SpeedStor™

PC Hard Disk
Utility Software
for Integration, Partitioning, and Diagnostics

STORAGE
DIMENSIONS

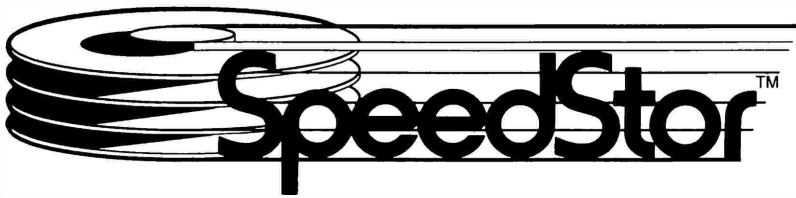*The Experts in High Capacity PC Storage*

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The Experts in High Capacity PC Storage

Table of Contents

1.0 Introduction

SpeedStor

SpeedStor is a software package of advanced utilities that let you integrate virtually any fixed disk (ST506, RLL, ESDI, and SCSI interface) into an IBM or compatible PC, PC XT, PC AT, and Compaq DeskPro running under MS or PC DOS. With SpeedStor you can integrate one or more fixed disks with a single command, or perform a more advanced installation procedure with HardPrep and PartEd, menu-driven programs on the SpeedStor diskette. SpeedStor is also a powerful diagnostics tool, allowing quick and easy identification of fixed-disk and controller problems.

1.1 Using This Manual

This manual provides instructions and reference information for initializing a fixed disk with SpeedStor software. Before using SpeedStor, you should be familiar with the IBM manuals, *PC XT Guide to Operations* or *PC AT Guide to Operations*, and *Disk Operating System*.

First time users of SpeedStor need only read the Chapter 1 indroductory material and then follow the directions in Chapter 2, Automatic Installation. Chapters 3 through 6 are provided for advanced system integrators who will use SpeedStor's advanced features.

Chapter 1 Introduction

All users should review this chapter. It provides an overview of SpeedStor, a list of system requirements for PC XT and AT, and an overview of SpeedStor's special keys, displays, and menus--what you'll use when initializing your new fixed disk.

Chapter 2 Automatic Installation

Provides instructions for SpeedStor's Automatic Installation, which prompts the user to specify desired options, then automatically executes the installation from start to finish.

Chapter 3 Advanced Installation

For the experienced system integrator, who want to use the more advanced features of SpeedStor's HardPrep and PartEd programs to initialize your fixed disk.

Chapter 4   Diagnostics and Troubleshooting

Describes SpeedStor's diagnostic capabilities for analyzing and troubleshooting problems you might have with your fixed disk or fixed-disk controller.

Chapter 5   HardPrep Reference

Contains reference information on SpeedStor's HardPrep program.

Chapter 6   PartEd Reference

Reference information on SpeedStor's PartEd program.

The appendices in this manual contain information on installing various types of controllers and fixed disks. Review the titles of the following appendices to see if they contain information applicable to your system.

Appendix A   Using RLL Controllers

Appendix B   Using ESDI Fixed Disks and Controllers

Appendix C   Using SCSI Fixed Disks

Appendix D   Jumper Options

1.2 Features

With SpeedStor, you can:

* Integrate virtually any drive with an ST506/412, ESDI, SCSI, or RLL interface
* Add 10Mbytes to 320Mbytes--and more--of storage to the PC XT or AT
* Overcome the 32Mbyte limitation of DOS--install partitions up to 1024 Mbytes without patching DOS
* Use flexible partition options
* Boot from the fixed disk drive
* Improve data throughput as much as 30%

SpeedStor consists of four major modules:

* HardPrep is an executable program for initialization and diagnostics
* PartEd is an executable program to create and format DOS partitions
* HardDrive.Sys is an installable device driver that allows DOS to use high capacity hard disk drives
* Automatic installation consists of several files on the SpeedStor diskette that provide the automatic routines.

SpeedStor's automatic installation, initiated by the Install command as described in Chapter 2, automatically executes HardPrep and PartEd and steps the programs through the required commands to perform the installation. SpeedStor automatically installs the DOS system files and sets up the HarDrive.Sys device driver. First time users are encouraged to use this routine to completely and easily install the fixed disk drive.

Experienced system integrators can execute HardPrep and PartEd and operate the programs manually to take advantage of advanced features that are available to improve system performance, storage efficiency, or system flexibility. The following is a brief summary of their features.

HardPrep Fixed disk preparation and diagnostics

With HardPrep you can:

• Use flexible initialization options
• Use comprehensive diagnostics for quick and easy fault isolation
• Select drive type from internal disk drive type table
• Lock out bad tracks without reformatting drive
• Use media analysis to detect additional media defects
• Park drive heads before moving your computer
• Use bounded initialization for different interleaves on the fixed disk
• Change interleave without destroying data

PartEd Advanced partition editor and formatter

With PartEd you can:

• Create and format up to eight fully DOS-compatible partitions
• Create partitions (volumes) as large as drive capacity
• Create read-only partitions--prevent valuable data from accidental erasure or illegal access
• Span two or more drives (up to eight) with a single partition or volume

HarDrive.Sys SpeedStor device driver

• Makes SpeedStor transparent to user
• Gives DOS the power to manage high capacity drives
• Improves system performance by as much as 30%
• Activates as many as sixteen partitions (maximum 8 per drive)
• Supports read-only partitions
• Boots up with DOS

1.3 System Requirements

For PC XT

- IBM PC XT or compatible with a minimum of one floppy drive
- PC XT compatible fixed-disk controller, such as:

  Western Digital WD1002S-WX1, WD1002S-WX2, or WD1002S-27X
  Adaptec 2002A, 2010A, or 2070A
  OMTI 5510-7, 5520-7, 5527-7
  Data Technology Corporation DTC-5150BX
  NDC Centan 5026

- Fixed disk drive and mounting hardware
- Minimum of 192K RAM
- PC or MS DOS version 2.0 or higher
- 20-pin fixed-disk data cable
- 34-pin fixed-disk control cable
- 50-pin fixed-disk cable (for SCSI drive)

For PC AT

To use SpeedStor with your PC AT, you need:

- IBM PC AT or compatible with minimum one floppy drive
- PC AT compatible fixed-disk controller, such as:

  Western Digital WD1002-WA2 (or WD1003-WA2) (fixed/floppy)
  Western Digital WD1002-WAH (or WD1003-WAH) (fixed only)
  Data Technology Corporation DTC-5290 (fixed/floppy)
  OMTI 8520 or 8620
  NDC Centan 5025 (fixed/floppy)
  Western Digital WD1005-WAH ESDI Controller

  (Note: All IBM PC AT systems are delivered with the fixed disk controller installed, regardless of whether a fixed disk is present.)

- Fixed disk with side-mounting rails attached and front panel removed
- Minimum 192K RAM
- PC or MS DOS version 3.0 or higher
- 20-pin disk-drive data cable
- 50-pin disk-drive cable (for SCSI drive)

1.4 Using SpeedStor Display Screens and Menus

Special Keys

Before using the SpeedStor display screens and menus, familiarize yourself with the following special keys:

ESC Tells the program to "go back a step;" aborts the current command, moves to the next higher menu, or exits the program.

BACKSPACE Erases the last character typed.

CURSOR-MOVEMENT KEYS In almost every situation, these keys are used to highlight SpeedStor options. In some instances, for example when you are entering a bad-track list, it is convenient to turn the cursor-movement keys into a numeric keypad by pressing the NUM LOCK key.

SHIFT and *NUM LOCK* Let you use the cursor keys as a numeric keypad.

PRTSC Outputs a copy of the display screen to the printer.

HOME Moves cursor to the first item on a list of SpeedStor options.

END Moves cursor to the last item on a list of SpeedStor options.

ENTER Enters the function selected by the highlighted cursor.

$ Use to enter a hexidecimal value when the program prompts for a numeric input. For example, an entry of $40 is interpreted as 64_{10}.

SpeedStor Menus

SpeedStor menu screens are divided into four areas.

- At the top of the screen, below the trademark and copyright information, is the menu section with the current selection of available functions. One of these functions will always be highlighted by the bar-cursor.

- Below the menu section is the drive-status bar, which contains information about the fixed disk.

- The next section is a work area. In HardPrep the Bad Track Table resides there, in PartEd the partition-information table is supplied.

- The lowest portion of the screen is used to provide program information, such as error messages.

Selecting Options

When you move the cursor to highlight the various options displayed on the SpeedStor menus, a description of that option appears below it. Highlight one of the available options by one of the following means:

- With the cursor arrow key, move the cursor to the desired option and press the ENTER key.

- Press the keyboard key that corresponds to the first character of the menu command you want to select.

- Press the keyboard character corresponding to the character contained in parentheses on your screen.

Press RETURN to select the highlighted option. Sometimes this causes a command to be implemented, and sometimes it causes a nested menu of additional options to appear.

SpeedStor allows you to select only legal, valid entries. If a menu option is not legal and valid, for instance, if there's not enough space on the fixed disk to contain a partition of a certain size, the option will be suppressed. A suppressed option is displayed in half intensity on your monitor screen.

2.0 Automatic Initialization

SpeedStor fixed-disk integration is made easy by a series of menus, displays, and onscreen options that lead you through a complete initialization procedure. Whether you're installing one or two drives, virtually all information needed by SpeedStor is listed on the screen for you to select. Simply highlight the correct option and press enter. (If you haven't already, review section 1.4, "Using SpeedStor Display Screens and Menus.")

Follow these instructions to initialize your new fixed disk. You will need a SpeedStor diskette and a DOS system diskette. Your fixed disk should already be installed.

1. *Boot your system with the DOS diskette.*

2 *Insert the SpeedStor diskette in the A: floppy drive. At the DOS A> prompt, type and enter:*

   INSTALL for an AT or compatible

   INSTALL /XT for an XT or compatible

   INSTALL /XT16 for an XT that uses an OMTI controller

   Follow the SpeedStor prompts to complete the initialization of your fixed disk.

3. *After you type INSTALL, followed by one of the above options (if necessary), the first SpeedStor menu appears on your screen with the SpeedStor logo and copyright information. You are prompted for the number of drives you'll be installing. Select from one of the three options, listed below:*

   1   Install Drive One only

   2   Install Drive Two only

   1 & 2   Install Drives 1 and 2

   Choosing Partition Options

4. *Select one of the following.*

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NO DOS PARTITIONS. (possibly create them later, manually)
(Select this option to use the drive with NOVELL, XENIX, or other nonDOS operating systems.)

EQUAL SIZED PARTITIONS, where all are 32 megabytes or less

32 Mbyte partitions (as many as will fit), plus whatever is left over

One SMALL BOOTABLE partition with a LARGE partition using the remainder

If two drives are present, the following two options will replace the third and fourth partition options:

One SMALL BOOTABLE with a LARGE Partition in EACH DRIVE

One SMALL BOOTABLE and ONE LARGE Partition LINKING ALL DRIVES

For more information on partitioning, refer to Chapter 6, "PartEd Reference."

Select Drive Manufacturer

5. When the drive-manufacturer menu appears on your screen, use the cursor arrow keys to select the manufacturer of the fixed disk.

A selection of disk-drive models made by that manufacturer will appear on your screen.

6. Use the cursor arrow keys to select the model of the fixed disk and press ENTER.

Some versions of SpeedStor support only one manufacturer and will not display this screen. If this screen is not displayed, skip steps 5 and 6, and proceed to step 7.

Compose Bad-track Table

7. After you select the fixed-disk manufacturer and model, the Bad Track Menu will appear on your screen. Refer to the bad-track or media-defect list supplied with your fixed disk. If there are no bad tracks listed on the defect list, select Quit and proceed to step 11.

8. If there are media defects listed, select ADD.

Warning: Failure to enter media defect locations at this point could result in poor disk performance or loss of data at any time.

9.   *SpeedStor prompts you for the head number, then for the cylinder number of the bad track. Type and enter the head and cylinder numbers.*

      Repeat steps 8 and 9, above, for all bad tracks. If you make an error while entering bad tracks, select Revise, Delete, or ClearAll to edit the bad-track table.

10.   *When all defect locations are entered, select QUIT.*

11.   *If you're installing two drives, repeat steps 5 through 10 for the second drive.*

12.   *A SpeedStor prompt asks if you want to continue with the initialization. Select YES, then press any key in response to the SpeedStor warning prompt.*

      Time for initialization, ten minutes to more than an hour, depends upon the size of your drive.

13.   *After SpeedStor formats a BootableDOS partition as part of the initialization procedure, a prompt asks if you want to copy DOS system files to drive C:. If you select YES, you will be prompted to remove the SpeedStor diskette and to insert a DOS system diskette into drive A:. SpeedStor will copy the DOS system files to drive C:.*

      If you select NO, you can copy the DOS files manually to drive C: after the initialization procedure has completed.

14.   *After initialization is complete, SpeedStor prompts you to open the door to the floppy drive to and press any key. SpeedStor will then attempt to boot the computer from the fixed disk.*

Ready-to-go Information

Your fixed disk is now ready for use. Please note the following facts about your fixed-disk subsystem:

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* Each partition on the fixed disk, created in the above procedure, functions as a separate disk drive, and is assigned a logical drive letter (C:, D:, etc.) by DOS.

  A BootableDOS partition must reside entirely in the first 32Mbytes of disk storage. Usually, this means that the bootable partition will be the first partition on the drive, and it will be less than 32Mbytes.

* When the system starts, or "boots," a message appears as the HarDrive.Sys Device Driver is activated, indicating the logical drive assignments and partition capacities for the DOS-compatible, DOS-extension, and DOS-spanned partitions.

* Review the following examples of SpeedStor partitioning to get an idea of how logical drive assignments are made:

  Example 1: The INSTALL command was used to initialize your SpeedStor subsystem, creating two DOS partitions:

  Drive   A: First floppy disk drive
  Drive   B: Second floppy disk
  Drive   C: First (boot) partition of fixed disk
  Drive   D: Second partition of fixed disk

  Example 2: Two SpeedStor fixed disks are installed. INSTALL was used to initialize your first and second fixed disk.

  Drive   A: First floppy disk drive
  Drive   B: Second floppy (if installed)
  Drive   C: First (boot) partition of first fixed disk
  Drive   D: Partition spanning balance of first drive and entire
               second drive

3.0 Advanced Initialization

Chapter 2 provided an installation procedure using SpeedStor's, automatic INSTALL procedure. For experienced systems integrators who want to use a wider variety of initialization options, this chapter provides a more comprehensive procedure.

If you're installing a fixed disk into an AT or XT with a standard AT or XT controller, follow the instructions in section 3.1.

Certain auto-configure controllers require you to use DOS's debug program, not SpeedStor, to perform a low-level initialization. (Refer to your controller's manual). If you are required to use a debug program for initialization, skip section 3.1 and proceed to section 3.2, "Prepare the Fixed Disk for DOS," after you've initialized your fixed disk.

3.1 Low-level Initialization

Before running SpeedStor's low-level initialization, make sure your fixed-disk is correctly installed with all cables attached securely to their connectors.

1. *Boot your system with a DOS diskette, 2.0 or higher.*

2. *Remove the DOS diskette from the floppy drive and insert the SpeedStor diskette.*

    Starting HardPrep

NOTE: Before starting HardPrep, review the HardPrep command-line options, listed in section 5.1.

3. *At the DOS prompt, type and enter* **HARDPREP**, *or*

    HARDPREP /XT *to initialize a fixed disk in an XT or compatible.*

    HARDPREP /XT16 *to install a fixed disk in an XT that uses an OMTI controller.*

    HARDPREP /SECS=xx *when using an ESDI or RLL controller and fixed disk, and when fixed-disk type override must also override the number of sectors. When setting drive type, forces the number of sectors to the number specified as xx.*

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HARDPREP /AUTOTYPE when using a nonstandard or autoconfigure controller, such as a SCSI host adapter. (AT only)

4. When the HardPrep menu appears, select **TYPE.** If "Type" is not an available menu option, skip steps 5, 6, and 7 below, and proceed to step 8.

Selecting Type

5. Use the cursor-movement keys to select either **(1)Drive One** or **(2)Drive Two.** Your choice will depend on whether you are installing your first or second fixed disk.

6. A screen of fixed-disk drive-type options will appear on your screen. You'll have the option to select:

    <no drive> (do not select this option at this time)
    <Standard Type>
    <Manual Params> or
      the manufacturer of the fixed disk you're installing

    Usually you will select the manufacturer. Review the options, below, before making your selection:

    ### Disk-drive Manufacturer

6a. If you select a disk-drive manufacturer, a list of drive types will appear on your screen. (Some versions of SpeedStor support only one drive manufacturer and will not display this option.)

    Use the down-pointing arrow key to highlight the proper drive model. Press the Enter key to select the drive. You will be returned to the main menu.

Standard Type (AT only)

The Standard Type option lets you select a drive type from a table of standard types contained in your computer's permanent ROM memory. When you select a standard type, you accomplish the same task as you would when you use the AT Setup program. Use the Standard Type option when installing a fixed disk with characteristics identical to a drive on the ROM drive-type table. To use this option:

6b. Select <Standard Type>. From the ROM-type table, select the specifications that represent the identical parameters (number of read/write heads, cylinders, etc.) as the fixed disk you're installing.

After you select a Standard Type, the drive status bar will display the characteristics you selected, and you will be returned to the main menu.

Manual Params

Manual Params (not present in all versions) allows you to override the parameters of the drive type you've specified with Standard Type. You can use Manual Params to install a fixed disk that does not appear on HardPrep's drive-type table. To use Manual Params:

6c. Select <Standard Type>. Review the options on the drive-type table. Select the standard type with the same number (or less) of read/write heads as the fixed disk you're installing. After you select a standard type, you will be returned to the main menu.

6d. Reaccess the Type menu, reselect Drive 1 or Drive 2, and select <Manual Params>.

A table with the characteristics of the Standard Type previously selected will be displayed. To accept the presented value, and to move to the next value, press the Enter key. To change any value, enter the new value and press the Enter key.

The Manual Parameters table may display zeros for certain parameters, and may display parameters that do not apply to the controller installed in your computer. Do not change a value unless you are certain it is correct.

Refer to Chapter 5, HardPrep Reference, for more information on setting drive type.

NOTE: With some AT compatible (i.e., non IBM) computers, the system must be restarted (rebooted) at this point. A message will appear instructing you to insert a DOS floppy and re-boot. After the system returns to the A> prompt, insert the SpeedStor diskette in the floppy drive and restart this procedure starting at step 3, above.

IMPORTANT: If you are installing the second fixed disk in your system, make sure the active drive displayed on the drive-status bar is drive 2. If "Drive 1" is displayed, use the NextDrive option on the main menu to toggle the active drive to drive 2.

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7. From the main HardPrep menu select **Initialize**. The Initialization menu will appear.

8. Select **StandardInit**. A message will appear warning that all data on the fixed disk will be lost if you proceed. Select **YES** if you wish to proceed.

9. A prompt will ask if you wish to enter media-defect locations. Refer to the bad-track or media-defect list supplied with your fixed disk. If there are media defects listed, respond with **YES** to enter them into HardPrep's bad-track table.

Warning: Failure to enter media defect locations at this point could result in poor disk performance or loss of data at any time.

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10. If the drive has no bad tracks listed on the manufacturer's defect list, select **NO**, and proceed to step 14.

11. The Bad Track menu wil appear. Select **Add**.

12. SpeedStor will prompt for the head and cylinder number of the bad track. Enter the head number and cylinder number.

    Repeat step 11 and 12, above, for all bad tracks. If you make an error during the entry of the bad tracks, select Revise, Delete, or ClearAll to edit the bad track table.

13. When the defects are all entered select **Quit**.

14. A prompt will ask you if you want to change the Interleave value.

    Enter a new interleave value, or press enter to accept the default interleave. Refer to section 5.2, "Initialization Menu," for an explanation of selecting the correct interleave. Selecting an incorrect interleave value may severely slow your system's speed.

15. Select **Initialize** to begin the initialization.

Time for initialization--from 10 minutes to more than an hour-- depends on the size of your fixed disk. On an AT, an onscreen counter displays the cylinder number being formatted. On an XT, an onscreen message tells you that your fixed disk will take about [xx] minutes to initialize.

16. *When initialization is complete select Quit to return to the main menu.*

17. *Select Quit to exit HardPrep.*

3.2 Preparing the Fixed Disk(s) for DOS

You must now use PartEd to create and format partitions that will be used by DOS. Partitions define areas on the fixed disk for DOS programs and files to reside. PartEd allows you to create and format up to eight DOS partitions. The following section provides a procedure suitable for most fixed-disk installations. For a description of additional PartEd capabilities and DOS-partition requirements, refer to Chapter 6, "PartEd Reference."

Keep the following in mind when you plan the partitioning of your fixed disk:

• Several small partitions on a fixed disk provide significant improvement in system speed.

• To protect data from accidental erasure or illegal access, PartEd allows you to set CompatibleDOS and ExtensionDOS partitions to read-only. Read-only partitions can hold application programs, utilities, or user files that cannot be deleted or changed.

• The file structure of ExtensionDOS and SpanDriveDOS partitions can be customized for your specific application. Large allocation units and logical sector sizes speed system performance, but may waste disk space if data records are small.

NOTE: Before starting PartEd, refer to the PartEd command-line options in Chapter 6.

1. *With your system booted, and the SpeedStor diskette in the floppy drive, type and enter PARTED, or*

   PARTED /AUTOTYPE when using a nonstandard or autoconfigure controller.

2. *If you have a two-drive system and want to create and format partitions on your second fixed disk, select NextDrive to change the active drive to drive two.*

3. *Select* **Create**.

   A menu of partition options--BootableDOS, Compatible DOS, ExtensionDOS, and SpanDriveDOS--will appear on your screen. Review the following options before making your selection:

   ### BootableDOS

   At least one BootableDOS partition is needed to boot DOS from the fixed disk. BootableDOS partitions are limited to 32 megabytes, and should almost always be the first partition on your fixed disk. If the PartEd status-bar display indicates two numbers separated by a slash under "Heads," for example 4/5, it is best to create a small bootable partition (500K minimum is recommended).

   Create additional partitions using one of the following partition types:

   ### CompatibleDOS

   CompatibleDOS partitions offer a high degree of compatibility with DOS and DOS applications. Like BootableDOS partitions, CompatibleDOS partitions are limited to 32 Mbytes.

   ### ExtentionDOS

   To create a partition larger than 32Mbytes, or to install custom file-structure parameters, select ExtensionDOS. Refer to Chapter 6 for information on selecting default values and other file-structure parameters (logical sector size, file-allocation tables, etc.) for ExtensionDOS partitions.

   ### SpanDriveDOS

   SpanDriveDOS lets you create a single logical partition that spans two or more fixed disks for contiguous storage. Refer to section 6.3, "Create Menu," for more information on SpanDriveDOS. All SpanDriveDOS partitions must be deleted before new ones are created.

4. *Select your partition option(s).*

Partition-size Options

A menu of partition-size options will appear. Because PartEd allows you to select only those options permitted by the amount of free space on your disk, all options may not be selectable. Remember that:

- BootableDOS and CompatibleDOS partitions are limited in size to 32 Mbytes.

- ExtensionDOS partitions are limited to the largest available free block on the active drive.

- SpanDriveDOS partitions will occupy all available free space on the active and all other drives.

The following partition-size options are available for BootableDOS, CompatibleDOS, and ExtensionDOS partitions (the default is always "Largest")--but not for SpanDriveDOS partitions:

Largest   Creates the largest allowable partition.

Size   Creates a partition of specified Mbyte size (a Mbyte equals 1,048,576 bytes.)

1 / (2) of Disk Creates a partition using 1/2 of the total disk space, if available.

1 / (3) of Disk Creates a partition using 1/3 of the total disk space, if available.

1 / (4) of Disk Creates a partition using 1/4 of the total disk space, if available.

Manual   Allows you to enter the starting and ending cylinder number for the partition.

Quit   Return to main menu without creating a partition.

When ExtensionDOS or SpanDriveDOS is selected, you will have the option to change the DOS structure. Normally you will want to use the default file parameter structure (see section 6.3 for more information.)

The line status bar will display the newly-created partition. If the fixed disk being installed has remaining free space, you can follow the above steps to create ExtensionDOS, CompatibleDOS, or SpanDriveDOS partitions to a total of eight partitions.

5. *Select Format from the main menu.*

6. Select *(1)One* to format partition 1.

7. A message will appear warning that data in the partition will be lost. Select **Yes** to proceed. The format could take several minutes to complete.

8. Repeat steps 5 through 7 above for all the newly created partitions, specifying *(2)Two* to format partition two, *(3)Three* to format partition 3, etc.

9. Select **Quit** to return to DOS.

10. Restart the system by inserting a DOS diskette in the floppy drive and pressing the **CTRL, ALT**, and **DEL** keys. This is necessary for DOS to recognize the changes made to the fixed disk.

NOTE: Perform steps 11 and 12, below, only if the new drive is the first drive in the system. If SpeedStor is being used to install the second drive in the system, go to step 13.

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11. Insert a copy of a DOS system disk in the floppy drive and enter: *SYSC:*.

12. Type and enter **Copy Command.Com C:**.

13. Insert the SpeedStor diskette in the floppy drive. Type and enter **ADDEVICE** [*/option*]

    Available ADDEVICE options:

    /XT to install a fixed disk into an IBM XT or compatible using a nonIBM controller such as the Western Digital.

    /XT16 to install a fixed disk into an IBM XT using an OMTI controller.

    /AUTOTYPE (AT only) when using a nonstandard or auto-configure controller.

14. Open the door to the floppy drive and reset the system by pressing the **CTRL, ALT**, and **DEL** keys simultaneously.

4.0 Diagnostics and Troubleshooting

You can use SpeedStor's powerful diagnostics to locate system faults, to isolate problems with the fixed disk or fixed-disk controller, and to find undetected media defects. A logical process of elimination is required to determine the source of any computer malfunction. After performing the preliminary troubleshooting procedures in section 4.2, you can:

• Use SpeedStor's automatic diagnostic routine, presented in section 4.3, or

• Perform the same set of procedures with additional options in section 4.4, SpeedStor's step-by-step diagnostics.

4.1 Before Calling Technical Support

Technical support is available for difficulties you may have while installing your fixed disk. Before calling, however, make sure you perform the preliminary troubleshooting procedure in section 4.2, below. In addition, support personnel will most likely ask for the following information when you first call:

1. Your computer type (PC, XT, AT or compatible) and manufacturer

2. Version of DOS

3. BIOS type

4. Manufacturer/model number of the fixed disk

5. Manufacturer/model number of the fixed-disk controller

6. Version of SpeedStor

Knowing the above information will reduce the time it takes for support personnel to find a solution to your problem. It will also help if you are familiar with the SpeedStor manual--support personnel may refer to sections of it when you call.

If you do require technical support call (408) 395-2688

4.2 Preliminary Troubleshooting

Many fixed-disk problems are caused by improper installation.

1. *Power-off your computer.*

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2   Check and recheck the orientation of the fixed disk and floppy interconnection cables. Be certain that each cable's pin 1 (indicated by a colored stripe, the number "1," or a notched arrow) is aligned with its connector's pin 1 on the fixed-disk and fixed-disk controller. Pin 1 on the fixed disk is the first pin on the notched side of the connector. Pin 1 on the controller's connector is indicated by the number "1."

3.   Make sure that all cables are attached securely to their connectors.

4.   Be certain that the drive-select jumper on the fixed disk is installed on the proper set of jumper pins. Most IBM PCs and compatibles require the drive select to be the second drive-select jumper (DS1 in a DS0, DS1, DS2 and DS3 scheme). Refer to Appendix D, "Jumper Options" for complete information on selecting the proper option.

5.   Make sure the terminating resistor is installed only on the first fixed disk.

6.   Turn power back on. If the fixed disk is functional, you will hear a sound from the drive as it starts to spin and increase in speed.

4.3   Automatic Diagnostics

To determine the cause of a software error or system malfunction, you can invoke an automatic diagnostic routine that leads you through a series of menus and onscreen options. After the test(s) have run, diagnostic results are listed on your screen.

1.   From the DOS A> prompt, type and enter DIAG.

Which drive(s) Will Be Tested?

2   The first diagnostic menu prompts you for the number of drives you'll be testing. Choose from one of the following:

   1   Drive One only

   2   Drive Two only

  1 & 2   Drives 1 and 2

3.   The next diagnostic menu prompts you for the type of test(s) you want to run. Select one of the following options:

ReadTest

When you select ReadTest, SpeedStor will perform the following tests, without erasing data on your fixed disk:

* Controller Test – Tests installation and functionality of the controller.

* SeekTest – Tests communication between the fixed-disk controller and the fixed disk; tests functionality of the drive.

* ReadRandom – Reads random sectors from the hard disk and checks for errors.

WriteTest

Select WriteTest to perform the following tests. Whenever WriteTest is run, all data on your fixed disk will be erased.

* Controller Test   (same as above)
* SeekTest   (same as above)
* WriteRandom – Writes a random pattern into sectors, then reads it back to compare written data.

Whenever WriteRandom is run, all data on your fixed disk is destroyed.

Comprehensive Media Analysis

Writes and verifies various test patterns to the fixed disk.

For more information on the tests run during automatic installation, review section 4.4, "Step-by-step Diagnostics," below.

4.4 Step-by-step Diagnostics

IMPORTANT: Many fixed-disk problems are related to temperature. After you power-on your computer, the fixed disk will begin to generate heat; its temperature will stabilize after approximately one hour. Before performing any of the following tests, allow your system to stand with power on for at least an hour.

1. *With your system powered-on and the DOS A> prompt displayed on your monitor, insert the SpeedStor diskette in your floppy drive.*

2. *Type and enter* **HARDPREP**. *The main HardPrep menu will appear.*

3.   Select **Diagnostics** to enter the diagnostics menu.

Testing the Controller

This test checks the fixed-disk controller, and its communication with the host computer system.

1.   Select **Controller** from the diagnostics menu. This test takes only a few seconds. The results, PASS or FAILED, will appear on the bottom of the display screen.

If the test results are FAILED, check that your fixed-disk controller is installed firmly in its adapter slot on your system board. If it was properly installed, the fixed-disk controller is probably defective.

Running SeekTest

This test checks communication between the fixed-disk controller and the fixed disk, and also checks the basic mechanical operation of the drive. It takes just a few minutes. While the SeekTest is running, you will hear the drive's internal mechanism moving rapidly, making a whirring and/or clicking sound. If you hear a loud, unusual mechanical sound, the drive is probably defective.

1.   Select **SeekTest**. The results, PASSED or FAILED, along with a listing of the average seek time in milliseconds, will be displayed on your screen as follows:

Recalibrating Drive   [PASS] or [FAILED]
Extremes to Middle Test   [PASS] or [FAILED]
Performing Random Seeks [PASS] or [FAILED]   Average Seek=xx.x

If FAILED appears during this test:

a. Turn off your computer.

b. Repeat steps in section 4.2, "Preliminary Troubleshooting." If you make any changes to your cables, jumper option, or terminating resistor, rerun the SeekTest.

c. If the SeekTest begins, and the drive begins to function, then a FAILED message appears, the drive is probably defective.

Your system will pass the SeekTest when the fixed disk and fixed-disk controller are mechanically functional, and the interconnection cables and drive select jumpers are installed properly and functional. If a problem persists, it is a more subtle mechanical and/or electrical problem. Proceed with the following tests:

Running Read Random and Write Random

Two tests, ReadRandom and WriteRandom, are provided to test the drive, and to check the ability of the fixed disk to access (seek), store (write), and recover (read) data. These tests simulate an application program running in a worst-case situation. To run these tests, you must have previously initialized your drive.

WriteRandom performs a drive exercise, and a comprehensive write and read data test. Write Random *will* destroy data on the fixed disk.

WARNING: Before running WriteRandom, make sure all data and programs on the fixed disk are backed up on floppy or tape.

ReadRandom performs a drive exercise and less stringent data test *without* destroying data on the disk drive.

Both tests can be stopped by pressing any key on the keyboard.

1. *Select either* **ReadRandom** *or* **WriteRandom**.

2. *The program will prompt:*

   Default Cylinders are X through XXX
   Do you want the defaults or your own values?   DefaultCyls ManualCyls

   (WriteRandom issues a warning prompt. Select "Yes.")

2a. *If you select* **DefaultCyls**, *the program prompts:*

   Default Heads are 0 through XX
   Do you want the defaults or your own values?   DefaultHeads ManualHeads

   Under most circumstances you will respond with "Default" to both prompts so that the entire range of available read/write heads and data cylinders will be included in the test. To limit the test to a specified head- and/or cylinder-number range, select "Manual." Heads and cylinders outside the specified range will not be tested. By concentrating on a suspected problem area, subtle problems can be more quickly identified.

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2b. *If you select **ManualCyls**, the program will prompt:*

```
Enter Starting Cylinder number        <0-XXX>     [   0]
Enter Ending Cylinder number          <0-XXX>     [   0]
```

where x is the first cylinder and xxx is the maximum cylinder available. Type and enter each value.

2c. *If you select **Manual Heads**, the program will prompt:*

```
Enter Starting Head number        <0 - x>:        [0 - X]
Enter Ending Head number          <0 - x>:        [0-X]
```

where 0 is the first read/write head and x is the last read/write head. Type and enter each value.

3. *The program will prompt:*

```
Enter Number of Tests to perform
(0 for continuous testing)          [   0]
```

Each test specified performs a random seek to a sector, then tests the sector. Press ENTER to begin the test.

4. *Allow the test to run for a minimum of one hour. Run the test for a full day, or longer if desired. Press any key to stop the test.*

As the test runs, read/write errors are reported by head and cylinder number on the display screen's Bad Track Table. Locate the defect list originally supplied with the fixed disk. Compare the list with the errors displayed on HardPrep's Bad Track Table. The defect locations on the screen should match the defect locations on the manufacturer's defect map. The ideal test result is one in which the number of defects and locations on the manufacturer's bad-track list equals the number listed on the screen.

• If the screen contains one to four more defects than the manufacturer's defect list, the fixed disk should be able to function normally. Lock-out the bad tracks according to the procedure in this section, "Locking-out Bad Tracks," below.

• If there are five or more defects on the screen than on the drive-manufacturer's list, the drive is probably defective.

• If the test halts itself, an error message displays on your screen, and all of the above troubleshooting steps have been followed, the drive is probably defective.

Running Media Analysis

SpeedStor performs a comprehensive media analysis to check for media defects, and to determine the ability of the drive to read and write data. When looking for data errors, this test writes to the disk and verifies several worst-case and random data patterns. Any error detected is reported on the bad-track table. Refer to "Locking-out Bad Tracks," in this section, below, to lock-out any defects found by this test.

WARNING: Running the media-analysis test will destroy any data on your fixed disk; before running this test, back up your fixed disk's data. After the media analysis is complete, the partition(s) on the fixed disk must be reformatted using PartEd (refer to Chapter 6) before any data is restored to the drive.

---

1. *Insert the SpeedStor diskette in the floppy drive; type and enter* **HARDPREP.**

2. *Select **Diagnostics.***

3. *Select **MediaAnalysis.***

4. *A message will appear warning that the drive is assumed initialized, and data on that drive will be destroyed. Select **Yes** to proceed.*

5. *The program will prompt:*

   Default Cylinders are X through XXX
   Do you want the defaults or your own values?   DefaultCyls ManualCyls

   then,

   Default Heads are X through XX
   Do you wish to specify a head number range? DefaultHeads ManualHeads

   Under most circumstances you will respond with "Default" to both prompts so that the entire range of available read/write heads and data cylinders can be included in the test.

   Under certain circumstances, to limit the test to a specified head- and/or cylinder-number range, you will enter "Manual." Heads and cylinders outside the specified range will not be tested.

5a. *If you specified a cylinder range, the program will prompt:*

Enter the Starting Cylinder number   < x> [x]
Enter the Ending Cylinder number   < x> [x]

5b. If you specified a head range, the program will prompt:

Enter the Starting Head number   < x> [x]
Enter the Ending Head number   < x> [x]

6.   After you enter the range(s), the program will prompt:

Analysis Range is Cylinders x to xxx, Heads x through xx
How many passes over the media do you want performed? [1]
(0 for continuous testing, ESC to abort)

Each test that you specify performs a media analysis over the entire range of cylinders specified in step 5a. The amount of time required for each test varies with the capacity of the drive. Higher-capacity drives will take more time for each test. As a rule, allow one hour per pass for every 15Mbytes on your fixed disk.

Locking-out Bad Tracks

NOTE: After you use SpeedStor to lock-out the bad tracks detected by the above tests, you will have to reformat *only* those partitions affected by the locked-out tracks. This not only saves time, but often data on the disk can be maintained.

1.   Back up your fixed disk to tape or floppy.

2.   Return to the main HardPrep menu.

3.   Select Initialize.

4.   From the initialization menu, select LockTracks.

5.   A message will warn that data on thedrive may be destroyed. Select Yes. The tracks are locked out.

6.   You will be asked if you wish to enter media-defect locations. Select NO.

7.   Press Quit to return to the main HardPrep menu.

8.   Press Quit to exit HardPrep (if desired).

10. *Restore your data to the fixed disk.*

4.5 Error Messages

This section provides a number of common error messages related to fixed-disk problems, followed by a description of the message and possible causes.

System and DOS Error Messages

The following error messages are originated either by DOS or the system ROM BIOS.

17XX Disk Error

On power-up and warm boot, your system performs diagnostics and checks the fixed disk(s) installed. If a problem is found, an error message accompanied by the characters "17XX" is displayed. Common problems causing a "17XX" error message are:

*   The fixed disk(s) has not been initialized. Initialize the drive according to the procedure in Chapter 2 or 3.

*   The fixed-disk and/or floppy interconnection cables are improperly installed. Refer to section 4.2, "Preliminary Troubleshooting."

*   The drive-select jumper is improperly installed. Refer to Appendix D, "Jumper Options."

*   The wrong drive-type has been selected.

    On an XT, check the jumper selections on the fixed-disk controller.

    On an AT, either the Setup program (on the AT Diagnostics disk) or SpeedStor's HardPrep has been used improperly to specify a drive type. To respecify the type from the main HardPrep menu, select "Type," then specify either "Drive 1" and/or "Drive 2." (See Chapter 5 for more information on selecting type.)

*   From the HardPrep menu, select "Initialize." If the POD-Fix option is available on the Initialization menu, select it. Reboot to see if the problem is solved.

SpeedStor

Illegal Drive Type

This error occurs when you attempt to access the fixed disk, and the system does not recognize that a fixed disk is present, or does not recognize one or more DOS partitions on the fixed disk.

* If you make any changes to the system, reboot so the system will recognize the changes.

* The DOS partition is not present or is not active. Refer to Chapter 6 for information on PartEd. Be certain that one or more DOS partitions are present, and that they are active and/or accessible.

* The SpeedStor device driver, HarDrive.Sys, is not active. Be certain that the fixed-disk active partition, or a floppy diskette that you will use to boot your system, contains the device driver HarDrive.Sys on the directory, as well as the file Config.Sys. The Config.Sys file must contain the line "Device=HarDrive.Sys". Refer to section 6.8 for more information on HarDrive.Sys.

   Re-boot the system to activate the device driver.

Problems with Fixed Disk or Fixed-disk Controller

Sector Not Found
General Failure Reading Drive X
General Failure Writing Drive X
Drive Not Ready

The messages listed above indicate one of the following problems with either the fixed disk or the fixed-disk controller:

* A media defect needs to be locked out. Refer to "Running Media Analysis," and "Locking-out Bad Tracks," in section 4.4 to find and lock-out media defects on the fixed disk.

* Initialization on the drive has been corrupted. Back up the contents of the fixed disk to a floppy disk or tape. Reinitialize the drive according to the procedure in Chapter 2 or 3.

* The fixed disk and/or controller has failed. Refer to sections 4.2 to 4.4 to locate the problem.

Bad Command to Disk BIOS

* An attempt was made to access a fixed disk that is not active. Check the drive type(s) specified and reboot the system.

4.6 Troubleshooting Guide

Using a Setup or Diagnostics Program

During the installation procedure, SpeedStor automatically sets the correct fixed-disk drive type. If an existing drive type was specified with the Setup program on your system's Diagnostics diskette, SpeedStor will override the previous type with the correct one. For best results, there should be no drive specified before installing a fixed-disk with SpeedStor.

If Your System Will Not Boot from the Fixed Disk

After completing the installation procedure in Chapter 2 or 3, your system should boot from the fixed disk and log onto drive C:. If your system doesn't boot:

1. *At the DOS A> prompt, insert a DOS diskette in the A: floppy.*

2. *Type and enter FORMAT C:/S.*

3. *Remove the DOS diskette, and insert the SpeedStor diskette in the A: floppy.*

4. *Type and enter ADDEVICE*

If you've completed steps 1 through 4, above, and your system still will not boot from the fixed disk, perform the following steps:

1. *At the DOS A> prompt, type and enter HARDPREP /NOCMOS.*

2. *Select Type from the HardPrep menu.*

3. *Select Drive 1 and one of the other type options (Standard Type, Manufactuer, or Manual Params).*

4. *Select Quit to exit the menu.*

Manufacturer-specific Versions of SpeedStor

SpeedStor is produced in a variety of versions. Some versions are limited to certain drive types, and will install only the fixed disks listed on the drive-type table. Contact Storage Dimensions if you want to purchase a universal version of SpeedStor.

5.0 HardPrep Reference

You can use HardPrep to perform the advanced initialization procedure presented in Chapter 3, or to run the fixed-disk diagnostics presented in Chapter 4. This Chapter provides reference information for the HardPrep program, and contains HardPrep features not presented elsewhere in this manual.

5.1 HardPrep Command-line Options

Command-line options provide HardPrep with additional features and enhanced compatibility. To start the program, enter HARDPREP, followed by the desired options, and press the Return key. An option must be preceded by a space and a slash. Use the form:

HARDPREP [/option] [/option]

Available HardPrep command-line options are:

/AUTOTYPE or
/NOTYPE   (AT only) Prevents HardPrep from overriding the ROM BIOS drive-type table with nonstandard drive parameters. Use this option to achieve compatibility with nonstandard fixed-disk controllers. These include some auto-configure controllers, SCSI host adapters, and ESDI controllers.

/FLAWLESS Use to prevent SpeedStor from performing the surface scan that is normally part of a standard initialization.

WARNING: Use the /FLAWLESS option only on drives, such as SCSI drives, that have no media defects, or on controllers or other devices that will perform track reallocation or sector sparing.

/HELP   Displays the available command-line options; Hardprep is not started.

/NOCMOS   In an AT or compatible, causes SpeedStor to leave the CMOS system-setup information exactly as it was. Drive-type override information is stored on the fixed disk instead of in CMOS RAM.

/NOCOLOR This option causes SpeedStor to remove color and display in monochrome. On monochrome monitors that use shades of gray to emulate colorgraphics, the color of HardPrep's displays and menus might be nondistinguishable.

/ROMLIST   Displays a list of the drive tables in system ROM.

/SECS=xx When setting drive type, forces the number of sectors to the number specified as xx. Use with nonstandard controllers (ESDI, RLL) when the disk-drive type override must also override the number of sectors.

/USECMOS In an **AT** or compatible, causes SpeedStor to store items of required disk information in CMOS RAM instead of on the fixed disk (if possible). Use this option when third-party software and SpeedStor share the same area on the fixed disk to store information.

/XT   Use to install a fixed disk into an IBM **XT** or compatible that uses a nonIBM controller such as the Western Digital.

/XT16   Same as the above option, but for use with **XT**-compatible controllers, such as the OMTI 5520-7, with 16 drive types on the lookup table. Allows the drive type, which has been selected with a jumper option on the controller, to be overriden.

5.2 Initialization Menu

NOTE: A fixed-disk requires initialization *only* when it is first installed.

Select "Initialize" to display the Initialization menu. The options are:

StandardInit

Performs a low-level initialization, composes the bad-track table, perfoms a surface scan to verify the format, and locks-out the bad tracks. *All data and partition information on the fixed disk will be lost.*

LockTracks

This option locks-out tracks that you entered into the bad-track table. Any data that is present on a track will be lost when you lock-out the track. Use this option after one of the diagnostic options, such as Media Analysis, locates media defects that are not on the defect list supplied with the fixed disk.

After locking-out additional tracks, it is not necessary to reinitialize the fixed disk with HardPrep. However, you must use PartEd to reformat any partition(s) on which the newly locked-out tracks reside.

POD-Fix

In most cases, when installing a fixed disk that does not match a type in the ROM-based drive-type table, SpeedStor overrides the ROM-based table of disk-drive types (refer to section 5.3, below). Under rare circumstances, the Power On Diagnostic (POD) will display a 17XX error. Press F1 to continue, then select the POD-Fix option to resolve the Power On Diagnostic error message. POD-Fix locks-out a single track as if it contained a media defect. POD-Fix is invoked automatically when performing a Standard Initialization.

POD-Fix should be used only when first installing a fixed disk.

BoundedInit

This option performs a low-level initialization on a specified range of heads and cylinders. You can also use BoundedInit to format variable interleave values for given partitions. You can achieve optimum data throughput under many circumstances. For example, data that is usually sequentially stored, as it is in data bases, can use an interleave of 2 or 3, whereas data that is randomly stored, such as that used in Basic programs, works best when used with larger interleaves.

To use the BoundedInit feature:

1. Select *StandardInit* to initialize the entire drive.

2. Select *BoundedInit* to specify a range of cylinders and the desired Interleave.

3. After initialialization has completed, use PartEd to create and format the partition(s).

Reinitialize

You can use the Reinitialize option to change the interleave of your fixed disk, or to change the interleave in a specified range of cylinders, without losing the data. Before SpeedStor formats the cylinders, data is saved to a memory buffer. After initialization, the buffer restores the previous contents of the cylinders. To use the Reinitialize option:

1. Select *Reinitialize* from the Initialization menu.

   You will have the option to reinitialize all of the fixed disks, or a specified range of heads and cylinders.

2. Select *Defaults* to reinitialize the entire fixed disk, or **Manual** to reinitialize a range of cylinders for a partition.

3.   Select a new interleave or accept the default.

Selecting Interleave

Interleave is the number of physical sectors to be skipped between logical sectors on your fixed disk. Before you run StandardInit, BoundedInit, or Reinitialize, a SpeedStor prompt asks if you want to specify a new interleave, or accept the default. The range is 1 to 16 (25 for RLL, 33 to 36 for ESDI or SCSI). Depending on the application, changing the interleave may speed up or slow down disk performance. The default interleave used by HardPrep is the IBM default--3:1 for AT and 6:1 for XT. If selecting an interleave value, change it *before* initializing your fixed disk.

5.3   Drive-type Override

In the AT, a table of fixed-disk types is located in the system ROM, and is used to determine the characteristics (number of heads, cylinders, etc.) of the fixed-disk being installed. Drive-type in an AT is normally selected via a setup program. Because the AT drive types are in ROM, the types of fixed disks that can be installed in the host computer is normally limited to this table. One of SpeedStor's special features is its ability to integrate fixed-disks that are not on the AT's drive-type table. This is called "drive-type override" and is accomplished using SpeedStor's internal-drive tables and Manual Params option.

In the XT, a different method of drive-type selection is used. Some XT fixed-disk controllers contain an auto-configure capability. These controllers do not contain a table of fixed disk types, but instead allow you to specify the fixed-disk characteristics. This is done using a ROM-based initialization program, accessed from the DOS Debug.Com program.

If the host computer or the fixed-disk controller's ROM BIOS is not fully compatible with the IBM ROM BIOS, SpeedStor may not be able to override fixed-disk types not on the table. In the XT, SpeedStor can be used only when the characteristics of the fixed disk match those on the host fixed-disk drive table.

5.4   Type-selection Guidelines

PC and XT

•   When using a standard-type controller with jumper-selectable drive types, install a jumper to select a drive type with the same number (preferably) or fewer read/write heads than the actual drive being installed. Do *not* install a jumper to select a drive type with more read/write heads than the actual drive being installed.

- When using an XT auto-configure controller, initialize the drive using the initialization program supplied with the controller. Refer to the controller's installation guide. After the initialization, return to SpeedStor and proceed with the installation.

- If HardPrep does not display "Type" when using a standard XT-type controller with jumper-selectable drive types, you must install a fixed disk that is specified by the controller drive-type table.

PC AT

- When using SpeedStor, it is usually best not to run the host-computer setup program to change fixed-disk drive types. Allow HardPrep to specify the drive type. If you run the Setup program at any time, you must reselect the drive type using HardPrep. (See section 5.5, below.).

5.5   Using the AT Setup Program

PC ATs and compatibles store system-configuration information in an area of battery-backed-up CMOS RAM. This information is normally changed with the system Setup program, which is found on the Diagnostics diskette accompanying the AT system documentation. With many fixed-disk types, SpeedStor overrides the information stored by the Setup program so that non-standard drive types (i.e., drive types not included on the system ROM BIOS look-up table) can be installed in the AT.

Drive-type override information is usually stored by SpeedStor in battery-backed-up CMOS RAM. Alternatively, SpeedStor is able to store the drive-type override information on the fixed disk. When that storage method is used, the battery-backed-up CMOS RAM is unchanged, and is fully compatible with your system's setup program.

IMPORTANT: Whenever you run the AT SETUP program, you must use HardPrep to reselect the drive-type. Alternatively, perform the following procedure to store drive-type override information on the fixed disk.

1.   *Type and enter HARDPREP /NOCMOS.*

2   *Select Type.*

3.   *Select (1)DriveOne.*

4.   *A screen of fixed-disk drive type options will appear on the screen (the display options will vary with the version of SpeedStor).*

Select type according to the procedure in section 3.1, "Low-level Initialization."

5.6   ParkHeads Option

Select this option to protect your fixed disk before moving your computer. Not all fixed disks need to have their heads parked. However, if there is a question, park the heads using this routine to be certain.

6.0 PartEd Reference

PartEd is an advanced partition editor that you can use to create and format up to eight partitions on your fixed disk. Use it in place of the DOS utility programs FDISK and FORMAT. PartEd supports high-capacity fixed disks, and contains many features not found in the DOS utilities.

Using PartEd, you can:

*   Create and format BootableDOS, CompatibleDOS, ExtensionDOS, and SpanDriveDOS partitions

*   Make logical-drive assignments

*   Give a SpeedStor partition a read-only attribute to protect programs and data from accidental erasure.

*   Change the active (bootable) status of DOS and non-DOS partitions

PartEd displays a menu with available options. These options, along with other reference information, are described in the following sections.

6.1 Command-line Options

For added features and enhanced compatibility, you can modify PartEd with command-line options. To use command line options, enter "PartEd," followed by one or more options, listed below. An option must be preceded by a space and a slash. Use the form:

PARTED [/option] [/option]

Available PartEd command line-options are:

/AUTOYPEor
/NOTYPE   (AT only) Prevents PartEd from overriding the ROM BIOS drive-type table with nonstandard drive parameters. This option is used for compatibility with nonstandard fixed-disk controllers. This includes some auto-configure controllers.

/DISPSECS   This option displays starting and ending partition points by sector number. (PartEd normally displays partition boundaries by cylinder number.)

/FLAWLESS Use to eliminate the media scan that is normally part of SpeedStor's format routine.

WARNING: Use the /FLAWLESS option only on drives, such as SCSI drives, that have no media defects, or on controllers or other devices that will perform media defect reallocation.

/HELP Displays the available command line options. PartEd is not started.

/NOCOLOR This option causes SpeedStor to remove color and display in monochrome. On monochrome monitors that use shades of gray to emulate colorgraphics, the color of PartEd's displays and menus may be nondistinguishable.

/XT Use to install a fixed disk into an IBM XT or compatible that uses a nonIBM controller such as the Western Digital.

/XT16 Same as the above option, but for use with **XT** compatible controllers, such as the OMTI 5510-7, with a drive type of 16 on the lookup table. Allows the drive type to be overriden.

/12BITFAT For use with versions of MS DOS 3.0 or higher that limit the File Allocation Table (FAT) to 12-bit entries. This option causes PartEd to create a file structure using 12-bit FAT entries.

6.2 AutoPart

Whenever you run SpeedStor's Automatic Installation, as described in Chapter 2, AutoPart works invisibly to create and format partitions that your system uses with DOS. AutoPart can also be used manually to create and format partitions for an entire fixed disk or for all fixed disks in a system.

From the main PartEd menu, select AutoPart. Three format options will appear on your screen:

EveryDrive Use to partition all available space on all drives.

CurrentDrive Use to format all available space on the currently-active drive. If you have more than one fixed disk in your system, use the NextDrive option to specify which drive is active before using CurrentDrive.

SelectedArea Use to enter the starting and ending cylinder number for the partitions for the active drive.

AutoPart's Create Modes

Once you've selected which drive(s) or range of cylinders to partition, a menu of partition-size options will appear on your screen:

EqualSized   Select this option to create equal-sized partitions. The partitions will be the largest possible to a maximum 32MBytes.

Max32meg   Select this option to create partitions up to 32 megabytes in size. The final partition will be 32 megabytes or smaller.

LargeExtension Select this option to create one small BootableDOS partition with 1 ExtensionDOS partition for the remainder of the fixed disk.

Spanned   Select this option to create one small BootableDOS partition and one SpannedDOS partition, which will take up all free space and span all drives. This option is only available if EveryDrive, above, was selected.

Select the drive(s) that you want to partition. AutoPart will automatically occupy all free space on the selected drives.

6.3 Create Menu

To create a single partition, select "Create" from the main PartEd menu, and select one of the DOS partition types available--BootableDOS, CompatibleDOS, ExtensionDOS, or SpanDriveDOS. After a partition is created, you must format it using PartEd's format function. *Do not use the DOS programs FDisk and Format.*

You can use PartEd to create up to eight partitions per fixed disk. If there is not enough space available to create a partition, or if eight partitions already exist, the Create option will not be available.

BootableDOS Partitions

An active BootableDOS partition must be present for your system to boot from the hard disk. (Drive C: never requires the SpeedStor device driver, HarDrive.Sys). In addition:

•   The partition must be 32Mbytes or less.

•   The partition must reside entirely within the first 32Mbytes of the fixed disk.

- Must be one of the first four partitions.

- Only one BootableDOS partition is allowed per fixed disk.

- PartEd's drive-status bar occasionally displays heads as x/xx, that is, two numbers seperated by a slash. Under these circumstances, make the BootableDOS partition small to reduce wasted disk space.

  The first number (x) indicates the number of read/write heads on the host-system drive type table; the second number (xx) is the number of read/write heads actually on the fixed disk. The number of heads created on the BootableDOS partitions equal the first number, and the number of heads created on the CompatibleDOS and ExtensionDOS partitions will equal the second, larger number.

CompatibleDOS Partitions

A CompatibleDOS partition is created with the same file structure as a BootableDOS partition, and offers a high degree of compatibility with DOS, application programs, and the host computer. The CompatibleDOS partition must be 32Mbytes or less, but can be located anywhere on the fixed disk. SpeedStor's HarDrive.Sys device driver must be active to use a CompatibleDOS partition.

ExtensionDOS and SpanDriveDOS Partitions

ExtensionDOS and SpanDriveDOS partitions can be larger than 32Mbytes-- they can take up all available free space on the disk. Large partition capability allows:

- A single file and directory structure for an entire high-capacity fixed disk.
- High-capacity file storage.

ExtensionDOS and SpanDriveDOS Partition Considerations

- ExtensionDOS and SpanDriveDOS partitions cannot be active (bootable).

- ExtensionDOS and SpanDriveDOS partitions are compatible with virtually all application programs, and contain an extended file structure, with logical sector sizes over the standard 512 bytes. Some programs rely on a standard 512-byte logical sector size and must reside in a BootableDOS or a CompatibleDOS partition. Programs that make standard DOS calls for disk I/O are fully compatible with ExtensionDOS and SpanDriveDOS partitions.

- ExtensionDOS and SpanDriveDOS partitions increase the amount of RAM used by DOS (i.e., decrease the amount of RAM available for programs). DOS allocates enough memory for each buffer to hold the largest possible

sector. Thus if your ExtensionDOS Partition uses 2,048 byte sectors, the command BUFFERS=20 would allocate more than 40,960 bytes of RAM for buffers. To minimize the amount of RAM used by DOS, we recommend using a value of 8 or less.

• You can create a partition that uses a small cluster size (but not smaller than the logical sector size); however, if it is a very large partition, it will require a large (more than 16K) File Allocation Table (FAT). A FAT of this size, though otherwise fully functional, will be too large for use with the DOS program, CHKDSK.COM.

SpanDriveDOS Partitions

This very powerful feature of SpeedStor will use all free space of two or more drives together to form one large DOS file structure. The system could have, for example, three 10Mbyte drives and, by creating a single SpanDriveDOS partition, a 30Mbyte drive D:.

When you create an ExtensionDOS or SpanDriveDOS partition, you will be prompted for file-structure parameters. You can use a set of default parameters, or specify file-structure options. Respond with either "Defaults" or "Manual" at the prompt.

• SpanDriveDOS partitions allow a single DOS partition to span two or more (up to eight) fixed disks. When created, SpanDriveDOS partitions will occupy all available free space on all drives present in the computer system.

• Only one SpanDriveDOS partition can be created.

• All parts of an existing SpanDriveDOS partition must be deleted before creating a new SpanDriveDOS partition.

DOS File Structure Parameters

It is recommended that only experienced systems integrators use anything other than default values. By using smaller logical-sector and allocation-unit sizes in certain installations, disk-storage efficiency can be increased. By using larger logical-sector and allocation-unit sizes, and by creating only a single File Allocation Table (FAT), data throughput speed can be optimized.

Default selections are automatically used unless changed. Select "Manual," to choose from the following options:

Select logical-sector size:
512(a)   1024(b)   2048(c)   4096(d)   8192(e)   16384(f)   32768(g)

Enter minimum number of Root Directories <X> [1024]
(This will be rounded to the nearest X directories.)

How Many File Allocation Tables (FATS)? (2)two (1)one

Select Allocation Unit (cluster) Size in Bytes:
512(a) 1024(b) 2048(c) 4096(d) 16384(e) 8192(e) 16384(f) 32768(g)

6.4 Type Option

Select "Type" to change the partition's type. The options are:

BootableDOS

Only one BootableDOS partition is allowed on any drive. The partition must meet BootableDOS criteria (fully residing in the first 32MBytes of disk space). This option is suppressed if the fixed-disk head count is not specifically supported by the host-system drive-type table.

CompatibleDOS

You can change a bootable partition on your fixed disk into a CompatibleDOS partition.

Write/Read and Read/Only partition attributes

CompatibleDOS, ExtensionDOS, and SpanDriveDOS partitions are assigned attributes of Write/Read or Read/Only:

Write/Read – This is the standard default attribute for a partition.

Read/Only -- You can set a partition to Read/Only to protect its contents from accidental erasure or illegal access. Any data or application program can be placed in read-only partitions for protection. To use the Read/Only Partition feature:

1. *Create as, or set the partition-type attribute to,* **Write/Read**.

2. *Reboot your system.*

3. *Copy the desired files to the partition.*

4. *Set the partition-type attribute to* **Read/Only**.

5. *Reboot the system to initialize the device driver to the new attribute.*

6.5   ReOrder

To change logical-drive assignments, this feature "swaps," or reorders, partitions on the fixed disk. Logical-drive assignments (D: to Z:) are made, among other things, according to the order of partitions as they appear on PartEd's partition table. When selected, ReOrder options are displayed that will change partition positions on the PartEd display.

To get an idea of how ReOrder works, consider the following for a system with a single floppy and a single fixed disk. In this example, the fixed disk has been partitioned into three DOS partitions. Normally the first partition is assigned C:, the second partition D:, and the last partition E:. When the ReOrder feature is used to swap partitions two and three, the second physical partition becomes logical drive E:, and the third physical partition becomes logical-drive D:.

Remember that, regardless of its position on the partition table, the BootableDOS partition is always C:. If more than four partitions exist, the BootableDOS partition must be partition 1, 2, 3, or 4.

6.6 Delete

The delete option removes a partition from the active drive. Free space is available after deleting partitions. Deleting a partition will most likely erase all data in that partition.

6.7 Format

After you create a partition, it must be formatted for use by DOS. The program will prompt for the name of the partition to format. The format process will take several minutes.

SpeedStor's Format is similar to the DOS format, though SpeedStor does not support the DOS /S option. System files and Command.Com cannot be written by PartEd. After the boot partition is formatted, reboot the system, and use the DOS SYS command to create the system files and to copy Command.Com onto the boot partition.

6.8 HarDrive.Sys Device Driver

SpeedStor's device driver, HarDrive.Sys, must be activated from your Config.Sys file when your system boots. The SpeedStor program, ADDEVICE, will look for a Config.Sys file on the C: partition. If a Config.Sys file is not present, ADDEVICE will create one and place HarDrive.Sys in it. If a Config.Sys file is present, ADDEVICE will add the entry "Device=HarDrive.Sys" to the existing file. As an alternative to using the ADDEVICE program, you can create or modify the Config.Sys file with an ASCII text editor such as WordStar or Edlin. If you create the Config.Sys file with a text editor, type and enter:

DEVICE=HARDRIVE.SYS (/option) (/option)

You can use HarDrive.Sys with a number of command-line options that improve its flexibility and performance in nonstandard configurations. Use the command-line options by running ADDEVICE, followed by the desired option(s). For example:

ADDEVICE /XT16

Review the following HarDrive.Sys command-line options:

/AT   Use to support AT drive select (CMOS RAM), vectoring, and DMA. (The /AT option is a SpeedStor default--use only with non-AT compatible hybrid 80286 machines.)

/DMA   Prevents transfer across DMA segment boundries (XT default)

/NODMA   Allows transfer across DMA segment boundries (AT default).

/NOTPCDOS   Eliminates need for IBM identifier in boot record.

/NOXCYL   Prevents multiple-sector reads from crossing cylinder boundries.

/NOXHEAD   Prevents multiple-sector reads from crossing head boundries.

/XT   Use with XT compatibles that use controllers such as the Western Digital. Supports XT drive-type override and XT DMA.

/XT16   Same as the /XT option, but for use with controllers such as the OMTI 5520-7 and the DTC-5150BX, with 16 drive-types on the lookup table.

Note the following HarDrive.Sys characteristics:

- When the system starts, or boots, a message appears indicating the logical drive assignments, partition capacities for the CompatibleDOS and ExtensionDOS partitions, and the amount of system memory used by HarDrive.Sys.

- HarDrive.Sys can reside with other device drivers in the Config.Sys file. If other drivers are present, for example, VDisk.Sys, the assignment of logical drive letters may be altered. DOS assigns drive letters C: through Z: in the order that device drivers are entered for block devices in the Config.Sys file, and according to the order of partitions on the partition table.

  Some device drivers are sensitive to their position in the Config.Sys file. If problems are encountered, reorder the device statements.

- All device drivers increase the amount of RAM space DOS occupies. HarDrive.Sys tells you at boot time how much RAM it is reserving for its own use. Note that ExtensionDOS partitions with large logical-sector sizes require larger buffers.

6.9   Starting DOS from the Fixed Disk

Starting, or booting the system from the fixed disk occurs when DOS is loaded after power is applied, or when the system is reset with the CTRL, ALT and DEL keys. To start the system with SpeedStor installed, the following conditions must be met:

- There must be a valid, formatted, and active BootableDOS partition on the first fixed disk.

- A copy of the system files must be present on the active partition. This is done using the DOS SYS C: command, or using the Automatic INSTALL procedure in Chapter 2.

- The file Command.Com must be copied to drive C:

- A copy of the file HarDrive.Sys must be present in the boot partition, either in the root directory, or accessable via the Path command.

- A Config.Sys file must be present on the root directory that calls for HarDrive.Sys. Refer to the following section for more information.

- In a system with two fixed disks, DOS will only start from the first disk.

6.10 Starting the System From a Diskette

The rules described in the above sections for starting the system from a fixed disk also apply to a diskette. To create a SpeedStor bootable diskette, first format a diskette with the DOS /S option, then copy the files Config.Sys and HarDrive.Sys from the fixed disk to the newly-formatted DOS diskette. This diskette can now have applications or other files placed on it, and be used to start the system if desired.

The root directory of the SpeedStor bootable diskette must contain the following files:

Config.Sys
HarDrive.Sys

The Config.Sys file must contain the entry:

Device=HarDrive.Sys

6.11   Multiple Operating Systems on a Fixed Disk

SpeedStor partitions can reside with other operating systems on a fixed disk. Here are a few guidelines:

- Other operating systems may have to reside in one of the first four fixed-disk partitions, and will not be able to reside in partitions 5 through 8.

- Keep in mind that SpeedStor overrides the host system ROM BIOS table of disk drive types for DOS. Other operating systems may only recognize those disk-drive characteristics represented by the ROM BIOS drive-type table.

- Always use PartEd to change the active partition.

- When changing operating systems frequently, it is often easier to boot from system floppies than to change the active partition.

Appendix A
Using RLL Controllers

RLL controllers use a special technique to store data on the drive in higher densities; typically, there is a 50% improvement in storage capacity. Not all fixed disks can be used with RLL controllers. Only drives certified by their manufacturer for use with RLL should be used.

RLL Controllers in an XT

RLL controllers for XTs automatically configure the system for use with RLL. Simply follow the installation procedure in Chapter 2 or 3.

RLL Controllers in an AT

When using an RLL controller in an AT, use the command-line option /SECS=26 when starting SpeedStor. For example, when following the initialization in Chapter 2, type and enter:

INSTALL /SECS=26

When following the initalization procedure in Chapter 3, type and enter:

HARDPREP /SECS=26

Appendix B
Using ESDI Fixed Disks and Controllers

Data on ESDI fixed disks is stored in densities higher than on other fixed disks, and typically can be formatted with 33, 34, 35, or 36 sectors per track. (Standard drives using the traditional ST506 interface use 17 sectors per track.) The actual number used depends on the specifications of the EDSI controller and fixed disk. The command "SECS=xx" can be used with SpeedStor to specify the proper number of sectors.

When using an ESDI controller in an XT or AT, use the command-line option /SECS=xx to start SpeedStor. For example, when following the procedure in Chapter 2, type and enter:

INSTALL   /SECS=34

to initialize an ESDI drive with 34 sectors per track.

When following the initialization procedure in Chapter 3, use the form:

HARDPREP   /SECS=35

to initialize an ESDI drive with 35 sectors per track.

If SpeedStor is unable to determine the ESDI fixed-disk configuration, invoke SpeedStor with the /AUTOTYPE option. Type:

HARDPREP   /AUTOTYPE

Refer to section 5.1 for more information on the /AUTOTYPE option.

Using OMTI Controllers in an AT

The OMTI 85XX and 86XX controllers contain their own ROM, which provides an onboard, low-level initialization program that must be used in place of SpeedStor.

- Perform the low-level initialization using OMTI's low-level format program, according to OMTI's instructions.

- Create and format DOS partitions using SpeedStor's PartEd according to the procedure in Chapter 3.

- Do not use the instructions in Chapter 2, Automatic Installation, to install an ESDI drive using an OMTI controller.

- Do not use HardPrep to initialize the fixed disk.

- When running the program ADDEVICE, use the option /AUTOTYPE. Type and enter: **ADDEVICE /AUTOTYPE**

Using the Western Digital WD1005-WAH Controller in an AT

The Western Digital WD1005-WAH ESDI controller has a feature that allows the computer to view the ESDI fixed disk as though it had 17 instead of 34 sectors. To accomplish this, the number of logical heads is doubled. The jumper W2 on the WD1005-WAH, if present, disables this feature.

If the W2 jumper is present, follow the initialization procedure in Chapter 2, using the command:

INSTALL /SECS=34, or

follow the initialization procedure in Chapter 3, using the command:

HARDPREP /SECS=34

If the W2 jumper is not present, do not use the installation procedure presented in Chapter 2. Instead,

1. Invoke HardPrep using the command

   HARDPREP /SECS=34

   and perform the initialization using the HARDPREP program.

2. After the initialization is complete, select **Type**, **Drive(1)** or **Drive(2)**,

3. Select Manual Params.

   Use the Manual Params option to change the number of sectors from 34 to 17, and to change the number of heads to twice that of the number displayed. Leave all the other parameters as displayed.

4. Quit from the HardPrep menu, and use PartEd to continue the initialization.

AppendixC
Using SCSI Fixed Disks

SpeedStor is designed to support SCSI host adapters with a ROM BIOS that is compatible with the standard PC fixed-disk system-software interrupt. SCSI fixed-disks are connected to the PC via a host adapter.

To install a SCSI fixed disk and host adapter, follow the procedure in either Chapter 2 or Chapter 3. If SpeedStor is unable to determine the SCSI fixed-disk configuration, use the /AUTOTYPE command-line option when you invoke SpeedStor. Type:

INSTALL /AUTOTYPE for the installation proecdure in Chapter 2, or

HARDPREP /AUTOTYPE for the installation procedure in Chapter 3

Refer to section 5.1 and 6.1 for more information on the /AUTOTYPE option.

Using Seagate ST01 and Future Domain SCSI Host Adaptors

SpeedStor's design allows using these host adaptors with no special commands. To install a SCSI fixed disk drive using one of these host adaptors, simply follow the procedure in Chapter 2 or Chapter 3.

Appendix D
Jumper Options

For IBM PC AT

All fixed disks use jumper or DIP switch options, which determine how the fixed disk responds to the fixed disk controller. The options vary from one drive type to another, but usually consist of a double row of pins along the back of the drive, near the cable connector. The drive selects are commonly referred to as DS0, DS1, DS2, and DS3. (Sometimes the scheme of DS1, DS2, DS3, and DS4 is used.) When you buy a fixed disk from Storage Dimensions, option jumper DS1 has been preselected with a jumper plug for compatibility with the IBM standard controller cable. Figure 1 illustrates a Micropolis drive; Figure 2, a Maxtor drive; Figure 3, a Seagate drive.

WARNING: Handle Fixed Disk Drives Like Eggs. Dropping or rough handling could damage the drive and void any warranty.
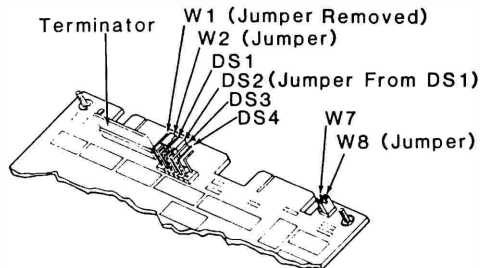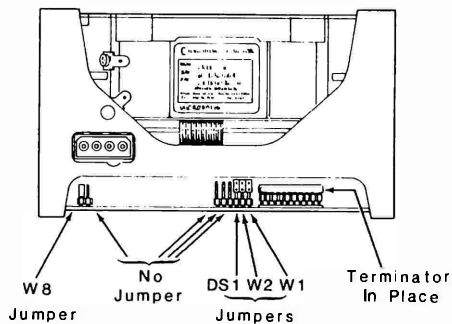
Jumper and Terminator Configuration for "Standard" AT

Figure 1   Micropolis 13XX Drive Select Jumpers

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BOARD LABEL	4C32C1	123456
FUNCTION	JUMPER BLOCK PIN NUMBERS	JUMPER BLOCK PIN NUMBERS
Drive Select 0	1.C	5,6
Drive Select 1	2.C	4,5
Drive Select 2	3.C	2,3
Drive Select 3	4.C	1,2

NOTE: Some boards have pins marked: 123456. The boards are electrically equivalent; only these labels are different. Refer to table 6 below.

TERMINATOR RESISTOR PACK
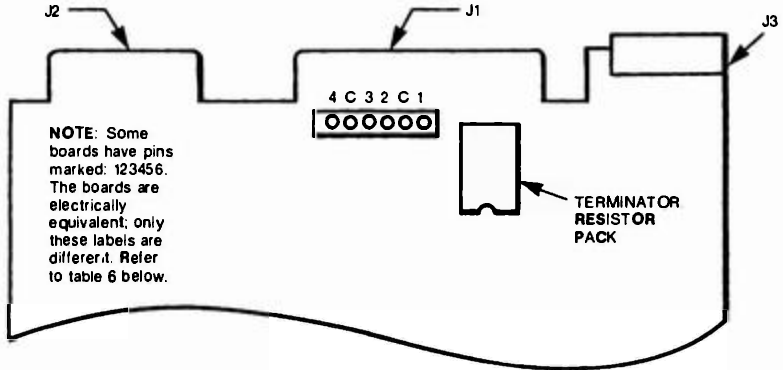
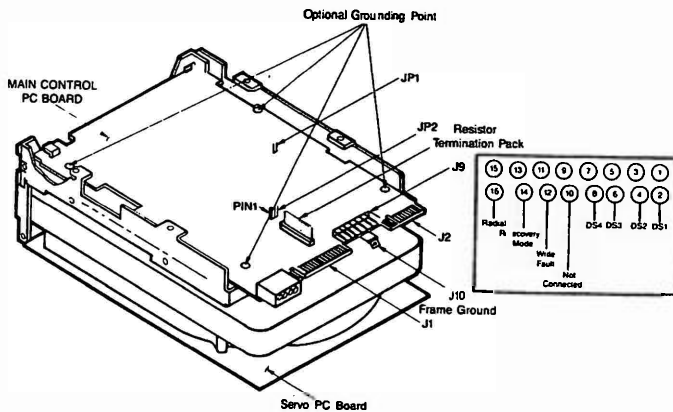Figure 2 Maxtor XT1000, XT2000 Drive Select Jumpers

Figure 3 Seagate ST4000 Drive Select Jumpers

For AT Compatibles

Non-IBM systems may use other drive-select schemes. To determine how to select the jumper options for AT compatibles, first locate the 34-conductor fixed disk control cable, which is provided with your fixed disk, or is already installed in the computer. On control cables supplied by IBM and some other suppliers, pins 25 through 29 have been inverted. If the pins are inverted, you will notice a portion of cable that has been sliced and twisted, near the end of the cable where the connector is attached. Control cables supplied by companies other than IBM may not have this inversion.

Selecting the Jumper Option

If you are using a drive whose jumpers have not been preselected (all drives shipped by Storage Dimensions have been preselected), use the jumper plugs to select the options, based on the following criteria:

* Select DS1 if the cable *does* have pins 25 through 29 inverted, regardless of whether you are installing the first or second fixed disk in the system.

* Select DS0 if you are installing the first (i.e., only) fixed disk, and the cable does *not* have pins 25 through 29 inverted.

* Select DS1 if you are installing the second fixed disk and the cable does *not* have pins 25 through 29 inverted.

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Revision C — for SpeedStor Versions 5.0 and above

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