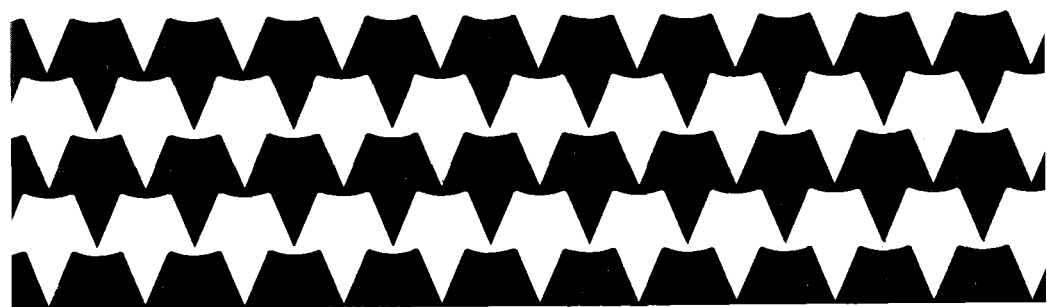


Tandy 1000

MS-DOS/GW-BASIC

Enhancements



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MS-DOS
Enhancements

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Introduction

The latest version of MS-DOS 3.2 contains several enhancements for MS-DOS and GW-BASIC. As well, it includes support for the Tandy 1400LT laptop computer. This manual introduces these enhancements and provides information to help you make the most efficient use of your operating system. **If you are using an MS-DOS version other than 3.20.21, you need to only read the section "Additional Notes."**

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MS-DOS Enhancements

This version of MS-DOS contains both enhancements to MS-DOS and a number of special utility programs to help you make the most efficient use of your system.

If you are using the 3½-inch diskette, your MS-DOS utility programs are already in the ROOT directory of your system diskette. If you are using the 5¼-inch diskettes, copy the programs from the Supplemental Programs diskette to your system diskette.

Use these programs in the same way you use MS-DOS commands. That is, execute them at the system prompt by typing the program name, followed by any parameters or options (or both) and then pressing [ENTER].

For information about using commands, see "How to Use the Command Reference," "Command Structure and Syntax," "Organization of MS-DOS Commands," and "The Use of Special Type" in Chapter 5 of the *Tandy 1000 MS-DOS Reference Manual*.

AUTOFORMAT Initializes a Hard Disk

AUTOFORMAT [/B]

Initializes a hard disk for use and, if the hard disk is the primary hard disk, installs the MS-DOS system files required to make the disk bootable. AUTOFORMAT makes hard disk initialization and formatting easy. In fact, for disks that have already received a low-level, or *hard*, format at the factory, the process can be completely automatic.

Before you can use AUTOFORMAT, you must create a special AUTOFORMAT diskette. (See the following "Notes and Suggestions" section.)

When you run AUTOFORMAT, it:

- Performs a hard format of the hard disk if the disk has not already received hard formatting from Tandy.
- Partitions the hard disk into one or more MS-DOS partitions and initializes all partitions for use by MS-DOS.
- Copies the system files to the disk to make it bootable, if you tell AUTOFORMAT to format a *primary* drive (Drive C).
- Creates a Config.sys file in the ROOT directory of the disk (or in the first partition) if such a file is needed to set the system for specific drives and multiple partitions.

- Writes a hard disk report in the ROOT directory of the disk (or in the first partition), containing information about the type of hard drive and its bad sectors (if any). To display this report file, Autofmt.rep, use the TYPE command.

Parameters

/B tells AUTOFMT to prompt you for bad sector information before formatting.

Notes and Suggestions

- See your hard disk documentation to determine whether your Tandy hard disk received hard formatting at the factory.

If the disk is hard formatted, it contains a table that AUTOFMT uses in determining disk type and bad sector locations. You do not need to use the /B switch. If you do include the /B switch, AUTOFMT appends to the existing table any additional bad sector information you enter .

If your hard disk documentation does not indicate that the disk is hard formatted by Tandy, use the /B switch with AUTOFMT. Use the information that came with your hard disk to type bad sector information as requested by AUTOFMT.

- If a hard disk has a capacity of more than 32 megabytes, it must be divided into more than one *partition*. MS-DOS treats each partition as a separate disk drive. AUTOFORMAT automatically creates as many partitions as your drive requires.
- If your disk requires more than one partition, AUTOFORMAT installs in the Config.sys file the configuration information MS-DOS requires to manage the additional partition(s).
- The AUTOFORMAT process can require up to 1 hour to complete. The time required depends on the capacity of your disk and whether your disk received hard formatting from Tandy.
- **Before you can use AUTOFORMAT, you must create an AUTOFORMAT diskette. To do so, follow these steps:**
 1. Format a bootable system diskette by using FORMAT with the /S switch. For example, to format the diskette in Drive B, type:

format b: /s [ENTER]
 2. Copy the file Sys.com from the MS-DOS/GW-BASIC diskette to the newly formatted diskette.
 3. Copy Autofmt.exe and Mlpart.sys from your system diskette(s) to the newly-formatted diskette.

4. Label your new diskette AUTOFORMAT.

For information on formatting and copying diskettes, see the FORMAT and COPY commands in Chapter 6 of the *Tandy 1000 MS-DOS Reference Manual*.

5. After using the AUTOFORMAT diskette, store it in a safe place to use whenever you want to format a hard disk.

Examples

To use AUTOFORMAT with a disk that has received hard formatting from Tandy, boot the system with the AUTOFORMAT diskette in Drive A. Type:

```
autofmt [ENTER]
```

A screen prompt asks you to:

Enter hard drive number to format (1 or 2) :

Press [1] if you are formatting your *primary* drive (Drive C). Press [2] if you are formatting your *secondary* drive (Drive D).

The rest of the process is automatic.

To use AUTOFORMAT with a disk that has not received hard formatting, place the AUTOFORMAT diskette in Drive A and type:

```
autofmt /b [ENTER]
```

A screen prompt asks you to:

Enter hard drive number to format (1 or 2) :

Press [1] if you are formatting your *primary* drive (Drive C). Press [2] if you are formatting your *secondary* drive (Drive D).

Next, AUTOFORMAT asks you to enter any bad sector information. Type the data in the format indicated on the screen.

After you enter the data, the rest of the process is automatic.

As AUTOFORMAT performs its operations, screen displays appear to indicate its progress.

When AUTOFORMAT is complete, a prompt asks you to:

Remove diskette from drive A:, and
hit <Ctrl><Alt>

Pressing [CTRL][ALT][DEL] causes your system to reboot using Drive C. Copy to Drive C any system files, commands, utilities, and any other programs you want on your hard disk.

CACHE Creates a disk read/write buffer

CACHE [*buffer size*][*/A*]

CACHE [*drive*][*/8*][*/9*][*/C*][*/G*][*/O*][*/R*][*/S*][*/T*][*/W*]

Speeds up disk read or read/write operations by establishing a RAM buffer for storing data coming from or going to a disk. This CACHE buffer reduces the number of times the system has to turn on a drive and locate sectors. Depending on the type of program you are running, and the size you establish for the CACHE buffer, using this utility can greatly reduce disk access time.

After initialization, you can use CACHE again to examine the CACHE operations and to set further options.

Parameters

buffer size is the size of the CACHE buffer in kilobytes. If you do not specify *buffer size*, CACHE sets the buffer at 30 K.

/A causes the cache buffer to reside in *expanded* RAM. This option is valid for computers that have an expanded memory board compatible with the Lotus®/Intel®/Microsoft expanded memory specifications and that have previously loaded an expanded memory management driver.

Other Options

After you install CACHE, the following configuration parameters are available. (Type CACHE, followed by one or more parameters.)

drive is the drive letter of the drive for which all the following parameters are effective. If you do not specify *drive*, CACHE assumes the current drive.

/8 sets CACHE for a diskette formatted at 8 sectors-per-track.

/9 sets CACHE for a diskette formatted at 9 sectors-per-track.

/C clears the accumulated CACHE statistics. (See the /S switch.)

/G displays the current CACHE status in the following format:

Tandy CACHE version 01.00.00 memory cache

Current cache status

Buffer Size 30 Kb

Normal Ram Version

0 seconds floppy valid time

(Not) Saving disk writes in cache

Current Cache Distribution

A: 0% 9 Sectors/Track

B: 0% 9 Sectors/Track

Unused 100%

/O toggles **CACHE** on and off. If you do not specify a drive, **CACHE** toggles on or off for all drives. Otherwise, **CACHE** toggles on or off for each drive you specify. When you first run **CACHE**, the program turns caching on for all hard disk drives and off for all diskette drives.

/R resets **CACHE** and clears all data in the **CACHE** buffer. Use **/R** before switching diskettes to ensure that all cached data is cleared from the cache buffer..

/S displays **CACHE** statistics in the following format:

Tandy **CACHE** version 01.00.00 memory cache

Cache Statistics All Drives

Hit Ratio	= 56%
# Hits	= 8422
# Reads	= 14821
# Sectors Read	= 9881
# Interrupts	= 4786
# Ints Made	= 3100
Disk Read Time:	0:28:33:40
Disk Write Time:	0:10:10:49

The **Hit Ratio** indicates the percent of successful *hits* (the percentage of times the system finds the requested data in the **CACHE** buffer).

Hits is the total number of **CACHE** hits.

Reads is the number of times **CACHE** looked in the buffer for requested data.

#Sectors Read is the total number of sectors that CACHE has loaded into the buffer since beginning operation.

Interrupts is the total number of times the system has called the CACHE routine to read one or more disk sectors.

Ints Made is the number of times CACHE has not intercepted calls to read disk sectors.

Disk Read Time and **Disk Write Time** show the amount of time the system has spent reading from and writing to the disk.

/T:seconds sets the time in seconds that data stored in the CACHE buffer from diskette drives remains valid. After setting *seconds* for a drive, do not remove the diskette until you are sure the specified time has elapsed since the system last accessed the diskette. Setting *seconds* to 0 tells CACHE not to check the time and to assume that the diskette is not to be removed. Use the **/R** parameter before removing a diskette after setting the time to 0. If you do not specify *seconds*, CACHE uses 4 seconds.

/W toggles CACHE writing on and off. When you initialize CAHCE, writing (saving disk writes in the CACHE buffer) is disabled (off). Specifying **/W** once causes CACHE to save disk writes to the buffer. Specifying **/W** again disables CACHE writing.

Notes and Suggestions

- CACHE is not effective with a virtual disk (VDISK)
- If you have a disk drive divided into partitions, you only need to set CACHE for the one *physical* disk drive, not for the partitioned *logical* drives.
- Regardless of whether disk writes are saved to the buffer, they are always passed through CACHE and written immediately to the disk.

Examples

cache [ENTER]

turns on CACHE, reserving a default buffer size of 30K.

cache a: /t:1 /w [ENTER]

sets the valid time for Disk Drive A to 1 second and causes CACHE to stop sending disk writes to the buffer if disk write is set to its default (ON) mode. If disk write is off, using /w turns it on.

cache /o [ENTER]

turns off the CACHE function if the current CACHE status is on for all disk drives.

DC Compresses/decompresses data files

DC [/C/D/Q][*pathname*]

Compresses files so they use less disk space and require less transfer time. Also returns compressed files to their normal state.

Parameters

pathname is the file or group of files (specified by wild cards) to compress or decompress. Compressing or decompressing a file does not change its name.

/C causes DC to compress a file. However, if the file you specify is already compressed, DC does not change it.

/D causes DC to decompress a file. However, if the file you specify is not compressed, DC does not change it.

/Q displays a message indicating whether or not the specified file is compressed. No compressing or decompressing takes place.

Notes and Suggestions

- Use DC to compress a file to save disk storage space, to reduce the time it takes to transfer or copy the file, or for archival purposes.
- DC uses a modified LEMPEL-ZIV algorithm that replaces certain byte patterns with codes. As it reads a file, DC creates a table of byte patterns and the codes representing each pattern. For decompression, the program reads the table and converts the code to its original state, and then removes the table.
- The degree of compression you can achieve depends on the length of the file and on the type of data in the file. DC can compress text and data files by 40 to 60 percent. It compresses binary data files, such as .exe and .com files, less than 20 percent.
- If you do not specify a switch, DC compresses a standard file or decompresses compressed files.
- If the contents of the file you specify are such that DC cannot compress them, it does not change the file.

Examples

`dc /c myfile [ENTER]`

compresses Myfile, located in the current directory.

`dc /d a:\relate\myfile [ENTER]`

decompresses Myfile, located in the RELATE directory of Drive A.

`dc /c *.txt [ENTER]`

compresses all files having an extension of .txt that reside in the current directory.

**DISKOPT
DISKOPT****Optimizes disk file storage**

Optimizes file storage on the specified disk by rearranging file sectors into a contiguous (consecutive) format.

Caution: Do not use DISKOPT on any disk that contains copy protected programs. Also, always make a backup of a disk before using DISKOPT. If DISKOPT is interrupted while optimizing a disk, the disk's data might become useless.

Parameters None

Notes and Suggestions

- To use DISKOPT, type:

diskopt [ENTER]

A prompt asks you:

Which disk drive do you want to optimize?

Respond by pressing the letter of the drive that contains the disk to optimize.

- DISKOPT analyzes each file on the indicated diskette or hard disk to determine whether the file's sectors are consecutive. If they are not, it rearranges the sectors to make them consecutive.
- When files on a disk are fragmented, reading or writing to that file requires extra drive head movement and reduces the speed at which the drive can access data. DISKOPT reduces disk access time to a minimum.
- The disk must contain at least one sector of free space before you can use DISKOPT successfully.
- Do not interrupt DISKOPT while it is optimizing a disk. If you do, the data on the disk might no longer be accessible.

Example

diskopt [ENTER]

executes DISKOPT. A prompt asks you for the name of the drive that contains the disk to optimize.

FBACKUP Makes a fast disk backup

FBACKUP [FROM=*pathname*][TO=*pathname*]
[FILE=*filespec*][/S][/M][/E]

Copies one or more files from one disk to another in about one-half the time the MS-DOS BACKUP command does. FBACKUP can copy between disks of different media, including all combinations of hard disks and diskettes.

Parameters

FROM=*pathname* specifies the drive and directory from which files are to be copied. If you do not use this parameter, FBACKUP uses the current directory of the current disk.

TO=*pathname* specifies the drive and directory to receive the files. The default is A:\ (the ROOT directory of Drive A). **Be certain you have the proper diskette to receive the backup files in Drive A. FBACKUP erases all existing files in the indicated directory and its subdirectories.** This means, if you indicate the ROOT directory of Drive A as the *pathname*, FBACKUP destroys all existing files on the diskette.

FILE=*filespec* specifies the file or files to copy. Use wild cards to specify a group of files. If you omit FILE=*filespec*, FBACKUP assumes the wild card of *.* (all files).

/S causes FBACKUP to copy from the specified directory and all its subdirectories.

/M causes FBACKUP to copy only those files modified since the last backup.

/E causes FBACKUP to copy system and hidden files.

Notes and Suggestions

- Only FRESTORE can read the files created by FBACKUP. Use it instead of MS-DOS's RESTORE command to replace the backed up files to their original disk.
- FBACKUP is faster than BACKUP because it creates only one data file containing information about all the backed up files. BACKUP creates one file for each file it backs up.
- Before FBACKUP begins copying, it calculates and displays the number of diskettes that it needs for storing the backup files. You can then select to format one or more diskettes.

- When FBACKUP fills a target diskette, it pauses and displays the following prompt:

Insert diskette number : xxx

Warning! Data on the target diskette will be destroyed.

Press <enter> to continue

<ESC> to abort backup

<F> to format the diskette

Press the appropriate key to continue, to terminate the backup, or to format a diskette.

Examples

```
fbackup from=c: /s [ENTER]
```

copies all of the files from all directories on Drive C to Drive A.

```
fbackup from=d:\novel to=b:\novel file=*.txt  
/m [ENTER]
```

copies from the NOVEL directory in DRIVE D to a directory named NOVEL on Drive B all the files that have the extension .txt and that have been modified since the last backup .

FRESTORE Restores backed up files

FRESTORE [FROM=*pathname*][TO=*pathname*]
[FILE=*filespec*] [/D]
[/P][S]

Copies to the specified drive and directory one or more files previously saved using FBACKUP.

Parameters

FROM=*pathname* specifies the drive and directory that contain the file or files to restore. If you omit FROM=*pathname*, FRESTORE assumes the current drive and directory.

TO=*pathname* specifies the drive and directory in which the file or files are to be restored. If you omit TO=*pathname*, FRESTORE assumes the current drive and directory.

FILE=*filespec* defines the file or files to be copied. You can use wild cards to specify a group of files. If you omit FILE=*filespec*, FRESTORE assumes a wild card of *.* (all the files in the specified drive and directory).

/D enables restoring files in subdirectories. FRESTORE displays a prompt before copying a subdirectory's files to let you indicate whether you want to restore that subdirectory.

/P causes FRESTORE to display a prompt before restoring files that have been changed since the last backup and before restoring read-only files.

/S causes FRESTORE to restore files from the specified directory and in all its subdirectories if you use the wild card *.*.

Notes and Suggestions

- FRESTORE can copy between disks that do not have the same capacity or formatting.
- FRESTORE cannot copy files backed up with MS-DOS's BACKUP command or with the IBM® BACKUP command.

Examples

```
frestore /s [ENTER]
```

copies all the files in the ROOT directory and subdirectories of Drive A to the current drive and directory.

```
frestore from=b:\novel to=d:\novel files=*.txt  
/d [ENTER]
```

copies from the NOVEL directory of Drive B to the NOVEL directory of Drive D all files that have an extension of .txt. Before FRESTORE copies a file, it asks you to verify the copy.

RCRYPT Encrypts/decrypts files**RCRYPT** *pathname1* [*pathname2*]

Changes the format of a file to make the contents meaningless and unreadable to anyone who does not know the *encryption key* (zero to eight characters that RCRYPT uses to alter the file format).

Parameters

pathname1 is the pathname of the file to encrypt.

pathname2 is the pathname of the file to receive the encrypted file. If you omit *pathname2*, RCRYPT uses the standard output device, the computer's display.

Notes and Suggestions

- When you execute RCRYPT, a prompt asks you to:

Enter encryption key :

Type zero to eight characters that RCRYPT can use as the key in the encryption algorithm. The characters do not appear on the screen as you type them.

RCRYPT now prompts:

Re-enter encryption key for verification :

Retype the encryption key exactly as you did the first time. Retyping helps ensure that you type the encryption key correctly so you can later restore the file.

- RCRYPT is actually a filter. You can pipe data through it. For example:

```
dir | rcrypt > dirfile.dat [ENTER]
```

encrypts the data in a directory listing and stores it in a file named Dirfile.dat. The same prompts shown in the previous note appear when you use RCRYPT in this manner.

```
rcrypt con > text [ENTER]
```

encrypts keyboard input to a file named Text. To terminate input, press [F6][ENTER].

- You decrypt a file in the same manner in which you encrypt it. You must supply the same key that you used for encryption.
- You can encrypt both ASCII and non-ASCII files.

Example

`rcrypt open secret [ENTER]`

encrypts a file named Open (if Open is a standard file), and stores it in a file named Secret. If Open is an encrypted file, this command decrypts it and stores it in its original configuration in a file named Secret.

Hard Disk Support

There are two ways to prepare your hard disk for use with MS-DOS. The easier way is to use the AUTOFORMAT utility described earlier. AUTOFORMAT performs hard disk initialization with a minimum of keyboard input.

You can also perform hard disk initialization step by step, using the MS-DOS hard disk formatting commands. If you are using 5 $\frac{1}{4}$ -inch diskettes, most of the MS-DOS 3.2 hard disk setup programs are on the Supplemental Programs diskette. The FORMAT program is on the MS-DOS/GW-BASIC system diskette. If you are using 3 $\frac{1}{2}$ -inch diskettes, all the MS-DOS and supplemental programs are on one diskette.

If you want to initialize your hard disk step-by-step, rather than using AUTOFORMAT, follow these steps:

1. Use HSECT to *hard format* the disk.

Note: If your Tandy disk received initial formatting (hard formatting) at the factory, **performing this step erases a special table of information from your disk.** This information is useful (but not necessary) to AUTOFORMAT if you change your mind and decide to use that utility. All of the information you must have is also included with the documentation that came with your Tandy drive.

2. Use FDISK to partition the hard disk. This program lets you establish a DOS partition on the disk. If you want more than one partition on the disk, or if your disk capacity is large enough (greater than 32 megabytes) to require additional partitions, these can be created by MLPART as indicated in Step 5.
3. Use FORMAT to *soft format* the DOS partition, the DOS must treat each partition as a separate drive. To prepare MS-DOS to do this, complete the following steps:

4. Copy all the files from the MS-DOS system diskette to your hard disk. **If you only have one DOS partition, this is the final step.**

If you have space on your hard disk that is not used by either the DOS partition or another operating system, you can create additional, non-bootable, partitions that MS-DOS can use for storage. To do so, complete the following steps:

5. Use MLPART to create one or more DOS 2 partitions on your hard disk.
6. Copy Mlpart.sys from the Supplemental Programs diskette to your hard disk drive. (Be sure to include a `DEVICE=mlpart.sys` command in your hard disk's Config.sys file.)
7. Remove the diskette from Drive A and reboot your computer. Now, every time you boot, the system loads the Mlpart.sys device driver into memory.
8. Use MLFORMAT to format any DOS2 partition you created.

French Canadian Keyboard

An additional Canada-French keyboard program is now provided for Tandy 1000 computers via the **KEYTxx** command. For instance, typing:

```
keytcf [ENTER]
```

causes MS-DOS to replace the current ROM BIOS keyboard program with the Canada-French keyboard program.

Note: KEYTCF does not apply to the Tandy 1400LT computer.

As with the other **KEYTxx** commands, you can use the **/US** parameter to tell MS-DOS that the character scan codes are to be converted to US scan codes. For example:

```
keytcf /us [ENTER]
```

You can place either of these commands in an **Autoexec.bat** file to change the keyboard layout automatically when you start your system.

You can also create a system diskette that installs the Canada-French keyboard every time you boot your computer. To do so, use the SELECT command. For example:

select 2 cf [ENTER]

For more information, see the SELECT command in your MS-DOS reference manual.

Keyboard Key Sequences

To quickly switch between the Canada-French keyboard layouts or to return to the USA keyboard layout, use the following key sequences [LSHIFT] represent [SHIFT] located on the left side of the keyboard):

[CTRL][LSHIFT][F1] Selects USA layout

[CTRL][LSHIFT][F2] Selects the Canada-French layout

[CTRL][LSHIFT][F3] Selects the Canada-French layout with USA scan codes

[CTRL][LSHIFT][x] If you have a Canada-French keyboard, produces the character that appears on the face of the selected key

KEYTCF lets you produce an accented character. To do so, press and release the appropriate *dead key* (a key that does not produce a character unless you use it in combination with another key). Then press the appropriate letter key. You can use the accent character by itself by pressing the accent key and then pressing the space bar.

The dead keys and the characters they can produce are:

^ (circumflex)	â ê î ô û
¨ (dieresis)	ë ï ü Ü
¸ (cedilla)	ç Ç
` (grave)	à è ù

Additional Notes

The following notes provide additional information to help you use MS-DOS.

- SPOOLER and VDISK can access expanded memory if you have an expanded memory manager. Use the /A with these commands to tell SPOOLER and VDISK they can use memory above 640K. For example, type

spooler /a [ENTER]

or, in the Config.sys file type this line:

device = vdisk /a [ENTER]

- VDISK can also access memory above 1 megabyte. If you have an expanded memory manager installed, use the /A switch to tell VDISK it can use expanded memory.
- If you place both Spooler.sys and Lpdrv.sys in a Config.sys file, always place Spooler.sys before Lpdrv.sys.
- Basic.exe is compatible with a 360K virtual disk (VDISK).
- Do not load Lpdrv.sys when using Graphics.com.

- If you use BACKUP to copy your entire primary hard disk, or if you include the Ibmbio.com and Ibmdos.com hidden system files in a backup, use the /P parameter with RESTORE when you replace the files on your hard disk. Specifying /P causes RESTORE to ask if you want to replace any read-only or hidden files that already exist on the disk you are restoring. **Never** replace Ibmbio.com or Ibmdos.com. Type N [ENTER] when the screen displays:

Warning! File /IBMBIO.COM
is a hidden file

Replace the file (Y/N)?

Likewise, type N [ENTER] when the screen displays:

Warning! File /IBMDOS.COM
is a hidden file

Replace the file (Y/N)?

If you replace either Ibmbio.com or Ibmdos.com on your primary hard disk during RESTORE, you can no longer boot your hard disk.

- You MS-DOS system diskettes contain three files for use with the Tandy Serial Mouse (Cat. No. 25-1040). You must have the mouse connected to a serial port before you can use these files. See the *Tandy Serial Mouse* manual for details.

- Do not use BACKUP and RESTORE to copy the files on one hard disk to another. Use the XCOPY command for hard disk-to-hard disk copies. For example, to copy the files on Drive C to Drive D, type:

```
xcopy c:\*.* d:/s [ENTER]
```

The Tandy 1400LT

There are a few differences between the operation of the Tandy 1400 laptop computer and other computers in the Tandy 1000 family. The following pages describe these differences.

MS-DOS Commands

The following MS-DOS commands are not supported by the Tandy 1400:

COPYDOS	SHIPTRAK	MLFORMAT
HFORMAT	FDISK	HSECT
VDISK		

The following MS-DOS commands operate differently for the Tandy 1400 than for other computers in the Tandy 1000 family. Note the differences:

On the Tandy 1400:

- You must specify the /H switch with the FORMAT command to format a 5•-inch double-sided diskette in a 5•-inch drive. For example, if Drive B is a 5•-inch drive, to format a diskette in it, type:

format b: /h [ENTER]

- The new KEYBDF command selects a built-in United States keyboard program. This program is in addition to the keyboard programs listed in the *Tandy 1000 MS-DOS Reference Manual* for the KEYBxx command. To select the KEYBDF keyboard program, type:

keytdf [ENTER]

- You can use the MODE command to select a video MONO mode as well as the BW (black and white) and CO (color) modes described in the *Tandy 1000 MS-DOS Reference Manual*. (See the MODE [video] [characters] command in that manual.)

To specify a monochrome display adapter that has only a display width of 80 characters, type:

mode mono [ENTER]

- Use the following information for setting communication para-meters with the MODE command:

MODE COM1: [baud][parity][databits][stopbits][P]

Sets the RS232 communications parameters:

baud Specifies the transmission rate. *baud* can be 110, 150, 300, 600, 1200, 2400, 4800, or 9600. You need to type only the first two digits of the baud rate value you select.

parity Specifies the parity, either N (none), O (odd), or E (even). The default is E.

databits Specifies either 7 or 8 bits of data. The default databit value is 7.

stopbits Specifies the number of stopbits, either 1 or 2. If baud is 110, the default is 2. Otherwise, the default is 1.

P Specifies that MODE is using the COM port for a serial printer and will continuously retry if a time-out error occurs.

- Use the following information to set printer characters-per-line and lines-per-inch with the MODE command:

MODE LPT1:*chars* [/type] [P]

Sets characters-per-line and optionally the lines-per-inch for output to a printer.

chars Specifies either 80 or 132 characters-per-line. The default is 80.

/type Can be either /DM (a Tandy dot matrix printer) or /PC (a PC-compatible printer). The default is /DM.

P Tells MODE to continuously try to send output to the printer if a time-out error occurs. You can exit the time-out loop by pressing [CTRL] [BREAK].

- There is only one COM port. The MODE command syntax for redirecting output from the LPT1 port to the COM port is:

mode lpt1:=com1 [ENTER]

- You can use the Ramdisk.sys device driver to set aside a portion of your computer's memory to use as a simulated disk drive. To do so, you need a Config.sys file that your system can access during bootup. To install the RAM Disk function, add the following line to an existing Config.sys file:

device=ramdisk.sys

The system installs the simulated disk drive as Drive C. You can then access the RAM Disk in the same manner you do a disk drive.

Devices

The following device drivers are not supported by the Tandy 1400LT:

Keycnvrt.sys
Hdrive.sys
Spooler.sys

Mlpart.sys
Vdisk.sys

BASIC

The following BASIC statements are not supported by the Tandy 1400LT:

PCOPY	PEN
STRIG	ON PEN GOSUB
ON STRIG () GOSUB	NOISE

The following BASIC functions are not supported by the Tandy 1400LT:

PEN
STICK
STRIG

GW-BASIC Enhancements

The enhancements described in this chapter are valid only if you are using a version of GW-BASIC that is later than Version 3.20.01, and they affect only systems using an Enhanced Graphics Adapter. If you do not have the proper version of BASIC and an EGA, you do not need the information in this chapter.

Enhanced Graphics Adapter Support

Using a version of BASIC later than Version 3.20.01 and an EGA card, you can have four additional screen modes; you can use additional features of the COLOR, PAINT, PALETTE, PALETTE USING, PCOPY, and SCREEN. You can also have screen resolution as high as 640 by 350. In addition, if you have an Enhanced Graphics Monitor, you can access as many as 64 colors.

Enhanced Graphics Color Selection

With an EGA/EGM combination in the enhanced mode, the number of available colors increases to 64 (eight shades of eight different colors). The following chart shows how the colors are distributed.

Color Chart								
Black	0	8	16	24	32	40	48	56
Blue	1	9	17	25	33	41	49	57
Green	2	10	18	26	34	42	50	58
Cyan	3	11	19	27	35	43	51	59
Red	4	12	20	28	36	44	52	60
Magenta	5	13	21	29	37	45	53	61
Yellow	6	14	22	30	38	46	54	62
White	7	15	23	31	39	47	55	63

The numbers in the Color Chart represent actual *colors*. For example, *Color Numbers* 1, 9, 17, 25, 33, 41, 49, and 57 each produce a different shade of blue. However, the shades of some colors, especially black and white, appear quite different than the original color. This color shift is normal.

To use the enhanced color shades (8-55), you must first load the desired colors into the 16-Color Palette. The color defaults for Palette Slots 0-7 match Chart Entries 0-7. However, the color defaults for Palette Slots 8-15 match Chart Entries 56-63.

16-Color Palette		
Black	0	8
Blue	1	9
Green	2	10
Cyan	3	11
Red	4	12
Magenta	5	13
Yellow	6	14
White	7	15

If your computer is not equipped with an EGA, the 16-Color Palette always uses the default colors, and you cannot change the palette colors. However, with the EGA, you can load any of the 64 colors into each of the 16 available *palette colors*. Use the PALETTE and PALETTE USING statements to redefine the palette colors in the 16-Color Palette. It is a *palette color number* rather than an actual *color number* that you specify in the following BASIC statements:

CIRCLE
COLOR
DRAW

LINE
PAINT
PRESET

PSET
SCREEN
VIEW

Video Memory

An EGA video card provides its own video memory, 256K BASIC uses this additional memory when you select SCREEN MODES 7, 8, 9, or 10. Without an EGA video card, BASIC sets aside 16K of your computer's main memory for video display use.

BASIC splits available video memory into *pages*. The number of pages you can have depends on the resolution of the screen mode you select and the number of colors the screen mode supports. If you select a mode that allows more than one video page, you can store information on one page while displaying another page. You can also copy the contents of one video page to another video page.

Summary

The following chart that summarizes the available video modes and their attributes:

Graphics		Resolution	Color Set	Text Width	Max. Pages	Video Pg. Size
Mode 0	No	N.A.	16 of 64 Colors	40/80	8 @ 40 4 @ 80	2K @ 40 4K @ 80
Mode 1	Yes	320 x 200	4 Colors 2 Palettes	40	1	16 K
Mode 2	Yes	640 x 200	Black & White	80	1	16 K
Mode 3	Yes	160 x 200	16 Colors	80	1	16 K
Mode 4	Yes	320 x 200	4 Colors	40	1	16 K
Mode 5	Yes	320 x 200	16 Colors	40	1	32 K
Mode 6	Yes	640 x 200	4 Colors	80	1	32 K
Mode 7	Yes	320 x 200	16 Colors	40	8	32 K
Mode 8	Yes	640 x 200	16 Colors	80	4	64 K
Mode 9	Yes	640 x 350	16 of 64 Colors	80	2	128 K
Mode 10	Yes	640 x 350	Monochrome	80	2	64 K

COLOR/EGA

Statement

COLOR [*foreground*][,*background*]

Selects the foreground and background palette color numbers for Screen Modes 7, 8, 9, and 10. In Screen Modes 7, 8, and 9 you can select from a palette color in the range 0 to 15. You can change a palette color to any of 64 colors using the PALETTE or PALETTE USING statements.

Foreground specifies the foreground color.

- In Screen Modes 7, 8, and 9, *foreground* is an integer in the range 1 to 15 that specifies a *palette color number* for the foreground. (Palette color number 0 is illegal for the foreground parameter.)
- In Screen Mode 10, *foreground* is an integer in the range 1 to 3 that specifies a *palette color number* for the foreground. The default foreground palette is:
 - 1 Normal foreground
 - 2 High-intensity, blinking foreground
 - 3 High-intensity foreground

Background specifies the background color.

- In Screen Modes 7, 8, and 9, *background* is an integer in the range 0 to 15 that specifies a *color number* for the background. (The background color can be in the range 0 to 63 in Screen Mode 9.)

- In Screen Mode 10, *background* is an integer in the range 0 to 8 that specifies the screen background. Possible backgrounds are de-fined as follows:

- 0 Off
- 1 Blinking off to on
- 2 Blinking off to high-intensity
- 3 Blinking on to off
- 4 On
- 5 Blinking on to high-intensity
- 6 Blinking high-intensity to off
- 7 Blinking high-intensity to on
- 8 High-intensity

Example

```
10 COLOR 7,0
```

sets the foreground to the color in Palette 7 and the background to the color in Palette 0.

Sample Program

```
10 SCREEN 9
20 PALETTE 7,58
30 PALETTE 0,0
40 COLOR 7,0
50 LINE (0,0)-(639,349)
```

PAINT

Statement

PAINT (*x,y*) [*,color*][*,border*][*,background*]]

Fills an area on the display with a selected color or colored pattern.

(*x,y*) specify the coordinates where the painting begins. *x* is the horizontal coordinate, and *y* is the vertical coordinate.

Color can be either a number or a string expression. If *color* is a number, it specifies a color number available in the current screen mode and in the current palette.

If *color* is a string expression, it specifies the mask to be used for tiling. The tiling mask describes a pattern to be used when painting and is in the form:

CHR\$(&Hnn)+CHR\$(&Hnn)+CHR\$(&Hnn)...

Border specifies the border color at which to stop painting and must be a color number in the current palette. If you omit *border*, BASIC assumes the value of *color*.

Background is a 1-byte string expression specifying which back-ground tile pattern or color to skip when checking for borders while paint tiling.

BASIC begins to change the color of pixels (picture elements) at the point you specify with *x* and *y* coordinates. BASIC continues to change the color of every pixel that is not the same color as *color*. When BASIC paints 1 line of pixels without changing the color of any pixel in that line, PAINT is complete.

However, you can continue past this point while tile painting. The background option tells PAINT what background tile pattern or color byte to skip when checking for the boundary.

This means that instead of stopping when one line of points has been painted without changing the color, PAINT can continue, if you specify *background*. For example, normally you cannot draw alternating blue and red lines on a red background because PAINT stops after painting the first red line. However, by specifying red as the background color (&HAA in the default palette), you can draw the red line over the red background.

PAINT must start on a non-border point. If the point is already *border* or *color* color, BASIC does not execute PAINT.

PAINT can fill any figure, but painting jagged edges or very complex figures can result in an "out of memory" error. If this happens, use the CLEAR statement to increase the amount of stack space available.

Tiling

Tiling lets you select a pattern to be used when painting an area on the screen. In low resolution graphics (320 x 200), the tile mask is 8 bits wide and can be a maximum of 64 bytes long.

x,y	Tile								byte
	8	7	6	5	4	3	2	1	
0,0	1
0,1	2
0,2	3
0,3	4
.									.
.									.
.									.
0,63	64

Each byte in the mask represents 8 points along the horizontal row and 1 point along the vertical row. PAINT repeats the tile mask pattern (horizontally and vertically) to create a uniform pattern over the entire painted area.

For high-resolution graphics (640 x 200), 1 bit of tile mask equals 1 point on the screen. Therefore, BASIC sets each position in the tile mask with the bit value of 1. You can paint a pattern of Xs with this tile mask:

Byte	8	7	6	5	4	3	2	1	
0	1	0	0	0	0	0	0	1	CHR\$(&H81)
1	0	1	0	0	0	0	1	0	CHR\$(&H42)
2	0	0	1	0	0	1	0	0	CHR\$(&H24)
3	0	0	0	1	1	0	0	0	CHR\$(&H18)
4	0	0	0	1	1	0	0	0	CHR\$(&H18)
5	0	0	1	0	0	1	0	0	CHR\$(&H24)
6	0	1	0	0	0	0	1	0	CHR\$(&H42)
7	1	0	0	0	0	0	0	1	CHR\$(&H81)

In four-color graphics, 2 bits correspond to each point on the screen. That is, each byte of the tile mask describes only 4 points. These 2 bits describe the color for the point to be drawn. The following chart shows the values for the given colors. Color 0 is the set background color.

Palette 0	Palette 1	binary value
green	cyan	01
red	magenta	10
brown	high-intensity white	11

The following tile mask sets a star pattern in either green and brown or cyan and high-intensity white using Palette 0 or Palette 1, respectively.

Byte

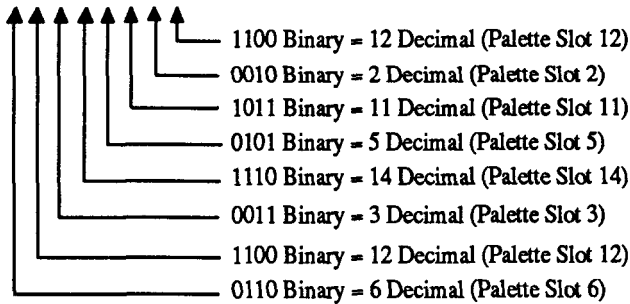
0	01 00 00 01	CHR\$(&H41)
1	00 01 01 00	CHR\$(&H14)
2	11 11 11 11	CHR\$(&HFF)
3	00 01 01 00	CHR\$(&H14)
4	01 00 00 01	CHR\$(&H41)

Enhanced Screen Modes

The enhanced screen modes use a different method to create tile patterns. Rather than interpret *color* string elements sequentially, BASIC stores the string as a stack of 8-bit units, called bit planes.

In SCREEN Modes 7, 8, and 9, BASIC uses 4 bit-planes to define 1 tile byte. It does this by reading each 4-bit column in the stack as a single value. This value represents a palette slot number as shown in the following illustration:

Bit Planes	Bit Columns								Hex Value
	8	7	6	5	4	3	2	1	
3	0	0	1	0	1	1	0	0	&H2C
2	1	0	1	1	0	1	1	0	&HB6
1	1	1	0	1	1	0	0	1	&HD9
0	0	1	0	1	0	1	0	1	&H55



Note that BASIC reads each column from bottom to top (from Bit Plane 0 to Bit Plane 3). PAINT uses these values to set eight pixels to the colors in the respective palette slots. Determine the values to include in PAINT's CHR\$ arguments by reading each sequence of Bit Plane digits (see the Value column). Type the value for Bit Plane 0 first, followed by the value for Bit Plane 1, and so on. To include this data in a program, you might type:

```
10 CLS:SCREEN 7:COLOR 7,0
20 PAINT (160,32),CHR$(&H55)+CHR$(&HF9)+CHR$(&HB6)
   +CHR$(&H2C)
```

Another 4-byte sequence in the program causes BASIC to set the pixels immediately below the previously manipulated pixels. In this way, you can build the patterns you want. For instance, to build a 3-layered pattern, you might type:

```
10 CLS:SCREEN 7: COLOR 7,0
20 T1$=CHR$(&H55)+CHR$(&H0)+CHR$(&H0)
   +CHR$(&H55)
30 T2$=CHR$(&H0)+CHR$(&H55)+CHR$(&H55)
   +CHR$(&H0)
40 T3$=CHR$(&H55)+CHR$(&H55)+CHR$(&H0)
   +CHR$(&H0)
50 PAINT (160,90),T1$+T2$+T3$
```

You determine where tiling begins by using the formula:

$y \bmod \text{tile length}$

In the previous example, $y=90$. There are 3 tile bytes of 8 pixels each. The result when you insert these values into the formula is:

$$90 \bmod 3 = 0$$

Tiling begins at Byte 0, Row 90.

SCREEN Mode 10

In SCREEN Mode 10, BASIC uses 2 bit-planes to define the attributes of 8 pixels. The attributes are:

- 0 = black
- 1 = normal intensity
- 2 = blinking from high intensity to off
- 3 = high intensity

The following illustration demonstrates how you might calculate and use bit-plane values in SCREEN Mode 10:

Bit Planes	Bit Columns								Hex Value
	8	7	6	5	4	3	2	1	
1	0	1	0	1	0	1	0	1	&H55
0	0	0	1	1	0	0	1	1	&H33

11 Binary = 3 Decimal (High Intensity)
 10 Binary = 2 Decimal (Blink)
 01 Binary = 1 Decimal (Normal intensity)
 00 Binary = 0 Decimal (Black)
 11 Binary
 10 Binary
 10 Binary ... and so on ...
 00 Binary

Subsequent 2-byte values set 8 pixels below the previously manipulated pixels. In this way, you create the effects you want. For instance, to manipulate a block 8 pixels wide by 2 pixels deep, you might type:

```
10 CLS
20 SCREEN 10
30 PAINT (150,190),CHR$(&H33)+CHR$(&H55)
  +CHR$(&H33) +CHR$(&H55)
```

Again, you determine where tiling begins by using the formula:

y mod tile length

In this example, $y=190$. There are 2 tile bytes of 8 pixels each. The result when you insert these values in the formula is:

$$190 \bmod 2 = 0$$

Tiling begins at Byte 0, Row 190.

Sample Program

```
10 CLS
20 REM * EGA MODE WITH EGA MONITOR
30 SCREEN 9
40 CLS
50 COLOR 7,16
60 DIM A%(16)
70 FOR X=0 TO 15
80 A%(X)=X+16
90 NEXT X
100 REM * LOAD PALETTE WITH ABSOLUTE COLORS 16-31
110 PALETTE USING A%(0)
120 REM * SETTING UP TILES *
130 T1$=CHR$(&HFF)+CHR$(&H0)+CHR$(&H0)+CHR$(&H0)
140 T2$=CHR$(&H0)+CHR$(&HFF)+CHR$(&H0)+CHR$(&H0)
150 T3$=CHR$(&H55)+CHR$(&HD9)+CHR$(&HB6)
    +CHR$(&H2C)
160 FOR X=1 TO 4
170 CIRCLE (50+100*X,200),40,X
180 NEXT X
190 REM *PAINT WITH TILING *
200 PAINT (150,200),T1$,1
210 PAINT (250,200),T2$,2
220 PAINT (350,200),T3$,3
230 PAINT (450,200),T1$+T2$+T3$,4
```


PALETTE

Statement

PALETTE [*palette color number*][,*color number*]]

Defines one of 64 colors to store in the specified slot of the color palette. This statement is only valid if you have an Enhanced Graphics Adapter video card and an Enhanced Graphics Monitor.

Palette color number specifies the palette position to change.

- In Screen Modes 0, 3, 5, 7, 8, and 9, *palette color number* is an integer in the range 0 to 15 that specifies a position in the 16-Color Palette.
- In Screen Mode 1, 4, and 6 *palette color number* is an integer in the range 0 to 3 that specifies a position in the default palette (Palette 1).
- In Screen Mode 2, *palette color number* is either 0 (background) or 1 (foreground).
- In Screen Mode 10, *palette color number* is an integer in the range 0 to 3 that specifies a position in the foreground palette.

color number is the color to put into the palette position specified by *palette color number*.

- In Screen Modes 0 and 9, *color number* can be any color listed in the 64-color Color Chart (0-63).
- In Screen Modes 1, 2, 3, 4, 5, 6, 7, and 8, *color number* can be any of the first 16 colors (0-15) listed in the 64-color Color Chart.

- In Screen Mode 10, *color number* is an integer in the range 0 to 8, as defined in the following chart:

- 0 Off
- 1 Blinking off to on
- 2 Blinking off to high-intensity
- 3 Blinking on to off
- 4 On
- 5 Blinking on to high-intensity
- 6 Blinking high-intensity to off
- 7 Blinking high-intensity to on
- 8 High-intensity

Example

```
10 PALETTE 0,43
```

stores color 43, a shade of cyan, in Palette Slot 0.

Sample Program

```
10 SCREEN 9
20 PALETTE 0,43
30 PAINT (320,175),0
```

paints the screen a shade of cyan.

PALETTE USING

Statement

PALETTE USING *array(subscript)*

Lets you set all palette entries with one statement.

Array is the name of the integer array that contains the color values.

Subscript specifies the starting position in the *array* for assigning actual colors to the palette color numbers.

The size of the array is determined by the maximum number of palette colors available in the current screen mode. Be sure to dimension your array with enough elements to contain the maximum number of palette colors. Any array elements not assigned a color are set to black. If you assign a value of -1 to an element, the corresponding palette color does not change from its previous value.

Example

```
10 PALETTE USING SHADE%(0)
```

Sample Program

```
10 SCREEN 9
20 CLS
30 DIM SHADE%(16)
40 FOR X=0 TO 15
50 SHADE%(X)=X
60 NEXT X
70 SHADE%(4)=19
80 SHADE%(5)=35
90 SHADE%(6)=59
100 PALETTE USING SHADE%(0)
110 FOR X=1 TO 4
120 CIRCLE (320,175),X*25,X+2
130 NEXT X
```

draws four circles, each larger than the previous and each of a different shade of cyan.

PCOPY

Statement

PCOPY *source page,destination page*

Copies one video page to another in Screen Modes 0, 3, 4, 5, 6, 7, 8, and 9.

Source page is an integer that specifies the video page you want to copy.

Destination page is an integer that specifies the video page to which you are copying.

Screen Mode 0 splits available screen memory into four pages if the screen width is 80, or into eight pages if the screen width is 40. Screen Modes 3, 4, 5, and 6 can have multiple video screens. Screen Modes 7, 8, and 9 have 256 kilobytes of memory available on the EGA card and can also have multiple video screens. This means you can create graphics on one page and copy it to another with PCOPY.

See the "Summary" section at the beginning of this chapter for a chart showing the video pages available for each screen mode.

The following chart shows the video screens available for each screen mode:

Screen Mode	Video Pages Available	Uses EGA Memory
0	8 at 40 columns 4 at 80 columns	No
1	1	No
2	1	No
3	8	No
4	8	No
5	4	No
6	4	No
7	8	Yes
8	4	Yes
9	2	Yes
10	2	Yes

Example

10 PCOPY 3,0

SCREEN**Statement****SCREEN** [*mode*][,]*burst*][,]*active page*][,]*display page*]]

Sets the screen mode and screen attributes for all other graphics statements (CIRCLE, LINE, DRAW, POINT, PSET, PRESET).

Screen modes (7, 8, 9, and 10) are valid only if your computer is equipped with an EGA video card. The Tandy Enhanced Graphics Adapter has 256 kilobytes of video memory, allowing increased graphics resolution and colors without reducing the amount of memory available to MS-DOS and BASIC. Modes 0-6 do not use the EGA memory.

Mode is one of the following integers: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10. Specifying the *mode* value sets the coordinates and colors you can use as shown in the following chart:

	Graphics	Resolution	Color Set	Text Width	Max. Pages	Video Pg. Size
Mode 0	No	N.A.	16 of 64 Colors	40/80	8 @ 40 4 @ 80	2K @ 40 4K @ 80
Mode 1	Yes	320 x 200	4 Colors 2 Palettes	40	1	16 K
Mode 2	Yes	640 x 200	Black & White	80	1	16 K
Mode 3	Yes	160 x 200	16 Colors	80	1	16 K
Mode 4	Yes	320 x 200	4 Colors	40	1	16 K
Mode 5	Yes	320 x 200	16 Colors	40	1	32 K
Mode 6	Yes	640 x 200	4 Colors	80	1	32 K
Mode 7	Yes	320 x 200	16 Colors	40	8	32 K
Mode 8	Yes	640 x 200	16 Colors	80	4	64 K
Mode 9	Yes	640 x 350	16 of 64 Colors	80	2	128 K
Mode 10	Yes	640 x 350	Monochrome	80	2	64 K

When you change from one mode to another, BASIC stores the new screen mode, erases the video display, and sets the foreground color to white and the background and border colors to black.

Burst activates or deactivates color on a television or composite monitor. Set *burst* to one of these values:

Modes	Activate	Deactivate
0	1	0
1, 4, 5	0	1

Burst had no effect in high or low resolution screens (Screen Modes 3, 6, 7, 8, 9, or 10) where color is always enabled, or in Screen Modes 2 and 10, the monochrome modes.

Active page is an integer that selects the video page BASIC is to use. All output statements to the screen go to the selected *active page*. The range depends on the screen mode and the amount of video memory available. If you omit *active page*, BASIC assumes the current active page (initially Page 0).

Display page is an integer that selects the video page for BASIC to display. The range is the same as *active page*. If you omit *display page*, BASIC uses the same page as *active page*. BASIC automatically sets *display page* to *active page* if the program halts because of an END or STOP statement or because of an error.

All video pages share one cursor. Therefore, when switching active pages, you should save the cursor position with the POS and CSRLIN statements. Then, when you return to an active page, you can restore the cursor with the LOCATE statement.

If you omit any parameter (except *display page*), BASIC continues to use the current value for that parameter.

Examples

```
10 SCREEN 0,0
```

selects text mode with color off.

```
10 SCREEN 8,1
```

selects a 640 x 200 graphics screen which can use all 16 colors at one time. Color is on.

Sample Program

```
10 CLS
20 REM * EGA MODE WITH CGA MONITOR
30 SCREEN 8
40 CLS
50 COLOR 7,0
120 REM * SETTING UP TILES *
130 T1$=CHR$(&HFF)+CHR$(&H0)+CHR$(&H0)
    +CHR$(&H0)
140 T2$=CHR$(&H0)+CHR$(&HFF)+CHR$(&H0)
    +CHR$(&H0)
150 T3$=CHR$(&H55)+CHR$(&HD9)+CHR$(&HB6)
    +CHR$(&H2C)
160 FOR X=1 TO 4
170 CIRCLE (50+100*X,100),40,X
180 NEXT X
190 REM * PAINT WITH TILING *
200 PAINT (150,100),T1$,1
210 PAINT (250,100),T2$,2
220 PAINT (350,100),T3$,3
230 PAINT (450,100),T1$+T2$+T3$,4
```


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