in effect until you toggle it off by pressing Fn-Echo or Ctrl-P again.

If you toggle screen printing on when no printer is connected to the current printer port, or when the printer is turned off or otherwise unavailable, MS-DOS displays an error message that ends

```
Abort, Retry, Ignore
```

MS-DOS is prompting you to enter A to abort the attempted print operation, R to retry the print operation, or I to ignore the error condition (generally a dangerous choice).

Before you respond to the prompt, you must press Fn-Echo **or** Ctrl-P **to toggle screen printing off.** If you do not do so, MS-DOS attempts to send the screen echo of your response to the printer, **thus generating a new error message.** This can result in a frustrating endless loop of error messages, and might tempt you to reboot the computer to escape from the loop. **It is not necessary to reboot the computer; just toggle screen printing off, and then abort the print operation.**

The NUMPAD.COM and NUMPAD.SYS Files

Your MS-DOS distribution diskette contains two files called NUMPAD.COM and NUMPAD.SYS. These files allow the TEMPEST GRiDCase numeric keypad keys to fully emulate the numeric keypad of an IBM PC, PC/XT, or enhanced PC keyboard.

NUMPAD.COM is an executable file that you load into the computer's memory by entering NUMPAD in response to the MS-DOS system prompt. The file NUMPAD.COM should be on the current drive. Otherwise, you must specify a path to the file.

If, for exemple, the current drive is internal floppy diskette drive A, you would load NUMPAD.COM by putting your MS-DOS diskette in drive A and entering

```
NUMPAD
```

Once you have loaded NUMPAD.COM, the file remains resident in memory until you turn off the computer or reboot the operating system.

When NUMPAD.COM is in the computer's memory, you can use the numeric keypad keys just as you would use the numeric keypad on an IBM keyboard: set the numeric lock to begin using the numeric keypad keys; release the numeric lock to return the keys to their normal functions.

NUMPAD.SYS is a device driver file. NUMPAD.SYS performs the same function as NUMPAD.COM. But NUMPAD.SYS is invoked from a CONFIG.SYS file, rather than from the MS-DOS command line. To invoke NUMPAD.SYS, put the following line into a CONFIG.SYS file:

```
DEVICE=NUMPAD.SYS
```

You can create a new CONFIG.SYS file specifically to invoke NUMPAD.SYS, or you can add the above line to your existing CONFIG.SYS file. Refer to the *TEMPEST GRiDCase MS-DOS Reference* manual for instructions on creating a CONFIG.SYS file.

The statements in a CONFIG.SYS file take effect only when you start or restart MS-DOS. Therefore, to invoke NUMPAD.SYS from a CONFIG.SYS file, you must first create or edit the CONFIG.SYS file and then reboot MS-DOS. Only then will you be able to use the numeric keypad keys.

Which file you should use depends on the frequency with which you expect to use the numeric keypad. If you expect to use the keypad only occasionally, you should probably use NUMPAD.COM, thereby conserving main memory when you have no need for the keypad. If you expect to use the keypad nearly every time you use the computer, you should probably use NUMPAD.SYS so that the keypad is always available to you.

Temporary Numeric Keypad Access It is, in fact, possible to access the numeric keypad keys without using NUMPAD.COM or NUMPAD.SYS. Doing so requires more keystrokes, but may be an acceptable alternative if you use the numeric keypad keys very infrequently.

To access the numeric keypad keys without using either NUMPAD file, take the following steps:

1. Enter NumLock mode by pressing Fn-NmLk.
2. Access the desired key by pressing Fn and that key together.

When you no longer need access to the numeric keypad keys, exit from NumLock mode by pressing Fn-NmLk again. While you are in temporary NumLock mode, any combination of Fn and an arrow key will result in the entry of a number instead of the desired cursor movement.

The numeric keypad +, −, and * keys are available whether or not you are in NumLock mode. You can access them at any time by pressing Fn and the desired key.

Drive Letter Assignments Under MS-DOS, every drive in your system is identified by a letter of the alphabet. The setting of the GPIB address switches on the back of external drives determines the letter assigned to each drive.

The five GPIB addresses applicable to TEMPEST GRiDCase external drives are 4, 5, 6, 12, and 13. Table 1-4 shows the switch settings for each of these addresses.

Table 1-4. *GPIB Addresses and Switch Settings*

Address	Switch Settings				
4	down	down	up	down	down
5	down	down	up	down	up
6	down	down	up	up	down
12	down	up	up	down	down
13	down	up	up	down	up

Each GPIB address switch setting corresponds to either one or two MS-DOS drive letters. The drive letters assigned to each drive depend on the number of drives present and the GPIB address switch settings of those drives.

Note: Under MS-DOS, your system ordinarily can have no more than four floppy diskette drives, counting the internal drive. Since MS-DOS treats a TEMPEST storage device, model 2127, as two floppy diskette drives, you are limited to no more than one 2127 and one TEMPEST portable floppy diskette drive, model 2107, or three 2107 drives. See "The DRIVER.SYS Device Driver" below for a way to exceed this MS-DOS limitation.

The **primary** drive letter A is always assigned to the internal floppy diskette drive. If any other drives are present, they are assigned primary drive letters alphabetically, in GPIB-address order. 2107 drives are assigned a single primary drive letter. 2127 drives are assigned two consecutive primary drive letters, the first to the left drive, the second to the right drive.

Suppose, for example, that your system includes a 2127 set to address 4 and a 2107 set to address 5. The internal floppy diskette drive is drive A, the left drive of the 2127 is drive B, the right drive of the 2127 is drive C, and the 2107 is drive D.

As mentioned above, the 2127, which is really two drives, is assigned two primary drive letters, compared to one primary drive letter each for the internal floppy diskette drive and any attached 2107 drives. The internal floppy diskette drive, drive A, and the lowest-addressed GPIB drive, drive B, are each assigned a **secondary** or **logical** drive letter in addition to their primary drive letters. Logical drive letters are assigned to drives in alphabetical order, after the primary assignments have been made. In the example given above, the internal floppy diskette drive would be logical drive E, and the left drive of the 2127 would be logical drive F.

The assignment of logical drive letters allows you to perform two-drive operations on a single drive. In other words, you can address the drive by either of the two drive letters, as if you were addressing two different drives. The computer prompts you to change diskettes as necessary.

Table 1-5 shows primary and logical drive letter assignments for various system configurations.

Table 1-5. *Drive Letter Assignments Under MS-DOS*

Configuration	Drive	GPIB Address	Drive Letter	
			Primary	Logical
1	Internal	na	A	B
2	Internal	na	A	C
	2107	5	B	D
3	Internal	na	A	D
	2107	5	B	E
	2107	6	C	na
4	Internal	na	A	E
	2107	5	B	F
	2107	6	C	na
	2107	13	D	na
5	Internal	na	A	D
	2127, left	4	B	E
	right		C	na
6	Internal	na	A	E
	2127, left	4	B	F
	right		C	na
	2107	5	D	na
7	Internal	na	A	E
	2107	5	B	F
	2127, left	12	C	na
	right		D	na
8	Internal	na	A	D
	2137, left	5	B	E
	right		C	na
9	Internal	na	A	E
	2137, left	6	C	na
	right		D	na
	2107	5	B	F
10	Internal	na	A	E
	2107	6	D	na
	2137, left	5	B	F
	right		C	na

Which address you set for which drive, and the order in which you connect the drives is up to you, with three qualifications:

1. Use addresses 4 and 12 only for 2127s. Use addresses 5, 6, and 13 only for 2107s.
2. If you want to boot MS-DOS from an external drive, that drive must have the lowest GPIB address on your system. You should therefore set the GPIB address of an external drive from which you wish to load the operating system to either 4 or 5, depending on the type of drive. To load the operating system from a 2127 storage device, set the address switches to 4, and put the operating system cartridge in the **left** drive.
3. Never set the GPIB switches of two drives to the **same** address. If you do, you will not be able to access either drive.

The DRIVER.SYS Device Driver

Your MS-DOS distribution diskette includes a file called DRIVER.SYS. DRIVER.SYS is a device driver that you can use to gain access to more than the four floppy diskette drives ordinarily allowed under MS-DOS. You can also use DRIVER.SYS to assign additional logical drive letters to the physical drives in your system. Both uses of DRIVER.SYS, as they apply to the TEMPEST GRiDCase, are described in this section. DRIVER.SYS is also fully documented in the *TEMPEST GRiDCase MS-DOS Reference* manual.

To use DRIVER.SYS, you must include a DEVICE statement in your CONFIG.SYS file.

Adding an Additional Floppy Diskette Drive

The appropriate form of the DEVICE statement to add an extra 2107 floppy diskette drive is shown below:

```
DEVICE=DRIVER.SYS /D:number /F:0 /H:2 /S:9 /T:40
```

The parameters are explained below:

- *number* is a number between 4 and 7. It specifies the physical drive to be added. The first four physical drives—the ones allowed without resort to DRIVER.SYS—are numbered as follows: A = 0, B = 1, C = 2, D = 3. Since drives 0 through 3 are available **without** DRIVER.SYS, you would never use a number less than 4 for this parameter. The upper limit is 7 because the first four drives must use **at least** one of the five available GPIB addresses, leaving four additional addresses at which drives can be added.

  Two examples should help clear up any confusion about the use of the *number* parameter.

The first example assumes that your system has the following drives:

—Internal floppy diskette drive A (0)

—2127 storage device at GPIB address 4, drives B and C (1 and 2)

—2107 floppy diskette drive at GPIB address 5, drive D (3)

Now assume that you want to add another 2107 floppy diskette drive to the system. Set the GPIB address switches of the new 2107 to 6. Then put the following DEVICE statement in your CONFIG.SYS file:

```
DEVICE=DRIVER.SYS /D:4 /F:0 /H:2 /S:9 /T:40
```

The next time you start MS-DOS, the DEVICE statement takes effect, and the system recognizes the new 2107 as your **fifth** floppy diskette drive. In this example, the new drive's primary drive letter is G. See "DRIVER.SYS Drive Letter Assignments" below for a full explanation of drive letters assigned to drives added with DRIVER.SYS.

The second example assumes the same system configuration as the first, **with this exception**: A fifth floppy diskette drive, the 2107 added in the first example, is already part of the system. To add still another 2107 to the system, set the new 2107's GPIB address switches to 13. Then add another device statement to the CONFIG.SYS file, as follows:

```
DEVICE=DRIVER.SYS /D:5 /F:0 /H:2 /S:9 /T:40
```

The next time you start MS-DOS, the DEVICE statement takes effect, and the system recognizes the new 2107 as your **sixth** floppy diskette drive. In this example, the new drive's primary drive letter is H. See "DRIVER.SYS Drive Letter Assignments" below for a full explanation of drive letters assigned to drives added with DRIVER.SYS.

- /F:0 specifies that the drive you are adding is a 320K/360K floppy diskette drive.
- /H:2 specifies that the drive you are adding has two read/write heads.
- /S:9 specifies that the drive you are adding reads and writes nine sectors per track.
- /T:40 specifies that the drive you are adding reads and writes 40 tracks on each side of a diskette.

Adding an Additional Logical Drive

You can use DRIVER.SYS to assign logical drive letters to floppy diskette drives that are not ordinarily assigned logical drive letters. **You cannot assign a logical drive letter to a 2127 drive that does not already have one.** Refer to "Drive Letter Assignments" earlier in this chapter for a discussion of logical drives—Table 1-5 shows the primary and logical drive letter assignments available **without** DRIVER.SYS.

The form of the DEVICE statement to add a logical drive letter to a physical floppy diskette drive is shown below:

```
DEVICE=DRIVER.SYS /D:number /F:0
```

The parameters are explained below:

- *number* is a number between 2 and 7. It specifies the physical drive to which the logical drive letter is to be assigned. Physical drives 0 and 1 (primary drive letters A and B) are always assigned logical drive letters. You would therefore never enter 0 or 1 for the *number* parameter.

  The number you actually enter depends on the number of drives in your system and on their GPIB addresses. The first four drives always receive primary drive letters A, B, C, and D and are seen by DRIVER.SYS as drives 0, 1, 2, and 3. If you have added additional floppy diskette drives to your system using DRIVER.SYS, those drives are seen as drives 4 through 7, depending on their GPIB addresses. The added drive with the lowest GPIB address is drive 4; consecutive addresses correspond to consecutively higher drive numbers.

  Let's look at a couple of examples.

  The first example assumes that your system has the following drives:

  —Internal floppy diskette drive A (0)

  —2127 storage device at GPIB address 4, drives B and C (1 and 2)

  —2107 floppy diskette drive at GPIB address 5, drive D (3)

  Ordinarily, only the first two physical drives, drives A and B in the above configuration, are assigned logical drive letters. Suppose, though, that you want to assign a logical drive letter to the 2107 floppy diskette drive, drive D. This can be useful if you need to perform two-drive operations on 5¼-inch floppy diskettes without a second physical 5¼-inch drive. You would put the following DEVICE statement in your CONFIG.SYS file:

  ```
  DEVICE=DRIVER.SYS /D:3 /F:0
  ```

  The next time you start MS-DOS, the 2107 is still primary drive D; now, however, it also has a logical drive letter assigned to it. The drive letters assigned both to added physical drives and to logical drives are discussed below at "DRIVER.SYS Drive Letter Assignments."

The second example assumes the same system configuration as the first, except that another 2107 floppy diskette drive has already been added. To assign a logical drive letter to the second 2107, you would put the following DEVICE statement in your CONFIG.SYS file:

```
DEVICE=DRIVER.SYS /D:4 /F:0
```

The drive letters assigned both to added physical drives and to logical drives are discussed below at "DRIVER.SYS Drive Letter Assignments."

- /F:0 specifies that the drive to which you are adding the logical drive letter is a 320K/360K floppy diskette drive.

DRIVER.SYS Drive Letter Assignments

As explained earlier under "Drive Letter Assignments," MS-DOS assigns primary drive letters alphabetically, starting with the internal floppy diskette drive, and proceeding in GPIB-address order. Then the two default logical drive letters are assigned.

Only after both these processes have taken place does MS-DOS assign drive letters to physical and logical drives specified by DRIVER.SYS. Therefore, the first physical or logical drive you add using DRIVER.SYS is assigned the drive letter that immediately follows the second logical drive letter that the system assigns by default.

Although this may sound confusing, it can be clarified by referring to an example. Look for a moment at configuration number 6 in Table 1-5. Note that the last drive letter assigned in that configuration is F, which is the logical drive letter assigned to the left drive of the 2127. Suppose that you use DRIVER.SYS to add a second 2107 floppy diskette drive to configuration 6. That drive will receive the letter G as its primary drive letter.

Note: The drive letters assigned to devices specified in the CONFIG.SYS file depend entirely on the order of DEVICE statements in that file. If a DEVICE statement that adds a logical drive precedes a DEVICE statement that adds a physical drive, the logical drive letter will precede the physical drive letter in alphabetical order. Likewise, if your CONFIG.SYS file contains DEVICE statements for both DRIVER.SYS and RAMDRIVE.SYS, the drive letters assigned to the added physical or logical diskette drive and to the RAM drive depend on the order of the DEVICE statements.

Note on Formatting 5 ¼-Inch Diskettes When you use the FORMAT command to format a 5 ¼-inch diskette on the 2107 external diskette drive, the following text is displayed on the screen:

```
Head: 0 Cylinder: 0
```

This text remains on the screen, unchanged, for approximately 30 seconds, during which time the drive's in-use light is lit, and you can hear a clicking sound from the drive. **Nothing is wrong.** A process called "hard formatting" is taking place. The head and cylinder displays do not change during hard formatting. The system is not hung, and you should not reboot the computer.

When hard formatting is complete, soft formatting begins. During soft formatting, the head and cylinder displays **do** change. The head display cycles back and forth between 0 and 1 as the two drive heads are employed alternately in the formatting process. The cylinder display increments from 0 to 39 as more and more of the diskette is formatted.

Running BASIC Programs on the TEMPEST GRiDCase In general, BASIC application programs written to run on an IBM personal computer with IBM's BASIC or BASICA interpreter program run correctly on the TEMPEST GRiDCase with the GW-BASIC 3.2 interpreter program available from GRiD Systems. There are a few points you must bear in mind, however:

- IBM's BASIC or BASICA interpreter program is built into IBM personal computers as part of their hardware. Thus, the BASIC interpreter program is available to you whenever you run the machine. GRiD's GW-BASIC 3.2 interpreter program, on the other hand, is supplied separately on diskette. Therefore, when you want to run a BASIC application program on the TEMPEST GRiDCase, you must make sure that the file GWBASIC.EXE (the interpreter program) is in the current directory of the current drive. You can then run your BASIC application program just as you ordinarily would, subject to the additional points listed below.
- To invoke IBM's BASIC or BASICA interpreter program, you enter `BASIC` or `BASICA` in response to the system prompt, depending on which interpreter is built into your computer. To invoke GRiD's GW-BASIC, enter `GWBASIC` instead (see the next point below for a possible exception).

- Some application packages use a batch file to invoke the BASIC or BASICA interpreter program. Such applications fail to run if no BASIC.EXE or BASICA.EXE file is present in the current directory of the current drive. You can overcome this difficulty in either of two ways:
  - —Edit the batch file, changing all references to BASIC or BASICA to GWBASIC.
  - —Rename the GRiD GWBASIC.EXE file to either BASIC.EXE or BASICA.EXE to match the references in the batch file. If you use this method, the command you subsequently use to invoke the interpreter becomes either BASIC or BASICA, depending on the name you give the file.
- The TEMPEST GRiDCase does not support light-pens, joy sticks, or cassettes. You cannot run BASIC programs that require any of these devices on the TEMPEST GRiDCase.
- The TEMPEST GRiDCase does not display color. Therefore, BASIC programs that use the COLOR statement produce displays on the TEMPEST GRiDCase that differ from those produced on an IBM personal computer equipped with a color monitor. Refer to "Color Mapping" below for a discussion of how the TEMPEST GRiDCase displays color output.

Color Mapping

The electroluminescent amber display of the TEMPEST GRiDCase does not display colors. Nor does it display the varying degrees of intensity (gray scale) often used to indicate color on a monochrome monitor. Application programs that depend on color may therefore yield unsatisfactory results when run on the TEMPEST GRiDCase. Results can sometimes be improved by changing the display attributes specified by the application program.

This section explains how various display attributes intended for a color monitor are displayed on the TEMPEST GRiDCase. You can use this information to control the display attributes of an application program.

Color Text Display

In text mode, an IBM PC is capable of displaying eight foreground colors and eight background colors for each character on a Red-Green-Blue (RGB) monitor. Each of the eight colors, including black, is in fact some combination of red, green, and blue—or none of those, in the case of black.

The foreground and background colors of each character, as well as the character's intensity and whether or not the character blinks, are controlled by a single eight-bit byte called the character's *attribute* byte.

Each bit of the character attribute byte controls a single attribute of the character displayed. The attributes controlled by the character attribute byte are shown in Table 1-6.

Table 1-6. *IBM PC Display Attributes in Color Text Mode*

Bit	Value	Attribute
7	0	character blinking OFF
	1	character blinking ON
6	0	background red OFF
	1	background red ON
5	0	background green OFF
	1	background green ON
4	0	background blue OFF
	1	background blue ON
3	0	normal intensity
	1	high intensity
2	0	foreground red OFF
	1	foreground red ON
1	0	foreground green OFF
	1	foreground green ON
0	0	foreground blue OFF
	1	foreground blue ON

On an RGB color monitor, every combination of attribute bits produces a visible character, unless the three foreground color attributes and the three background color attributes are identical.

TEMPEST GRiDCase Foreground and Background Color Attributes On the TEMPEST GRiDCase, all but two of the possible combinations of foreground and background color attribute bits produce a normal amber character on a black background. The two exceptions are described below:

- If foreground blue is ON, and the other two foreground colors are OFF, the TEMPEST GRiDCased displays an underlined character.

- If all three background colors are ON, the TEMPEST GRiDCase displays the character in reverse video, that is, a black character on an amber background.

Note that on the TEMPEST GRiDCase, **no combination of foreground and background colors produces an invisible character.**

TEMPEST GRiDCase Blinking Attribute On the TEMPEST GRiDCase, the blinking attribute has the same effect as it does on an RGB display: If this attribute bit is ON, the character blinks.

TEMPEST GRiDCase Intensity Attribute On the TEMPEST GRiDCase, the intensity attribute determines which of two fonts is used to display the character. If the intensity attribute bit is OFF, the normal default condition, the character displayed is a bold, double-line character. If the intensity attribute bit is ON, the character displayed is a fine, single-line character.

Color Graphics Display

In color graphics mode, an IBM PC's display is bit mapped. The color value of each pixel of the display is determined by two bits in the computer's memory. Because there are four possible combinations of two bits, a maximum of four colors can be displayed on the screen at once. Those four colors can be drawn from either of two color palettes. The possible combinations are shown in Table 1-7.

Table 1-7. *IBM PC Display Attributes in Color Graphics Mode*

Bits Values	Palette 1 Results	Palette 2 Results
0 0	background color	background color
0 1	green	cyan
1 0	red	magenta
1 1	blue	white

On the TEMPEST GRiDCase's display, a pixel is either ON or OFF; there are no intermediate values. If a pixel's bit value is 00, the pixel is OFF. If a pixel's bit value is anything **other than** 00, the pixel is ON.

Pixels with bit values of 01, 10, and 11 are indistinguishable from one another. Therefore, a graphics display that depends on colors to distinguish different fields will be unsuccessful on the TEMPEST GRiDCase: A pie chart with slices of three different colors is displayed as a solid amber disk.

Summary of Important Points Here's a summary of the important points to remember from this chapter:

- Use only GRiD MS-DOS supplied specifically for your TEMPEST GRiDCase.
- The COMP command is not available under GRiD MS-DOS.
- GRiD MS-DOS includes the DEVICES command, which allows you to list quickly and easily all current device assignments on your system.
- GRiD MS-DOS includes the HELP command to provide you with on-line information about other MS-DOS commands and options.
- The GRiD MS-DOS MODE command controls output to the TEMPEST GRiDCase's four communications ports. Correct use of this command conserves power and is necessary for GPIB or serial printer output.
- GRiD MS-DOS includes the PCMASTER and PCSLAVE commands, which allow you to transfer non-copy-protected software from the drives of an IBM PC or compatible computer to the 3½-inch internal drive of the TEMPEST GRiDCase or to a TEMPEST storage device, model 2127, attached to the TEMPEST GRiDCase. PCMASTER and PCSLAVE are thoroughly explained in Chapter 2.
- Use the XCOPY command, not DISKCOPY, to copy the entire contents of a 5¼-inch diskette to a 3½-inch diskette.
- To use the TEMPEST GRiDCase's numeric keypad, you must either invoke the NUMPAD.COM file from the command level of MS-DOS or invoke the NUMPAD.SYS file from within a CONFIG.SYS file.
- GRiD MS-DOS recognizes up to four floppy diskette drives. The internal drive is always drive A. External drives are assigned drive letters alphabetically, according to their GPIB address switch settings. The lowest-addressed GPIB drive is drive B. If the lowest-addressed GPIB drive is a 2127 storage device, its two drives are drive B and drive C. Drives A and B are each assigned a second, logical drive letter. These two logical drive letters are the next two letters of the alphabet after all primary drive letters are assigned.
- You can add additional physical and logical drives to your system using the DRIVER.SYS device driver.

- BASIC programs written for an IBM PC run on the TEMPEST GRiDCase **if** the file GWBASIC.EXE is present on an active drive. GWBASIC is **not** built into the TEMPEST GRiDCase. If you use a batch file that references BASIC or BASICA, you must either change the references to GWBASIC or rename GWBASIC.EXE to BASIC.EXE or BASICA.EXE. BASIC programs that require light pens, joysticks, or cassettes do not run on the TEMPEST GRiDCase. BASIC programs that use color are not displayed in color on the TEMPEST GRiDCase.
- Color output is mapped to the TEMPEST GRiDCase's electroluminescent display differently than to many monochrome monitors. Some color combinations that are invisible on other monitors are visible on the TEMPEST GRiDCase's display. Some text displayed in color on other monitors appears underlined on the TEMPEST GRiDCase. Adjacent fields of color, which are distinguishable as varying shades of gray on other monochrome monitors, are indistinguishable from one another on the TEMPEST GRiDCase.

Chapter 2: Moving Application Programs to the TEMPEST GRiDCase

This chapter is for readers who run application programs on an IBM PC, PC/XT, PC/AT, or fully compatible computer using 5¼-inch diskettes and who want to run the same programs on the TEMPEST GRiDCase. It describes two methods of moving programs and data files to the TEMPEST GRiDCase:

- Executing programs you currently use on an IBM or compatible from the original diskettes placed in the 2107 external floppy diskette drive.
- Copying programs and files from the IBM or compatible's drives to the TEMPEST GRiDCase's internal 3½-inch diskette drive or attached 2127 storage device using the PC File Transfer Utilities, PCMASTER and PCSLAVE. This method can be used when an external 5¼-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 portability of your TEMPEST GRiDCase when your application program and data files reside on 3½-inch diskettes. This allows you to operate from the internal drive, and leave your external storage devices behind when you leave your work area.

You can copy an application program from a 5¼-inch to a 3½-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 program is copy protected, read the installation documentation that comes with it. If it is protected, contact a GRiD representative to find out if a version of the program is available on 3½-inch diskettes.

Note: You cannot run copy-protected programs on the 2107 external floppy diskette drive. That drive's controller is not compatible with the IBM controller that copy-protection schemes expect.

Using the 2107 External Floppy Diskette Drive

If an application program diskette is not copy protected, you can generally run the application program from a 2107 external floppy diskette drive connected to the TEMPEST GRiDCase.

Put the application diskette in the 2107 drive and run the application program as you ordinarily would, bearing the following considerations in mind:

- Many application diskettes also contain the PC-DOS operating system or a non-GRiD version of the MS-DOS operating system. **Do not boot the TEMPEST GRiDCase from such a diskette.** Instead, boot the machine from your GRiD MS-DOS diskette in the internal floppy diskette drive or from your MS-DOS ROMs.
- Many application programs expect certain drive configurations and do not work correctly with a different configuration. Some programs, for example, expect to find application-program files on drive A and data files on drive B. Since the TEMPEST GRiDCase's internal drive is drive A, you must use the MS-DOS ASSIGN command to satisfy the expectations of such programs when you run them from a 2107 external floppy diskette drive.

  ASSIGN is an external command. For practical purposes, this means that you should have your MS-DOS diskette in internal drive A and that drive A should be the current drive when you enter an ASSIGN command.

  The following ASSIGN command tells the operating system to redirect all attempts to access drive A to drive B:

  ```
  ASSIGN A=B
  ```

  Assuming that you are running the application program from a 2107 drive connected as physical drive B, the foregoing command lets the application run normally if it expects to find application-program files on drive A. Each time the application looks for a file on drive A, the request is redirected to drive B, and the file is found.

You may need to issue more than one ASSIGN command, depending on the expectations of a particular application program.

You should cancel any assignment when you no longer need it. You can do this either by rebooting the system or by issuing an ASSIGN command without parameters:

```
ASSIGN
```

NOTE: Remember, ASSIGN is an external command. To use it, you must have access to the file ASSIGN.EXE, which is on your MS-DOS diskette, probably in the internal floppy diskette drive. But if you have already used ASSIGN to redirect attempts to access drive A (the internal drive) to drive B (an attached 2107 drive), you can't get to ASSIGN.EXE when drive A is the current drive—if you try, the system will look for ASSIGN.EXE on physical drive B. To get around this difficulty without rebooting the system, access the internal floppy diskette drive by using its **logical drive letter.** The logical drive letter assigned to the internal drive varies, depending on your system's configuration (see "Drive Letter Assignments" in Chapter 1). Assuming you have only a single 2107 attached to the computer, the internal drive is logical drive C. Enter "C:" to make drive C the current drive, and then enter "ASSIGN" without parameters.

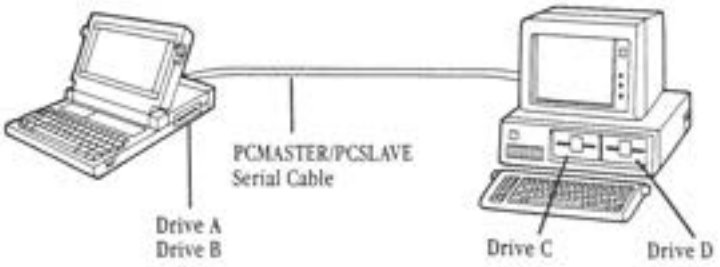
Using the PCMASTER and PCSLAVE Utilities

This procedure uses the PC File Transfer utilities—described in detail in Chapter 11 of the *TEMPEST GRiDCase MS-DOS Reference* manual—to move files from an IBM PC or compatible's diskette drives or hard disk drive to a TEMPEST GRiDCase's 3½-inch internal diskette drive or attached 2127 storage device. PCMASTER and PCSLAVE allow one computer, the master station, to take control of the drives of another computer, the slave station. These utilities are particularly useful for transferring files when an external 2107 drive is unavailable. You can also use the PC File Transfer utilities to transfer files from your TEMPEST GRiDCase to an IBM PC, PC/XT, PC/AT, or compatible computer.

The PC File Transfer utilities consist of two programs, PCMASTER and PCSLAVE. The programs run concurrently, one on a TEMPEST GRiDCase, and one on the other computer. The two computers must be connected by a cable attached to a serial port of each computer.

Figure 2-1 shows a typical PCMASTER/PCSLAVE configuration. In the configuration shown, the TEMPEST GRiDCase is acting as the master station, and the IBM PC is the slave station. Other configurations are possible.

Figure 2-1. *Moving Files Using the PC File Transfer Utilities*



For the configuration shown in Figure 2-1, GRiD MS-DOS assigns the primary drive letter A to the TEMPEST GRiDCase internal diskette drive, and C and D respectively to the drives on the IBM PC.

If the PC had only one diskette drive and a fixed disk, GRiD MS-DOS would have assigned Drive C to the diskette drive and Drive D to the fixed disk.

To use the transfer procedure, you need the following:

- The GRiD MS-DOS 3½-inch system diskette, which contains the PCMASTER.SYS and PCSLAVE.EXE files.
- The GRiD-supplied 5¼-inch diskette that contains the PCMASTER.SYS and PCSLAVE.EXE files.
- A PC-DOS or MS-DOS boot diskette for your IBM PC, PC/XT, PC/AT, or compatible.
- One or more formatted 3½-inch diskettes, for copying files to the TEMPEST GRiDCase internal drive.
- The GRiD Model 6130 shielded 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 work with the PC File Transfer utilities. See Chapter 11 of the *TEMPEST GRiDCase 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 or PC-DOS must be the master station. For example, if you are using an IBM PC running PC-DOS 2.1 and a TEMPEST GRiDCase running MS-DOS 3.2, the TEMPEST GRiDCase must be the master station. Failure to observe this caution may result in the loss of valuable data.

The steps required to run the PC File Transfer utilities and to copy files from the drives of an IBM PC or compatible computer to the TEMPEST GRiDCase's internal drive are described below. The exact procedure you use will depend on which computer is the master station and which is the slave station. Remember, **the computer running the more recent version of DOS must be the master station.**

Running the File Transfer Utilities

1. Turn off the power to both computers.
2. Connect the serial ports of the two computers with the 6130 or null-modem cable. The cable connects to the 25-pin serial port on the TEMPEST GRiDCase. That port is COM1. If the IBM PC has two serial ports, make sure that their switches are set correctly and that you know the number of the port you connect the cable to (COM1 or COM2).
3. Turn on the slave station and load its operating system.

   NOTE: It is important that you start the slave station first.
4. Activate the slave station as follows:

   Put a diskette that contains PCSLAVE.EXE in the current drive.

   If you are using the slave station's COM1 port, enter `PCSLAVE`.

   If you are using the slave station's COM2 port, enter `PCSLAVE 2`.

   The slave station's screen will then display the following message:

```
Slave station ready
Enter commands at master station
Enter Ctrl-C upon completion
```

5. Turn on the master station and load its operation system.
6. Activate the master station as follows:

   Put a bootable diskette that contains PCMASTER.SYS in the default drive.

   Create a CONFIG.SYS file by entering the following sequences:

```
COPY CON CONFIG.SYS
DEVICE=PCMASTER.SYS
F6
```

NOTE: If the IBM PC is the master station, and you are using its COM2 port, change the second line above to read `DEVICE=PCMASTER.SYS 2`.

Press Return after entering each line. "F6" refers to function-key 6—do not enter the characters F and 6.

Restart the operating system (press Ctrl-Alt-Del) to activate the CONFIG.SYS file you have just created.

At this point, the drives of the slave station are recognized by the master station simply as additional drives attached to that station. The drive letters assigned to master and slave station drives depend on which computer is the master station, which computer is the slave station, and how many drives each has. Before you begin copying files, it's a good idea to use the DIR command to check the contents of each drive. This allows you to ascertain the drive letter associated with each drive.

Once you are sure of drive letter assignments, you can begin copying files from the IBM PC's drives to the TEMPEST GRiDCase's drive(s). Simply use the COPY command as if you were accessing additional drives connected to the master system.

Suppose, for example, that your system is configured like the one shown in Figure 2-1. To copy all the files from a 5¼-inch diskette in the PC's right drive to a 3½-inch diskette in the TEMPEST GRiDCase's internal drive, you would enter the following command at the TEMPEST GRiDCase:

```
COPY D:*.*A:
```

The primary purpose of the PC File Transfer utilities is to allow you to copy files between an IBM PC or PC-compatible computer and the TEMPEST GRiDCase when no common diskette medium is available. You can also access the slave station's drives from the master station for other MS-DOS operations, however. In fact, you can access the slave station's drives with any MS-DOS command **except** the following:

FORMAT
DISKCOPY
DISKCOMP
DFISK

When you are through using the PC File Transfer utilities, go to the slave station and press Ctrl-C. The DOS system prompt then returns to the slave station's screen. Both computers can now be used independently.

At the master station, you should delete the CONFIG.SYS file containing the statement `DEVICE=PCMASTER.SYS`. Or, if you added that statement to an existing CONFIG.SYS file, edit the file to remove the statement.

Do not disconnect the 6130 or null-modem cable until both computers are turned off. Leaving the cable connected does not impede the performance of either computer.

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 cable connecting the serial ports of the two computers is firmly attached. Then try again—enter R, for "retry."

Message: **Not ready error reading drive *x***

What to Do: *x* is the letter identifying the drive. Check the following:

- Make sure the diskette is properly inserted and the diskette drive latch is closed.
- Make sure the diskette is in the drive that corresponds to the drive letter you specified in the command.

File Transfer Troubleshooting

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

- Make sure you have the most current versions of PCMASTER.SYS and PCSLAVE.EXE.
- Make sure the system running the higher-numbered version of MS-DOS or PC-DOS is the master station.
- Make sure you are using a GRiD Model 6130 shielded serial cable or an equivalent, such as an INMAC-null modem serial cable. Refer to Chapter 11 of the *TEMPEST GRiDCase MS-DOS Reference* manual for cable details.
- If the IBM PC system has more than one serial port, make sure the card switches are set correctly and the cable is plugged into the correct serial port.
- Make sure the serial port specified in the PCSLAVE command is the port that the cable is plugged into.
- At the PCMASTER station, make sure the CONFIG.SYS file on the boot device contains the statement DEVICE = PCMASTER.SYS [1 | 2].
- At the PCMASTER station, make sure the serial port configuration hasn't been changed from the system default. You can reset the serial port by rebooting the computer or by entering the following MODE command:

  ```
  MODE COMn:96,N,8,2
  ```

  where *n* is either 1 or 2.

Chapter 3: Notes on Program Installation

This chapter describes some modifications you may have to make to the installation procedures given in the documentation of some of your application programs. Many of these modifications are related to differences between 5 ¼- and 3 ½-inch diskettes. As more and more application programs become available on 3 ½-inch diskettes, the documentation for those programs will probably provide all the information you need.

Programs on Copy-Protected 5 ¼-Inch Diskettes Copy-protected diskettes will not run on the 2107 external floppy diskette drive. If you have application programs on copy-protected 5 ¼-inch diskettes, contact the publisher of the program or your GRiD representative to find out if the programs are available on 3 ½-inch diskettes.

Programs that Must Run from Drive A Many application programs assume that the diskette that contains the application program will always be in drive A. The installation routines provided with some programs allow you to change this default assumption and run the program from another drive. Other programs do not have this flexibility.

If you have an application program on a non-copy-protected 5 ¼-inch diskette, and that program must be run from drive A, you have two choices:

- Copy the application program to a 3 ½-inch diskette as explained in Chapter 2.
- Use the MS-DOS ASSIGN statement to make an external 5 ¼-inch floppy diskette drive act as drive A.

For a discussion of using the ASSIGN statement to make drive B function as drive A, see "Using the 2107 Floppy Diskette Drive" in Chapter 2.

Programs that Require a Data Diskette in Drive B Some application programs designed for use on 5 ¼-inch diskettes require a program diskette in drive A and a data diskette in drive B. Because a single 3 ½-inch diskette holds twice as much data as a 5 ¼-inch diskette, one 3 ½-inch diskette in the internal floppy diskette drive can hold both the program and the data files. If, however, the program expects to find data files on drive B, you must issue an ASSIGN statement to make the internal floppy diskette drive act as **both** drive A and drive B. In a system with only one drive, the internal drive is both physical drive A and logical drive B. You must still use the ASSIGN statement, however, because the system expects a physical change of diskettes when you change from physical drive A to logical drive B.

For a discussion of using the ASSIGN statement to make drive A function as drive B, see "Using the 2107 Floppy Diskette Drive" in Chapter 2.

Installation Procedure Generates an Error Message When you follow the installation procedures for some application programs, the system may display the following message:

```
No room for system on destination disk
```

This occurs if the installation procedure tried to use the SYS command to put MS-DOS system files on the application program diskette. The application program reserves only enough space for PC-DOS, which is smaller than GRiD MS-DOS; therefore, insufficient space was available for the system files.

This is not a serious problem; it just means that you cannot boot the system from the 5 ¼-inch application program diskette. You can get around it in either of two ways:

- Use your GRiD-supplied MS-DOS system diskette to boot the operating system; then invoke the application program from the command line.
- Copy the application program files to a bootable 3 ½-inch diskette.

Installation Instructions Tell You to Use DISKCOPY Do not use the DISKCOPY command—see Chapter 1 for an explanation. Instead, format a blank diskette, and then use COPY *.* to copy all the application files to that diskette.

Application Programs Written in Interpreted BASIC Some application programs are written in an interpreted form of the BASIC programming language called BASICA. Such applications, if they were originally written to run on an IBM PC, may include a batch file that references the BASIC interpreter program. Depending on the version, that program may be named either BASIC.EXE or BASICA.EXE.

The BASIC interpreter program that can be purchased with the TEMPEST GRiDCase is called GW-BASIC. It is stored in a file named GWBASIC.EXE. To make an application that expects to find BASIC.EXE or BASICA.EXE run under GW-BASIC, rename GWBASIC.EXE to BASIC.EXE or BASICA.EXE, depending on the file name referenced in the batch file. Refer to "Running BASIC Programs on the TEMPEST GRiDCase" in Chapter 1 for more about interpreted BASIC programs.

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