DIAMOND EDGE

V2.50

Disk management software for Atari computers

Anodyne Software

Diamond Edge

Disk Diagnostics and Repair for Your Atari

by Roger Burrows

Anodyne Software

Diamond Edge

Manual rev 1.2 (January 2017)

This manual corresponds to version 2.57 of Diamond Edge.

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DISCLAIMER

We have tested this product as thoroughly as possible and have not found it to cause problems of any kind. Nevertheless, Anodyne Software cannot guarantee that Diamond Edge will function with all software and machine configurations, and hereby disclaims any implied warranty with respect to fitness for any particular purpose.

DEVELOPERS

Program coding by Roger Burrows.

Original design and coding by Robert Luneski.

Contents

1. Getting Started

What can Diamond Edge do for you?

Congratulations, you have just purchased the most powerful set of disk management, optimization, diagnostic, repair, and data recovery tools available for Atari systems. Among the most frequently used and least appreciated components of your computer system are your disks and disk drives; that is, until something goes wrong. Diamond Edge provides you with easy-to-use disk management, optimization, diagnostic, repair, and recovery tools. With Diamond Edge you can:

- Optimize your hard drive for reading or writing speed
- Save, restore, and edit critical disk information to repair damaged information or recover crashed hard disks
- Validate the files on your hard disk with checksums or CRCs to guarantee accuracy and detect file corruption
- Test and repair the structure of your disks. Diamond Edge can identify and repair an exhaustive range of disk problems and can recover information even from very badly damaged disks
- Map bad sectors on your hard disk to identify physically damaged portions of your disks and mark them unavailable for use. Diamond Edge will even repair and recover information from any affected files
- Recover deleted or damaged files
- Obtain critical information about your disk status
- Partition your hard disk
- Zero, wipe, and unzero partitions
- Copy partitions either as an image or defragmenting while copying
- Perform all of these functions on hard disks or floppy disks
- Test and save critical disk data on bootup, using Diamond Mirror. This makes possible the recovery of even fragmented deleted files

Installation

Before you may begin to use your new software you must complete the installation procedure. Insert your Diamond Edge distribution diskette into your floppy drive and double-click on **INSTALL.PRG**. In the displayed dialog, please enter your name and address, the product serial number and registration code (located on your distribution disk), and the hard disk partition where you want to install Diamond Edge. You also have the option of installing Diamond Mirror (we highly recommend doing so).

When you have filled in the required information, click on Install to begin the installation process. The installation program will then create a folder called **EDGE** on the specified drive and copy all of the required files to that folder. If you chose to install Diamond Mirror at this time, it will be installed in the **AUTO** folder on your boot drive. You are now ready to enjoy your new software. To begin using Diamond Edge, open the **EDGE** folder on your hard drive and double-click on **EDGE.PRG** to launch the program.

Included with your software distribution is an owner's registration card. Please take the time to fill it out completely and return it to Anodyne Software **<u>TODAY</u>!** It is very important that we be able to reach you to inform you of product upgrades and other Anodyne Software news. A completed registration card is our only way to know how to contact you. It is also a **<u>requirement</u>** to obtain product support services.

What you need to know and do first

Diamond Edge is a very powerful program. However, if used improperly, it can do as much harm as good.

IT IS IMPERATIVE THAT YOU READ THIS MANUAL COMPLETELY AND CAREFULLY TO FULLY UNDERSTAND THE OPERATION OF DIAMOND EDGE.

Items within the manual that you should pay special attention to are preceded by a check mark ✓.

✓If you do not understand an operation or the consequences of any program function, then take the time to refer to the manual for clarification. Think before you click!

Here are a few initial actions that you should take after you install Diamond Edge.

✓**CAREFULLY READ THIS ENTIRE MANUAL**

✓Create an emergency diskette, as follows (this can help you recover from many catastrophic disk situations):

- After installation, copy the EDGE folder from your hard disk to an empty formatted floppy diskette, and label it **DIAMOND EDGE EMERGENCY DISK**.
- Run Diamond Edge from the Emergency Disk.
- From the Undelete menu, select Save SCSI Mirror. Select all of your SCSI devices and then click on Save SCSI info file.
- From the Undelete menu, select Save Disk Mirror. Select all of your partitions and then click on Save.
- Quit the program and remove your Emergency Disk from the floppy drive, enable the write protect tab, and then store it in a safe place. You should update the disk mirror information weekly and the SCSI mirror information whenever your partitions change.

✓**CAREFULLY READ THIS MANUAL AGAIN!**

✓Think before you click! When in doubt, please re-read the appropriate manual section. Remember that if improperly used, the tools in this program can cause irrecoverable data loss. Always back up your disk before performing any diagnostic or repair function.

✓Backup your hard drive - FREQUENTLY! Diamond Edge will assist you in recovering from many catastrophic disk situations and regain speed through optimization; however there is NO substitute for a valid up-to-date backup. To make this job as pleasant and as fast as possible, we suggest that you use CDbackup or Diamond Back.

2. The Anatomy of a Disk

The disk drives in your Atari system are as amazing and mysterious as any part of your computer. The following is intended as a basic primer to Atari disk structure. It does not represent an exhaustive or totally comprehensive treatment, but is intended solely to provide enough understanding of your disks to fully utilize the power of Diamond Edge.

A basic level of computer knowledge is required to fully understand this section. The user should be familiar with basic storage elements such as bits, bytes, and hexadecimal representation of numbers (denoted by a leading 0x). If you are not familiar with these concepts, we suggest that you refer to any good introductory programming book.

Disk Media and Interfaces

There are two basic types of disks that Atari systems can access: floppy disks and hard disks. All of Diamond Edge's functions are usable on either type of disk. Floppy disks for the Atari come in 360K, 720K and 1440K capacities. To save repetition, we will mostly discuss disk structures in terms of hard disk partitions, but you should note that the disk structures on a floppy are analogous to those within a hard disk partition.

Hard disks are the primary storage system for most Atari users. Unlike floppy disks, hard disks are rigid platters that rotate over fixed heads. The read/write heads never actually come into contact with the disk medium, but ride on an extremely thin cushion of air. If the heads ever do come in contact with the platters, for instance as a result of bumping your hard drive, you will probably experience significant loss of data. This is known as a head crash and can ruin your hard drive.

Atari systems communicate with the hard drive via an interface protocol. On systems prior to the Atari TT, the interface protocol was the Atari Computer Systems Interface (ACSI). This is similar to, but not identical to the industry standard peripheral communication protocol called the Small Computer Systems Interface (SCSI). Both the TT and the Falcon support the SCSI interface directly (the TT also supports ACSI).

Most hard drive manufacturers produce hard drives that communicate with the host computer using the standard SCSI protocol. Because the ACSI protocol is not exactly like the SCSI protocol, Atari ST systems require a communication translator to convert the native ACSI protocol to the standard SCSI protocol that the hard drive understands. This is commonly referred to as a host adapter. A number of companies, including Atari, Supra Corp., ICD Inc., and Berkeley Microsystems manufactured ACSI host adapters for the Atari.

Some older hard drive systems were built using IBM PC-compatible MFM or RLL hard drives. These drives not only require the ACSI host adapter to translate ACSI to SCSI, but also require an additional communication translator to convert SCSI commands to MFM/RLL commands. The two translations of commands combined with the general poor performance of MFM drives make these systems extremely slow.

Physical Sector 0

The basic unit of storage on a hard disk is the physical block or sector. The standard size of physical sectors is 512 bytes. The most important sector of all is physical sector 0. This is where the information is stored that tells the hard disk driver how the drive is partitioned and how to access the information stored on the drive. The hard disk driver software reads this sector to determine the logical layout of the physical disk.

The Partition Structure

The partitioning information appears in physical sector 0 in the following format. All offsets given are in hexadecimal values from the start of the sector.

Component	Offset
Total Hard Disk Size	0x1C2
Partition 1 Structure	0x1C6
Partition 2 Structure	0x1D2
Partition 3 Structure	0x1DE
Partition 4 Structure	0x1EA
Start of Bad Sector List	0x1F6
Size of Bad Sector List	0x1FE

Each partition structure contains the following information:

Component	Size
Partition Flag	1 byte
Partition Identifier	3 bytes
Partition Starting Sector	4 bytes
Partition Size	4 bytes

The partition flag defines whether the partition is active and whether the partition is bootable. When set, bit 0 indicates the partition is active and bit 7 indicates that the partition is bootable. Bits 1-6 are currently not used.

The partition identifier is a three-character identifier that is used to classify the type of partition. There are three standard types of partitions recognized: GEM, BGM, and XGM.

A GEM partition is the original type of disk partition. The logical sector size is the same as the physical sector size: 512 bytes. GEM partitions can be as large as 16 megabytes under TOS 1.0 and 1.02, and 32 megabytes (with the right driver) under TOS 1.04 or above.

BGM stands for Big GEM partition. This format is used to create partitions larger than a GEM partition. The TOS operating system has a limitation on the number of allocation units that can be accessed in a single partition. To circumvent that limitation, and to create larger partitions, the logical size of these allocation units is increased. One logical sector can contain many physical sectors. The logical sector size is 512 bytes times a power of two; i.e. logical sectors can be 512, 1024, 2048, 4096, etc. bytes long. The hard disk driver software then converts the request for a logical sector to the appropriate physical sector.

XGM stands for Extended GEM partition. The original Atari hard disk specification as shown above was limited to 4 partitions per hard disk. To get around that limitation, Atari introduced extended partitions. The XGM entry points to a location on the hard disk where another pseudo-physical sector 0 resides that describes the location and size of additional partitions. These additional pseudo-root sectors can be chained together to create as many partitions as are required.

Other partition types have been defined by a variety of different operating environments outside of TOS. ACK and OOP are used as identifiers for Spectre partitions. OS9 is used as the partition identifier for the OS9 operating system.

The remaining entries in the partition structure pertain to the partition size and location. The starting sector is the starting physical sector of the partition. The partition boot sector always resides in the first logical sector of the partition. The sector size is the total number of 512 byte physical sectors in the partition.

Vendor Specific Considerations

Several third party hard disk host adapter vendors developed an extended partitioning scheme prior to the release of Atari's XGM standard. In particular, Supra Corporation and ICD hard drives support this standard. The basic difference is that these vendors allow up to 12 individual partition structures to be specified in physical sector 0 before an extended partition, as described above, is required. The format of the partition information structure is identical, there are just more allowed in each sector. The offsets of these additional partition structures are as follows:

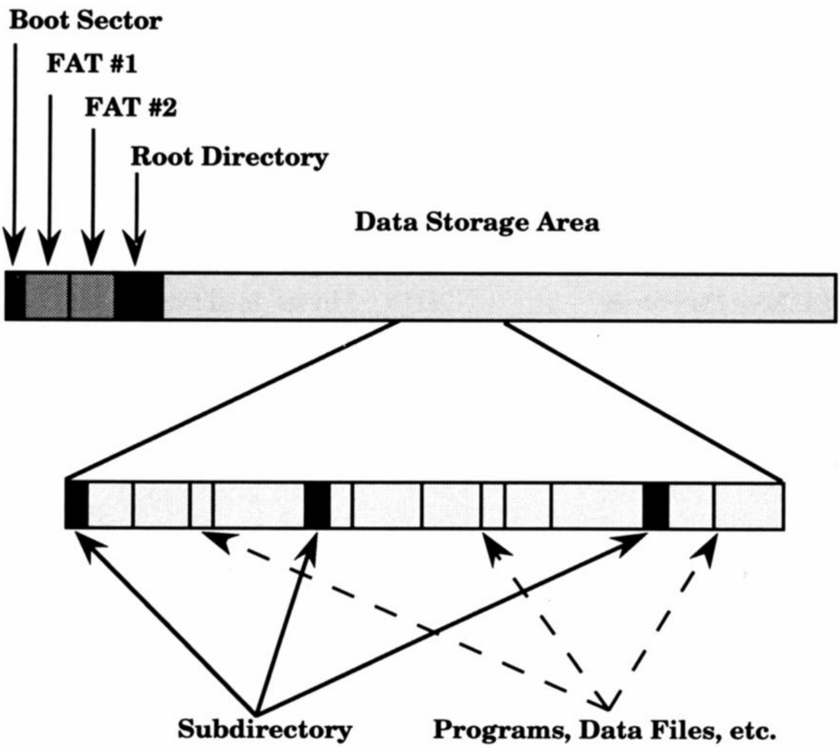
Third Party Partition Extensions

Component	Offset
Partition 5 Structure	0x156
Partition 6 Structure	0x162
Partition 7 Structure	0x16E
Partition 8 Structure	0x17A
Partition 9 Structure	0x186
Partition 10 Structure	0x192
Partition 11 Structure	0x19E
Partition 12 Structure	0x1AA

It is important to note that an ICD or Supra hard disk driver can access all of the partitions of a hard disk partitioned according to the Atari standard. However, the converse is not true. An Atari hard disk driver can only access the first four partitions on an ICD or Supra formatted drive.

Inside a Disk Partition

The internal structure of a disk drive partition is really not as complicated as it seems. It is organized via a controlling boot sector that tells the hard disk driver how big the drive is and where to find key partition information. Information about files and file attributes is stored in directory sectors. The information about where files are physically located in the partition is contained in the File Allocation Table or FAT. A diagram of a partition is on the following page.



The Boot Sector

The boot sector is one of the most important sectors in a partition. The boot sector always occupies logical sector 0 of the partition. It provides the hard disk driver with all of the parameters necessary to access information in the partition. Most of the information in the Diamond Edge Disk Information screen is derived from the boot sector. The items in the boot sector and their significance are described below; all offsets within the sector are given in hexadecimal.

Most of the information stored in the boot sector is coded in 8086 or Intel format. For a word value, this means the first byte represents the low byte of the word and the second byte represents the high byte of the word. This is the opposite of a Motorola format word, which is stored high byte first and low byte second. Atari systems use the Intel encoding in the boot sector because the Atari disk structure is derived from, and is compatible with, the IBM PC's disk structure.

Boot Sector Contents

Item	Offset	Length	Comments
Branch to Code	0x00	2 bytes	Used if bootable
Filler	0x02	6 bytes	Manufacturer's ID
24 bit Serial Number	0x08	3 bytes	Used for media change
Bytes per Sector	0x0B	2 bytes	Intel format
Sectors per Cluster	0x0D	1 byte	Generally 2
Reserved Sectors	0x0E	2 bytes	Intel format
Number of FATs	0x10	1 byte	Generally 2
Root Directory entries	0x11	2 bytes	Intel format
Total sectors	0x13	2 bytes	Intel format
Media Descriptor	0x15	1 byte	Ignored by Atari BIOS
Sectors per FAT	0x16	2 bytes	Intel format
Sectors per Track	0x18	2 bytes	Intel format
Number of Sides	0x1A	2 bytes	Intel format
Number of Hidden Sectors	0x1C	2 bytes	Intel Format
Checksum Even out	0x1FE	2 bytes	Used if Bootable

The first item that relates to the partition structure is Bytes per Sector. If you look at this and find the value 0x0002, this is really 0x0200 or 512 bytes per sector. If the partition were a BGM partition, you might find the low-byte/high-byte value 0x0008 at offset 0x0B. Decoded this is 0x0800 or 2,048 bytes per sector. Remember that to get partitions with higher capacities, TOS increases the logical size of the sectors. Physical sectors are always 512 bytes.

The next item in the boot sector is Sectors per Cluster. Typically, there are 2 sectors per cluster. A cluster is the basic disk allocation unit. All space allocated to files is allocated in whole numbers of clusters and the smallest number of clusters allocated to a non-zero length file is one. For standard GEM partitions with 512-byte logical sector sizes, this means that a small file will consume 1 cluster = 2 sectors = 1,024 bytes of disk capacity regardless of whether the file is 1 byte long or 1,024 bytes long. One of the disadvantages of BGM partitions is inefficient disk utilization. The same 1-byte file that occupied 1,024 bytes on a GEM partition would occupy 4,096 bytes on a BGM partition with 2,048 byte sectors.

The number of Reserved Sectors is the number of sectors reserved at the start of the partition including the boot sector. This value is typically one. The number of File Allocation Tables is typically two; these structures will be described in a later section.

The next entry is the maximum number of root directory entries. Unlike subdirectories, the root directory has a fixed size. Since each directory entry occupies 32 bytes, the number of logical sectors occupied by the root sector can be calculated from this value. The next entry is the total number of logical sectors in the partition. This includes the boot sector, FAT tables, and root directory sectors. The number of sectors per FAT is given in the next entry. The remaining entries, Sectors per Track and Number of Sides, pertain to the physical properties of floppy disks and are generally left as zero in the boot sector of a hard disk partition.

With the data presented so far in the boot sector, the operating system has all of the information required to calculate and locate specific controlling structures, as follows. The sector numbering convention always has the boot sector as sector 0. The starting logical sector of the first FAT is then 0 + # of reserved sectors. The start of the second FAT is # of reserved sectors + # of sectors per FAT. The start of the root directory sector is # of reserved sectors + (# of FATs times # of sectors per FAT). And finally the starting logical sector of the data storage area is # of reserved sectors + (# of FATs times # of sectors per FAT) + # of root directory sectors. All of the sectors allocated to the boot sector, FAT tables, and root directory sectors are called control sectors; the remaining sectors are called data sectors.

The File Allocation Table (FAT)

Now that we know where to find all of the control structures, it is time to examine the most critical one. In fact, it is so critical that the operating system maintains two independent copies of it to guard against corruption and unrecoverable loss of data. The File Allocation Table is used to store information about where files reside in the partition and what space is available for use. Simply stated, the File Allocation Table is a road map to tell the operating system where to find the data for existing files, and where it can put new ones.

The value of each entry in the FAT is encoded. Atari TOS supports two styles of encoding for the FAT: 12-bit encoding and 16-bit encoding. 12 bit encoding is generally used for small capacity (no more than 4096 clusters) storage media such as floppy disks and RAM disks because it reduces the size required for the FAT. In this encoding scheme, two FAT entries occupy three bytes, whereas in 16-bit encoding each FAT entry occupies two bytes. Decoding a 12-bit FAT is quite complicated;

however 16-bit FAT encoding is simply the Intel encoding (low byte-high byte) described earlier.

The first cluster available for data storage is defined as cluster number 2. For each file, the value of each entry in the FAT is the next cluster containing data for that file.

There are several special values that a FAT entry can have:

Special FAT Values

12-bit value	16-bit value	Meaning
0xFFF	0xFFFF	End of File
0xFF7	0xFFF7	Bad Sector
0x000	0x0000	Free Sector

The operating system uses the FAT to find where files are and to determine where it can place new files. When a new file is added to the partition, the operating system looks at the FAT to find the first FAT entry with a value of 0. If the amount of contiguous free space is insufficient to hold the file, then the operating system will look for the next available free space (thus creating a fragmented file). This process continues until enough clusters have been allocated to hold the file. Based on this information, the operating system creates a FAT chain for the file and makes the appropriate entries in the FAT.

Each file in the partition has an associated FAT chain. The FAT chain is the structure that the operating system uses to locate all of the clusters associated with a given file. For any given file, the value of each entry in the FAT "points" to the next cluster belonging to that file (the next cluster in the FAT chain).

As an example, suppose a file occupies clusters 10, 11, 12, 16, and 22. The file's FAT chain would look like this: FAT[10] = 11; FAT[11] = 12; FAT[12] = 16; FAT[16] = 22; FAT[22] = 0xFFFF. The process of going from FAT entry to FAT entry until you reach the end of the file is called "walking the FAT chain".

We now know how to walk the FAT chain, to locate all of the clusters belonging to a file. But where do we start our walk? The answer resides in the directory sectors.

The Directory Sectors

The last special control structure used by the operating system is the directory sector, which consists of multiple directory entries. There are two types of directory sectors: the root directory and subdirectories. The only differences between the root directory and subdirectories are in expandability and location; the format of the directory entry is the same in both.

The root directory is a control structure that lies outside of the “data” area and is not expandable. When you partition your disk, the maximum number of root directory entries is set and recorded in the boot sector. On the other hand, subdirectories are really a special kind of file with their own FAT chain. Space for subdirectories is allocated as needed, lies within the data storage area, and consumes available disk space. Although some versions of TOS limit the number of files in a subdirectory that can be viewed from the desktop window, there is essentially no limit to the number of files you can have in a subdirectory.

Directory sectors contain multiple directory entries. Each directory entry is 32 bytes long and contains all of the information about the file. The elements of the directory entry are as follows:

Directory Entry Contents

Element	Offset	# of Bytes
Filename	0x00	8
Extension	0x08	3
Attributes	0x0B	1
Reserved	0x0C	10
Time	0x16	2
Date	0x18	2
First cluster	0x1A	2
File size	0x1C	4

The first field contains the filename. This typically contains only uppercase ASCII letters and numbers. If there are less than eight characters in the filename the remaining places are filled with the ASCII character 0x20 (space). The filename extension occupies the next three bytes and is also filled with spaces if necessary.

Note that the dot in a file name is not stored in the directory sector but is added by the operating system. Thus the filename READ.ME would be stored as READ(space)(space)(space)(space)ME(space). When a file is deleted, its directory entry is modified by changing the first character of the filename to 0xE5.

The next field is the file attribute byte. It contains a bit code of the attributes of the file. The meaning of the bits is as follows:

File Attributes

Bit	Value if set	Meaning if set
0	0x01	Read Only
1	0x02	Hidden File
2	0x04	System File
3	0x08	Volume Label
4	0x10	Directory
5	0x20	Archive Bit
6		Reserved
7		Reserved

The value recorded in the directory entry is the result of "ORing" all of the applicable attribute bits together. So the attribute byte for a read-only hidden file that needs to be backed up (archive bit set) would be 0x01 | 0x02 | 0x20 = 0x23. A normal file has a file attribute of zero. The next ten bytes of the directory entry are reserved for future use.

The next two entries are the file creation/modification time and date. These entries are stored as bit encoded (to save space) Intel format words. The next entry contains the answer to the question we asked when discussing the FAT: where to start the walk of the FAT chain, i.e. the number of the first cluster of the file. This is stored as an Intel encoded word. The last element of the directory entry is the file size. The file size is 4 bytes long and is stored as an Intel format long word.

In every subdirectory there are two special entries that are always the first two entries in the directory: "." and ".." The entry "." represents the current directory and contains all of the location information for the current directory. The entry ".." represents the parent directory (directory that contains a directory entry pointing to the current subdirectory) and contains all of the location information for the parent directory.

Space for subdirectories is allocated one cluster at a time. As mentioned before, each directory entry takes 32 bytes of disk space. So when the number of files added to the subdirectory equals (#of bytes per cluster/32), another cluster needs to be allocated to the subdirectory before any more files can be added. To expand a subdirectory, a free cluster is found and the FAT chain for the subdirectory is updated to include that cluster. This process of expansion is essentially limitless (subject to partition capacity).

It is important to note that the very process of expansion creates a special kind of disk fragmentation: Directory Fragmentation. As the directory is expanded, the added directory clusters are almost never contiguous. This means that the operating system has to move the disk head all over the partition just to get information about a single subdirectory. Significant levels of directory fragmentation seriously impact disk performance. You can detect directory fragmentation by observing the order in which Diamond Edge's fragmentation map is generated.

Causes of Disk Damage

Damage to data on your disks can result from hardware failure, magnetic media errors, software bugs, computer viruses, human error, or acts of nature.

Hardware

Hardware is those parts of the computer that you can see and touch such as the keyboard, mouse, disk drives, and the computer itself. Most hardware failures do not result in permanent data loss. However, if the device that failed was a disk drive the potential for data loss is much greater. We need to distinguish between two types of drive failures: permanent and temporary. A permanent failure means that nothing can be done to recover the data because the disk cannot be accessed. The read/write heads not moving is an example of this. This is quite different from a temporary failure such as the destruction of the disk partitioning information. With the tools provided by Diamond Edge, you have a very good chance at full data recovery in the latter case.

Magnetic Media

Magnetic media are the magnetic disk materials that are used to store your information. Media errors occur when there is an area of the disk that does not hold the magnetic charge properly. Weak or damaged disks often function completely normally until you attempt to read or write data to the damaged areas. This can lead to an error condition known as flipped bits. A bit can be a 1 or a 0. If the magnetic media is weak, then a bit can be a 1 the first time it is read and change to a zero the next time it is read. You can use Diamond Edge's Map Bad function with multiple passes to detect and mark bad sectors as unavailable for use.

If you detect bad media on a floppy disk, we recommend that you copy the remaining information to another disk and throw the bad disk away. Once disk media weakens you will continue to experience data loss, often unrecoverable. Your data is worth more than the cost of a new floppy disk.

Software and Viruses

Software-related problems consist of “bugs” in user applications, conflicts between concurrently running applications, or computer viruses. Bugs are defects in application software that can potentially lead to disk damage. If a program “crashes” with one or more bombs while writing to the disk, it can leave the disk in a corrupted state. If this occurs, it is advisable to run Disk Medic immediately to assess any possible damage.

Conflicts between concurrently running programs can occur even in plain TOS systems, since TOS supports cooperative multitasking via desk accessory (DA) programs. Bugs in an AUTO folder program or DA can cause random crashes in an application program. If you suspect a conflict, reboot your computer with no DAs or AUTO folder programs active. Then add one DA or AUTO folder program at a time, rebooting in between, until you identify the conflict. If a conflict causes a crash you should run Disk Medic to assess any possible damage.

Computer viruses are another type of software threat to your disks. Viruses enter your system through boot sectors of floppy disks or attached to otherwise benign application programs. They become active and spread throughout all of your disks each time the program or triggering mechanism is run.

Human Error

Absolutely the most common cause of data loss is human error. This can result from overwriting a newer version of a file with an older version, accidentally deleting an important file, or performing a disk operation that you didn’t really want to do. Diamond Edge provides many tools to assist you in recovering from human induced loss of data.

Acts of Nature

If the power goes off or power ‘spikes’ occur while performing disk read/write operations, you will likely have a corrupted file or disk structure. Never operate your computer when there is an electrical storm in your general vicinity. If you can see it or hear it, shut down immediately.

Always ensure that you have a stable power source. Installing surge protectors and line noise filters is an excellent protection against this type of data loss. An Uninterruptible Power Supply (UPS) is even better. Note that a surge protector on your electric line is not always enough. If you have a modem connected to your computer then you also need a surge protector on your phone line. Many a “surge protected” computer system has been fried by surges coming over the phone lines from lightning strikes.

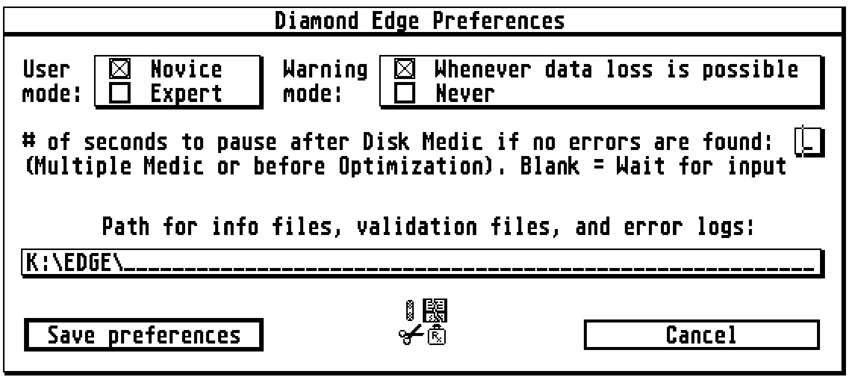
The disk drives in your Atari system are as amazing and mysterious as any part of your computer. This primer to Atari disk structures was not intended to be an exhaustive treatment of the subject. We hope you now have a greater appreciation for the complexity of disk drive structure and enough understanding of your disks to fully utilize the power of Diamond Edge.

If nothing else, we hope that this greater understanding of disk structure convinces you of the high probability of eventually experiencing disk structure corruption. The best protections against disk structure corruption are regularly updated disk information and mirror files and a current up-to-date hard disk backup.

3. Using Diamond Edge

Preferences

General program preferences may be set through the **Preferences** item under the **File** menu. These preferences are automatically set during the installation process and you may modify them at any time. Various function-related preferences are set via selecting or deselecting menu items in the **Medic**, **Optimize**, and **Undelete** menus.



To save the current set of preferences, select **Save preferences**; to exit without any modification to the current preferences, select **Cancel**.

✓Note that **all** of the currently selected preferences are saved in the configuration file. This includes options set by menu check marks.

User Mode

The User Mode defines the level of experience with disk functions that **you** say you have. There are two levels: **Novice** and **Expert**. Although all program functions are available to all users, you will receive additional warnings and explanations of the effects of your actions if you choose **Novice** mode. If you choose **Expert** mode, it is assumed that you know what will happen when you select an action. Be certain that you do!

Warning Mode

The Warning Mode affects the amount of warning that you will receive before the program performs certain types of actions. There are two types of warning modes: **Whenever data loss is possible** and **Never**.

Note that even if you select Expert mode and Never warn, you will still receive warnings before critical actions, such as repartitioning your hard disk or zeroing drive C.

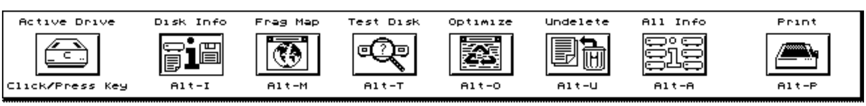
✓Until you are very comfortable with the operation of Diamond Edge, it is strongly suggested that you select both Novice user mode and Warn whenever data loss is possible.

Medic Pause Delay

There are many situations (such as when no errors are found) where automatic continuation after a Disk Medic pass is convenient. If you enter a value (0 to 9) here, Diamond Edge will pause for that number of seconds between displaying the Disk Medic Report and continuing with the next task. If you leave the value blank, the program will always wait for user input before continuing. The program will also wait for user input if any disk errors are found during a Disk Medic pass.

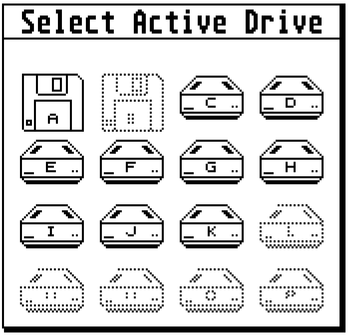
The Active Drive

When you start Diamond Edge, the basic disk information window is displayed. At the bottom of the window is the window function block or button bar shown below.



There is one operating principle that applies to nearly every program function: the **Active Drive**. The button bar contains a set of buttons that operate on the **Active Drive**.

✓**ALMOST ALL PROGRAM FUNCTIONS ARE PERFORMED ON THE ACTIVE DRIVE**. The only exceptions to this rule are the SCSI level operations and Disk-to-Disk copy operations.



To change the Active Drive, select the Active Drive icon in the button bar, and click on the appropriate drive button within the popup window. Alternatively, you can switch active drives directly from the main window by pressing the keyboard letter corresponding to the desired drive.

If your system contains a CD-ROM drive, and the drive letter assigned to it is **not** greyed-out in the popup window, do not attempt to select it as the active drive. If you do, you will receive error messages because the disk structures on a CD are not the same as those on a hard disk. If you are using a current CD-ROM driver this will not occur, since Diamond Edge will detect the presence of CD-ROM drive(s) and automatically mark them as not selectable.

Online Help

Online help is available via the **Help** menu, or by pressing the corresponding function key (F1 thru F5). When the help text is displayed, the following keys control movement through the text:

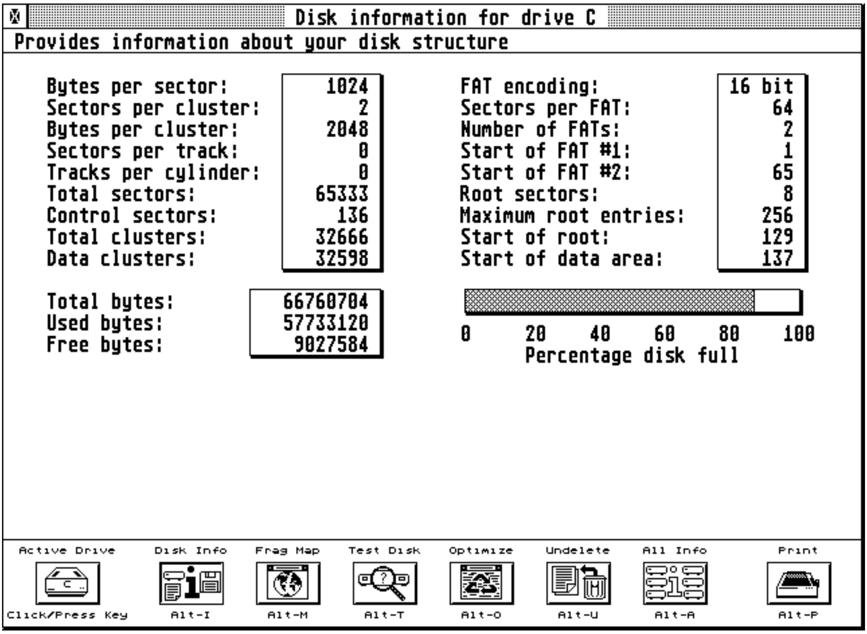
- up/down arrow: move up or down a line
- shift-up/down arrow: move up or down a page
- Home: move to first line in help
- Esc: exit viewing

Alternatively, you may use the mouse for some of these functions:

- left button: move down a line
- right button: move down a page

The Disk Information Display

When you select **Disk Info** from the button bar (or press Alt-I), critical disk information is displayed for the Active Drive.

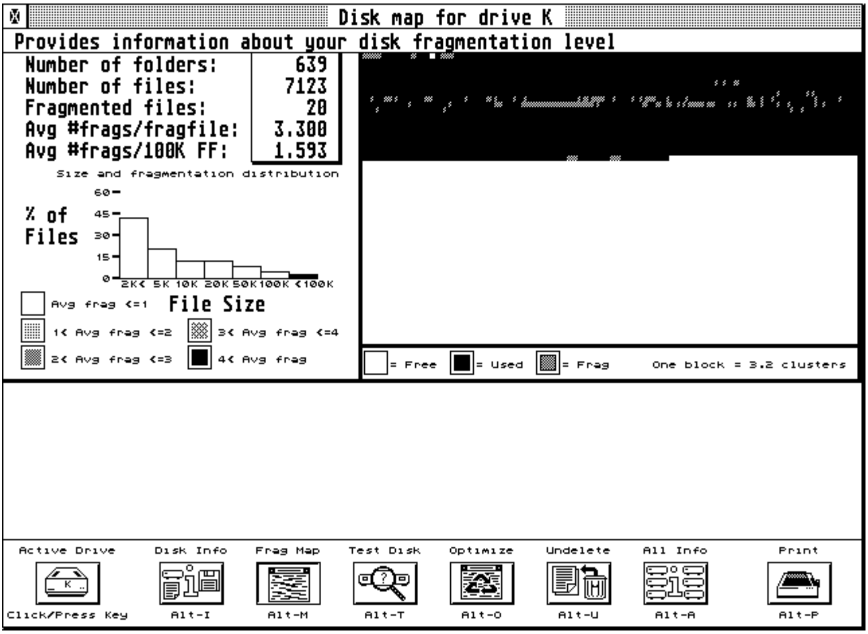


For a complete description of all of the items contained in this display, please refer to "Inside a Disk Partition" in Chapter 2.

The Disk Fragmentation Display

Selecting **Frag Map** from the button bar (or pressing Alt-M) will create a visual display of the fragmentation level of the active drive, as well as showing additional drive statistics. Fragmentation occurs when parts of a file or folder become spread across a hard disk partition (or a floppy disk) in different locations. This occurs as a normal by-product of creating files, deleting files, and adding more files.

When a file is created, the operating system looks for free space on your disk for the new file. When it finds some free space, it allocates the space to the new file. When that space is filled up, the operating system looks for additional free space. If that free space is not contiguous with the currently used space, the result is a fragmented file. Files may occupy multiple fragments, as dictated by the available areas of free space.



As files are added and deleted, your disk will become very badly fragmented. The end effect of disk fragmentation can be a significant reduction in hard disk performance. The speed of hard disk reads and writes will become slower, file searches, copies and deletes will take longer. In fact, all disk operations will become significantly slower. The degradation in performance occurs slowly over time and you may not even notice it. Disk performance may not be much slower today than it was yesterday, but it's likely to be a lot slower than it was a month ago!

A unique feature of Diamond Edge's fragmentation map is the way that the visual display is generated. The fragmentation map is generated in the order that an actual folder search would take. What you see is not only the amount of file fragmentation on the drive, but also the amount of folder fragmentation. If you have a heavily fragmented drive, you might notice that the map fills in at seemingly random locations. This demonstrates how hard your disk has to work to perform a simple folder search.

The Disk Fragmentation Map also displays a number of useful drive statistics and graphs that allow you to assess the fragmentation level of your disk. For the purposes of the statistics, each interruption to the consecutive assignment of clusters to a file is defined as one fragment. So a file that is separated into two pieces on the disk has 1 fragment, a file that is separated into three pieces on the disk has 2 fragments, etc. A file that has all of its clusters consecutive on the disk has no fragments.

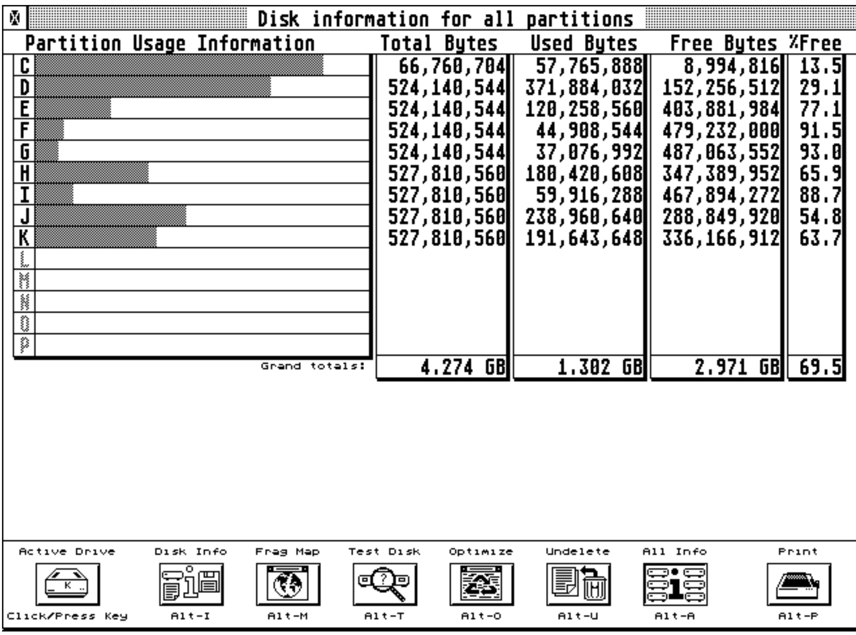
The summary statistics shown include the total number of folders, the total number of files, and the total number of fragmented files on your drive. Additional information is provided for the fragmented files: the average number of fragments contained in each fragmented file, plus the average number of fragments contained in 100K bytes of fragmented files.

The graph in the Disk Fragmentation Map display is a relative frequency histogram showing the distribution of the sizes of files on your drive and the average fragmentation level for each size class. Each bar represents a range of file sizes and the height of the bar shows the percentage of the total number of files on your drive that are in that size category. The shading on each bar represents the average number of fragments for files contained within that size category.

This information is useful in determining the level and severity of fragmentation. It provides you with a quick summary of how much fragmentation you have, where the fragmentation is, and what type of files it affects. This information can be used to determine whether it is necessary to optimize the drive to regain performance.

The All Partitions Information Display

Selecting **All Info** (Alt-A) provides a list of the capacities of all of your hard disk partitions, as well as the current usage. Total capacity, bytes used, bytes free, and percentage bytes free are given for each partition individually. The total for all your partitions is displayed at the bottom of the All Partitions Information display.


Disk information for all partitions

Partition Usage Information	Total Bytes	Used Bytes	Free Bytes	%Free
C	66,760,704	57,765,888	8,994,816	13.5
D	524,140,544	371,884,032	152,256,512	29.1
E	524,140,544	120,258,560	403,881,984	77.1
F	524,140,544	44,908,544	479,232,000	91.5
G	524,140,544	37,076,992	487,063,552	93.0
H	527,810,560	180,420,608	347,389,952	65.9
I	527,810,560	59,916,288	467,894,272	88.7
J	527,810,560	238,960,640	288,849,920	54.8
K	527,810,560	191,643,648	336,166,912	63.7
L				
M				
N				
O				
P				
Grand totals:	4.274 GB	1.302 GB	2.971 GB	69.5

✔ If you have some drive letters assigned to CD-ROM drives and you are **not** using a modern CD-ROM driver, Diamond Edge may attempt to access these drives as though they were hard disk partitions, resulting in error messages.

Print

You can print out the information from any of the displays listed above by selecting **Print** (Alt-P) from the button bar. It is a good idea to have a printout of all your critical disk information for emergency recovery purposes.

4. Disk Diagnostics and Repair

One of Diamond Edge's primary functions is to protect against, identify, and repair damage to your disks and files. A wide variety of tools are provided to assess the state of your disks and to repair them. Each tool is designed to identify particular types of disk or file damage. The regular use of all of these tools will provide you with excellent protection against data loss and early warning of potential trouble.

File Validation

Creating Validation Files

The first disk protection technique is file validation. The process of file validation involves the creation of a reference validation file. This is a file that contains, for each file on the active disk, all of the file attributes (name, date, time, size, etc.), plus a reference number that represents the contents of that file. Diamond Edge provides both 16-bit Cyclical Redundancy Check (CRC) and 16-bit Checksum methods of calculating the reference number.

✓When creating a validation file, note that creating and checking checksums is marginally faster than doing the same for CRCs. However, CRCs provide greater security, so in most cases we recommend the use of CRCs, particularly on faster systems such as Falcons and TTs.

To create a validation file for the active drive, select **Create CRC File** or **Create ✓Sum File** from the **Medic** menu. By default, the **Ignore Program Headers** option is set, which causes the CRC/checksum calculation to exclude the first few bytes of each file. The purpose of this is to ensure that changing just the execution flags of a program (e.g. to make it run in TT RAM) will not cause a false validation error.

Whichever method you choose, the validation file will be automatically created in the folder specified in the Preferences dialog. Validation files are named DRIVE_X.VAL where X is the relevant drive.

Validating Files

The second part of the file validation process is to use the CRC or checksum file to verify that the files have not become corrupted over time. This is useful to perform on a periodic basis to determine if any random data corruption has occurred on your disk. It is especially useful after you have had a major disk corruption/crash, in order to determine what files were affected.

To perform a validation of the active drive, select **Validate Files…** from the **Medic** menu. If a validation file for that drive exists in the default location, it will be used; otherwise, a standard GEM file selector will be displayed, prompting you for the reference validation file to use. After the validation file is selected, you will be asked what action to take when Diamond Edge encounters a file that is not in the reference validation file. You may choose to automatically add the new file to the existing validation file; to skip all new files; or to be prompted for action each time such a file is encountered.

✓At any time during the creation of a validation file, or during file validation, you may pause the process to study the screen by selecting **Control-S**; to resume the process, select **Control-Q**. You may abort the entire process by selecting **Control-C**.

What to do if a Validation Error is found

✓A file validation error occurs when the calculated CRC or checksum value does not match the value stored in the reference validation file. Each time this occurs the name of the affected file will be recorded in a file named VALID_**X**.ERR where **X** is the drive concerned. At the end of a validation run, you will be notified if any errors were recorded.

✓If a validation error is recorded, **DON'T** panic. After the validation is complete, view the affected files recorded in the validation error file. Even though a validation error is observed, you may not actually have a corrupted file. Many programs (especially **AUTO** folder programs) embed configuration information within the programs themselves. When they update the configuration information, these programs often do it in a way that doesn't change the file's size, date, or time stamp. However, the bytes within the program have changed and this will trigger a false file validation error. Other types of files that modify themselves without updating the size, date or time stamp include some database files and files from the Atari Resource Construction program.

Testing Your Disk Structure

Diamond Edge provides the most comprehensive set of disk diagnostic and repair tools for your Atari. Diamond Edge has the capability to automatically detect and correct any type of disk structure problem and return even heavily damaged disks to full functionality.

✓As with all of Diamond Edge's functions, the Disk Medic can be performed on either floppy disks or hard disk partitions. We strongly recommend that you run Disk Medic on **ALL** of your hard disk partitions at least once a week. Another way of performing the same function is through the use of the Test option of Diamond Mirror: refer to "Configuring Diamond Mirror" in Chapter 6 for further details.

Diamond Edge’s Disk Medic will check for (and correct if Fix is selected) the following types of disk structure errors:

- **Invalid Boot Sector:** This sector tells the operating system what the disk structure looks like and where to find things. If the boot sector is invalid, then you will have to reinstall a valid boot sector using the Install boot sector function before you can continue (see Chapter 4).
- **Inconsistent FAT #1 and FAT #2:** If FAT #1 does not match FAT #2 then you will be given the option to use one or the other FAT for the Medic pass. FAT means File Allocation Table; please see Chapter 2 for a full description.
- **Invalid directories:** A directory sector is either improperly terminated (the next cluster entry in the FAT points to an invalid cluster) or does not contain valid directory entries. Invalid directories are truncated (if improperly terminated) or deleted.
- **Unreadable directory sectors:** A directory sector could not be read due to physical disk damage. Readable portions of the affected directory sector chain are adjusted to eliminate the unreadable portion; if no sectors are readable, the directory is deleted from the parent directory.
- **Illegal filenames:** A filename contains one or more characters that are not normally allowed. Illegal characters are replaced with an X or left unchanged depending on user preference. An illegal filename error is also triggered if there are two or more files in the same directory with the same name.

- **Bad directory entries:** An entry within a directory sector cannot be recognized as a directory entry. Bad directory entries are deleted.
- **Inconsistent file size:** The file size contained in the directory entry does not match the number of clusters allocated for the file on the disk. When fixed, the file size is adjusted to reflect the number of clusters that the file actually occupies on the disk.
- **Bad FAT entries:** An entry in the FAT points to an illegal or nonexistent cluster. Files with a FAT chain containing a bad FAT entry are truncated and their file size adjusted.
- **FAT chain collisions:** The FAT chains of two or more files contain the same clusters. Independent copies of all affected files are made, creating a valid FAT chain for each file. The user will subsequently need to determine which of the affected files were corrupted by the collision.
- **Lost clusters:** A cluster that is marked as allocated in the FAT does not belong to any of the files currently on the disk.

One more statistic is listed in the Disk Medic report, but is not a disk structure error: **Bad clusters**. This is the number of clusters in the FAT that were previously marked bad, typically by partitioning software or by the Map Bad Sector function of Diamond Edge.

Disk Medic Options

The actions of Disk Medic are controlled via options in the **Medic** menu. If you select **Auto-Fix Errors**, Diamond Edge will automatically correct all disk errors found during the Disk Medic evaluation of the active drive. A log of all errors found will be written to the file MEDIC_**X**.ERR where **X** is the active drive (Disk Medic error files are saved in the folder specified in the Preferences dialog). After the Disk Medic pass, you may view the error file for information on what errors were found and fixed. Error files are for information only and may be safely deleted after exiting Diamond Edge.

✓ If you do **not** select **Auto-Fix Errors**, Disk Medic will perform a test pass on the active drive first. If errors are found during the test pass, Disk Medic will then pause and allow you to view the error file from the Disk Medic Report to find out what errors were found and what files are affected. At this point you may either cancel without fixing the errors or instruct the Disk Medic to fix the errors in a second pass.

One of the types of disk error that Disk Medic can fix is illegal filenames. Filenames that contain characters **other** than A-Z, 0-9, or _ (underscore) can cause problems for some programs. However, some people cherish the ability to create file names like ©1992.ß1 or !READ.ME!. Use the **Ignore Illegal Names** option to have Disk Medic ignore illegal filenames; otherwise illegal filename characters will be replaced with **X,** so !READ.ME! would be changed to **X**READ.ME**X**.

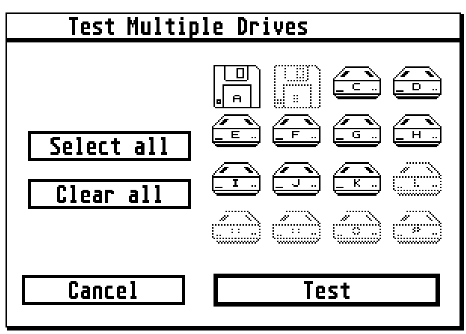
It is possible for clusters on a drive to be marked as in use, but not to be assigned to a file. Such clusters are known as lost clusters, and can be created by application errors. When you select **Save Lost Clusters**, any lost clusters will be saved to files named LOSTnnnn.DAT (where nnnn is a four digit number) in the root folder of the active drive. Otherwise, the data in lost clusters will be discarded (the clusters will be returned to the pool of available clusters).

✓We highly recommend that you save lost clusters. You can examine the information in the lost clusters data file(s) and may be able to recover the lost information, particularly if the lost information is plain text. If you cannot recover the information (or choose not to do so), you may safely delete the LOSTnnnn.DAT files after exiting Diamond Edge.

The final Disk Medic option is **Visual Update**. As Disk Medic runs, if Visual Update is set, the part of the partition being examined is displayed in the graphic window. Areas with errors are displayed in red (cross hatch on a monochrome display). If you turn Visual Update off, the testing process will be slightly faster but you will not be shown the locations of the errors.

Running Disk Medic

To start Disk Medic on the active drive, select **Test Disk Structure** from the **Medic** menu. Remember that the drive you are testing is the Active drive. If you want to test more than one drive in a single pass, select **Test Multiple...:** the Test Multiple selection dialog will then be displayed. Select all of the drives that you want to run Disk Medic on, and then click on **Test**.

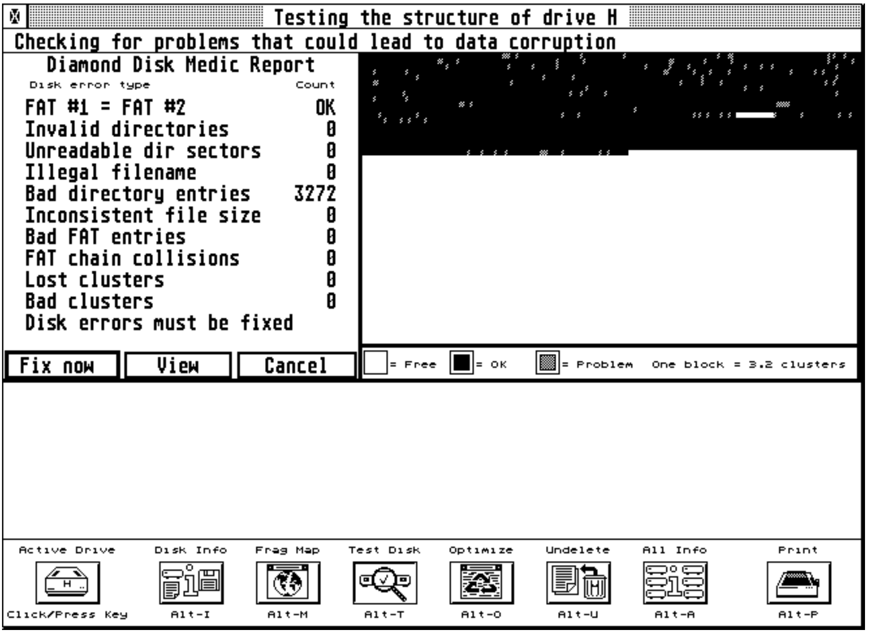


After you have started Disk Medic on the active drive, the Disk Medic operation screen will be displayed. The program first validates the integrity of the boot sector and verifies that FAT #1 equals FAT #2. If FAT #1 does not equal FAT #2 then you will be asked to select one or other of the FATs for the Medic pass. If you had previously selected **Auto-Fix Errors** you will be given the option to turn Auto-Fix off.

✓When FAT #1 does not equal FAT #2, it is ALWAYS a good idea to run Disk Medic with Auto-Fix turned off, using each FAT in turn. Then you should examine the disk errors resulting from the use of each FAT and select the FAT that produces the least number of disk errors.

Disk Medic will then examine the entire partition structure looking for errors. As the pass proceeds, the part of the partition being examined is displayed in the graphic window, if you have Visual Update selected. Areas with errors are displayed in red (cross hatch on a monochrome display). If you turn Visual Update off in the **Medic** menu, the testing process will be slightly faster but you will not be shown the locations of the errors. When the Disk Medic pass is complete, the Disk Medic report screen will be displayed.

Disk Medic Report



The Disk Medic Report gives the total number of each type of disk error (as described above) found on the active drive. If Auto-Fix was selected, any errors detected have already been corrected during the

Disk Medic pass. This is indicated by the message **Disk Errors Have Been Fixed** on the Report Screen. If Auto-Fix was not selected, and errors were detected, this is indicated by the message **Disk Errors Must Be Fixed** and the appearance of a **Fix Now** button on the Disk Medic report screen.

✓Any errors detected and the files they affect can be viewed from the Disk Medic Report screen by selecting View. If Auto-Fix was not selected and you want to fix the disk errors, then select **Fix Now** from the Disk Medic Report screen. This will start another Disk Medic pass that will fix all of the disk errors. If you do not want to fix the errors now, select **Cancel**. If no errors were found, or after they have been fixed, select **Continue**.

Mapping Bad Sectors on Your Drives

Over time, portions of a hard disk drive may become unusable. This may be due to weakened magnetic media or physical damage to the disk surface. Regardless of the cause, bad sectors can result in loss of data and disk corruption. The Map Bad Drive function is designed to identify areas of your disk that are potential problems and mark them as unusable.

You may Map Bad on either just the active drive or on multiple drives. The status of the Auto-Fix option in the **Medic** menu selects whether bad sectors are automatically marked bad or just recorded for review. When you select **Map Bad Drive** from the **Medic** menu the Bad Sector Mapping Preferences Dialog is displayed. Three types of Bad Sector Mapping are available:

- **Read-Read Non-destructive:** This method reads each sector of the active drive twice and compares the data. If there is a difference, that sector is identified as bad. The data already existing on your hard drive is not affected.
- **Read-Write-Read Non-destructive:** This method reads each sector of the active drive and writes it back to the same place. The sector is then re-read and compared to the data originally read. If the information differs, that sector is identified as bad. Data in sectors that are not found to be bad is not affected.
- **Write-Read Destructive:** This method writes a quasi-random bit pattern to each sector of the active drive and then reads that sector back. If the information read back is not the same as the bit pattern that was written, then that sector is marked as bad.

This is a destructive test: all data existing on the drive will be destroyed.

✓These methods are listed in increasing order of effectiveness and increasing order of risk. **Read-Read** is the least effective method but no data is ever written, so even data in marginally bad sectors will not be lost. **Read-Write-Read** is the most effective non-destructive method, but it has a very small chance of one sector data loss if you have a bad sector where the data can still be read, but goes bad when written to. **Write-Read** is the most effective method of detecting bad sectors, but all data existing on the drive will be lost (hint: back up your data first with CDbackup or Diamond Back).

✓REMEMBER TO TURN OFF ALL DISK CACHING BEFORE DOING A BAD SECTOR MAP OF YOUR DISK!

Performing multiple bad sector mapping passes can increase the effectiveness of all methods. Many bad sectors are simply weak sectors that sometimes operate correctly and sometimes produce checksum errors when reading or writing. These types of sectors may not be properly identified as bad if you just perform one bad map pass. The number of passes that you want to perform is entered in the Mapping Bad Sectors preferences dialog. Note that the more passes you specify, the longer it will take to complete the process. When you are ready to begin mapping bad sectors, select **Map bad sectors now**.

Map Bad then examines the entire drive looking for errors. As each pass proceeds, the part of the disk being examined is displayed in the graphic window. Areas where errors are detected are displayed in red (cross hatch on a monochrome display). When Map Bad is complete, the Map Bad Report screen is displayed.

Map Bad Report

The cluster numbers corresponding to each bad sector found are displayed in the Map Bad Report screen. If Auto-Fix was not selected and errors were detected, this is indicated by the message **Disk Errors Must Be Fixed** and the appearance of a **Fix Now** button on the Map Bad Report screen. Selecting **Fix Now** from the Map Bad Report screen will mark the bad sectors as unavailable for use and launch a Disk Medic pass that will fix all of the disk errors. If you do not want to mark the bad sectors as unavailable for use, then select **Cancel**.

Partitioning Your Hard Drive

NOTE: this function requires an installed SCSIDRV driver. If not available, the corresponding menu entry will be greyed-out.

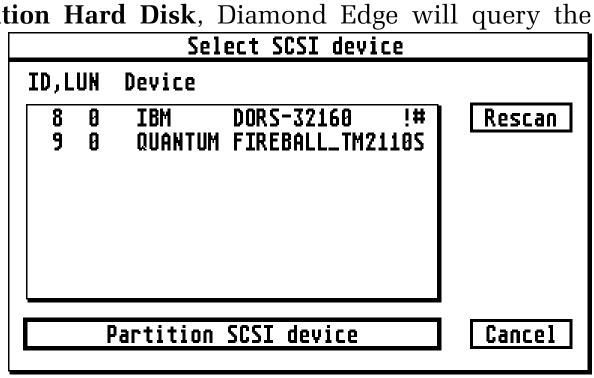
Physical hard disks are divided into one or more smaller logical disk drives, commonly referred to as partitions. A single physical disk drive can have many partitions. In general, the performance of your disk can be improved by splitting your disk into a greater number of smaller partitions. The operating system imposes a limit on the total number of active partitions on all your physical disk drives (in standard TOS this limit is 14).

✓In order to partition your hard disk, Diamond Edge must access sectors outside the normal hard disk partitions. To do this on all of the many Atari-compatible systems available, Diamond Edge uses the SCSIDRV interface. This interface must be provided by other software in your system, such as the well-known hard-disk driver HDDRIVER. If you do not have a SCSIDRV driver on your system, the partition function will NOT be available.

Diamond Edge provides a full-featured disk partitioning system that supports both the Atari Disk partitioning standard as well as third party partitioning standards such as Supra, BMS, and ICD. You can completely change your disk partitioning scheme, just change one partition, hide and unhide secret partitions, save and restore partitioning information. The flexibility of creating a new disk structure or modifying old ones is unlimited.

Selecting the SCSI Drive to Partition

After you select **Partition Hard Disk**, Diamond Edge will query the SCSIDRV driver for installed hard disk devices on the system buses. The devices found will be displayed in the Select SCSI device dialog. Select the device you wish to partition and click on **Partition SCSI device**; physical

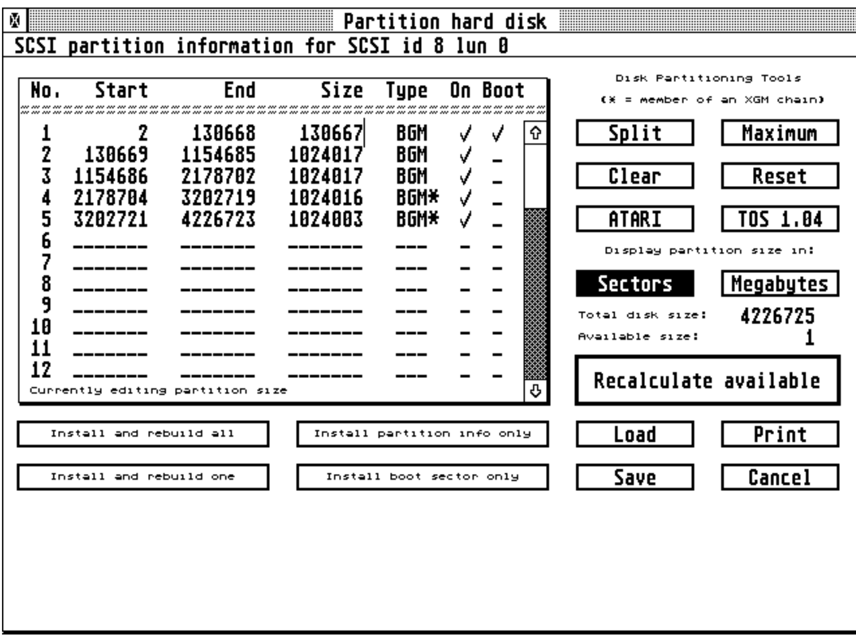


sector 0 of the hard disk will then be read into memory. If valid partitioning information exists in sector 0 it will be displayed as the basis to begin the partitioning session.

✓We strongly suggest that you consult Chapter 2 of this manual before attempting to use this function. This will give you the basic understanding of disk and partition structure necessary to fully utilize this function.

Disk Partitioning Options

The information displayed for each partition includes the starting and ending physical sectors, the size of the partition in physical sectors/Megs, the type of Partition GEM/BGM, etc., whether the partition is active, and whether the partition is bootable. The total size of the hard disk and remaining available space is also displayed.



When entering information into the partitioning dialog, there are three basic editing modes: Start/End sectors, Size, and Partition Type. The current editing mode is displayed at the bottom of the partition window. To change fields within an edit mode, you may use the usual Arrow and Tab keys. You may also move the mouse pointer to the desired field and click the left button; this also serves to change edit modes.

✓As you edit your partition definitions, there are two basic rules to remember regarding the sizes and locations of partitions:

1. Partitions must be sequential, e.g. the start of partition #2 is the next sector following the end of partition #1, and
2. You cannot create partitions whose total size exceeds the size of your hard disk.

Disk Partitioning Tools

The following partitioning aids are provided to expedite the task of partitioning your disk:

- **Display Size Mode**: You can select to have the disk and partition size information displayed in either Sectors or Megabytes (MB). Diamond Edge displays Megabytes consistent with the ICD definition of 1 MB = 1,000,000 bytes. Note that this differs from the usual Atari definition (1 MB = 1,048,576 bytes).
- **Split**: Selecting split will split your hard disk into a number of partitions of equal size. You will be prompted for the number of partitions to create. An easy way to partition your hard disk into one large partition is to split the disk into one partition.
- **Maximum**: Selecting this option will divide your hard disk into multiple partitions of the maximum allowable size, according to the ROM version that is currently selected via the TOS xxx button (see below). For a ROM version of 1.00, the partition type will be GEM, with a size of 16MB: this is suitable for small hard disks only. For other ROM versions, the partition type will be BGM. In either case, an additional partition will be created containing any excess hard disk space.
- **Clear**: Selecting this option will clear all entered partitioning information.
- **Reset**: This option will reset the displayed partitioning information to the original information read off the hard disk.
- **ATARI/ICD**: Selecting this button will toggle the state of the extended partitioning mode. If ATARI is selected, extended partitions (more than 4 partitions on the same hard disk) will be set up in accordance with the Atari extended partition standard. If ICD is selected, extended partitions will be set up according to the ICD/Supra extended partition standard. Please

refer to “Physical Sector 0” in Chapter 2 for a description of extended partitions.

- **TOS xxx**: Selecting this button will switch the state of the ROM dependence mode. If TOS 1.00 is selected, then partitions (both GEM and BGM) will be limited to 32,767 sectors. These disks will be readable on any TOS system regardless of ROM version. If you select TOS 1.04, partitions may include up to 65,535 sectors; these disks cannot be accessed by TOS 1.00 or 1.02. Selecting TOS 4.00 will allow logical sector sizes up to 16384 bytes; these disks cannot be read by versions of TOS lower than 4.00 (although they are accessible if you use MagiC, MiNT, or BigDOS).

- **Recalculate Available**: At any time during your editing session you can recalculate the amount of available space on your disk. You can either click on the **Recalculate Available** button or press the **Return** key to update the available information. All of the currently selected options are taken into account and some of the partitions may begin in a slightly different place after recalculation. This is due to the different control sector requirements of the different extended partitioning methods.

- **Load**: This allows you to load previously saved partition information files. One use of this is to partition a new disk "just like" another disk. Once loaded, the information is fully editable.

- **Print**: This option will print a copy of the currently displayed partition information on your printer; we recommend that you use this whenever you partition a disk. Although the partitioning information in physical sector 0 is not frequently lost, the impact of such an event is very severe! You should **always** have a printout of your partition parameters, plus a SCSI mirror file saved offline (e.g. to a floppy disk).

- **Save**: You can save the currently displayed partitioning information to a file for future reference or installation. This option creates a SCSI information file in the same format as that created by the Save SCSI Mirror function of the **Undelete** menu.

- **Cancel**: If you have not performed any other action, then selecting **Cancel** will return you to the Diamond Edge main window. However, if you have installed partition information, or rebuilt one or more partitions, then selecting **Cancel** will perform a cold boot of your system. This is required for the operating system to become aware of the new disk structure.

For each partition, you can specify whether it is to be active or inactive, by clicking on the appropriate line in the **On** column of the partition display. A check mark (✓) indicates that the partition is active. Diamond Edge allows up to 64 different partitions to be installed on each disk. However, GEMDOS only allows a total of 14 active partitions (C thru P) on all your hard drives. One use of extra partitions is as "Secret" partitions, which can be activated by changing their Active status and using the **Install Information Only** option to activate them.

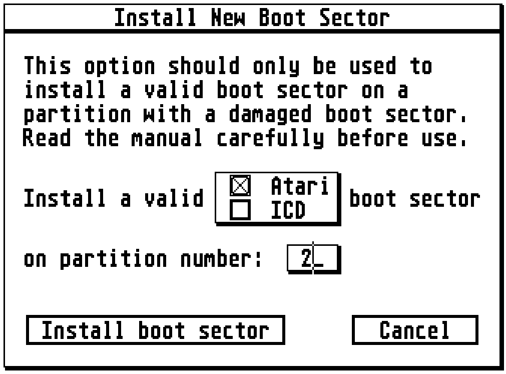
You may also specify which partition is bootable by clicking on the appropriate line in the **Boot** column of the partition display. A check mark (✓) indicates that the partition is bootable. Only one bootable partition per physical disk is allowed, and partitions within an XGM extended partition may **not** be made bootable.

Disk Partitioning Actions

After you are satisfied with the partitioning information currently displayed, you have the following action choices:

- **Install and rebuild all**: Use this option to repartition your entire hard disk. The current disk partitioning information will be installed and all partitions will be rebuilt. **ALL EXISTING DATA ON THE ENTIRE HARD DISK WILL BE LOST.**
- **Install and rebuild one**: This will install the displayed partition information and rebuild one specified partition. When rebuilding a partition, Diamond Edge creates a boot sector, two FATs and a root directory on the specified partition and then initializes them. **ALL EXISTING DATA ON THE AFFECTED PARTITION WILL BE LOST.**

  ✓ If you accidentally rebuild a partition and need information that was previously in that partition, you may be able to recover it by reinstalling the old partitioning information and reinstalling the disk information from a saved Disk Mirror file. Please refer to “Restoring Disk Information” in Chapter 7 for further information.
- **Install partition info only**: Select this option if you only want to install the current partition information without rebuilding any partitions. This can be used to change the activation status of hidden partitions, or to reinstall the partition information after a hard disk crash without changing any of the data in the hard disk partitions.



- **Install boot sector only**: This option should be used only to install a valid boot sector on a partition whose boot sector has been damaged. When you choose this option, a dialog will give you the choice of installing an Atari or ICD boot sector. You must install the same kind of boot sector as was originally there, or you will not be able to access the information on this partition after completing this operation.

5. Optimizing Your Drives

As you use your Atari, files and folders become scattered around your hard disk in different locations. When you ask your computer to read or write data, it has to look harder and move farther to complete the request. This significantly degrades the performance of your hard disk. Disk optimization, also referred to as disk defragmentation, reorganization, and file remapping, involves the reorganization of files on a disk to improve the disk performance.

✓File fragmentation occurs when parts of files become spread across your disk in different locations. This is a normal by-product of the everyday process of creating files, deleting files, and then adding more files. When a file is created, the operating system looks for free space on your disk for the new file. When it finds some free space, it allocates the space to the new file. When that space is filled up, the operating system looks for additional free space. If that free space is not contiguous with the currently used space, the result is a **fragmented file**. Files may occupy multiple fragments, as dictated by the available areas of free space. Accessing a fragmented file is much slower than accessing an unfragmented file. Since a folder is just a special kind of file, folders can also become fragmented.

As files are added and deleted, your disk will become very badly fragmented. The end effect of disk fragmentation can be a significant reduction in hard disk performance. The speed of hard disk reads and writes will become slower, file searches, copies and deletes will take longer. In fact all disk operations will become significantly slower because the disk head must travel to many locations on the disk to complete each read or write request.

✓Disk head movement is the slowest component of any disk operation; hence minimizing the amount of disk head movement is critical to disk performance. The degradation in performance occurs slowly over time and you may not even notice it. Performance may not be much slower today than it was yesterday, but it’s likely to be a lot slower than it was a month ago! Regular optimization will ensure that your drives are always operating at their fastest possible speed.

Optimization Methods

Diamond Edge offers two optimization methods: **Full Optimization**, and **Compress Free Space**. You choose the desired optimization method under the **Optimize** menu. Depending on your individual requirements, either of these methods can be used effectively to help maintain your hard disk at peak operating performance.

Full Optimization provides complete optimization of a drive. First, all of the sectors of a given folder are consolidated, then each file within the folder is defragmented, then all of the files within a folder are located consecutively on the disk. Actually this happens all at once, but the result is complete and total optimization: subdirectory clusters are contiguous, all of the file clusters are contiguous, and all of the files within a subdirectory are located consecutively on the disk. Diamond Edge’s state of the art disk optimization algorithm is the fastest, by a significant margin, of any algorithm available for the Atari.

Compress Free Space eliminates free space from the area of used space by moving it all to the end or beginning of the drive. If there is any free space within the allocated space on the drive, it will be eliminated. **Compress Free Space** does **not** defragment files or folders; it simply moves data between clusters so there is no free space within the allocated area. This essentially segments the drive into two areas: all of the used space is together and all of the free space is together.

The main reason to use **Compress Free Space** rather than **Full Optimization** is speed. Even with the speed of the full optimization algorithm, compressing free space is generally a great deal faster. This is especially true if the disk was previously fully optimized. And, as long as you compress free space regularly, you will reduce the chance of files becoming fragmented in the future since the free space will be contiguous.

✓We recommend that all disks be fully optimized when you first receive Diamond Edge. Then you can use the compress free space option to keep the free space contiguous between performing full optimizations. Use the disk fragmentation maps and statistics to assist you in determining the level of disk fragmentation on each of your disks.

Optimization Priority

Diamond Edge provides two optimization priorities: **Prioritize Reading** and **Prioritize Writing**. You select the desired priority by choosing the appropriate entry under the **Optimize** menu. The basic distinction between the two priorities is where the allocated space is moved.

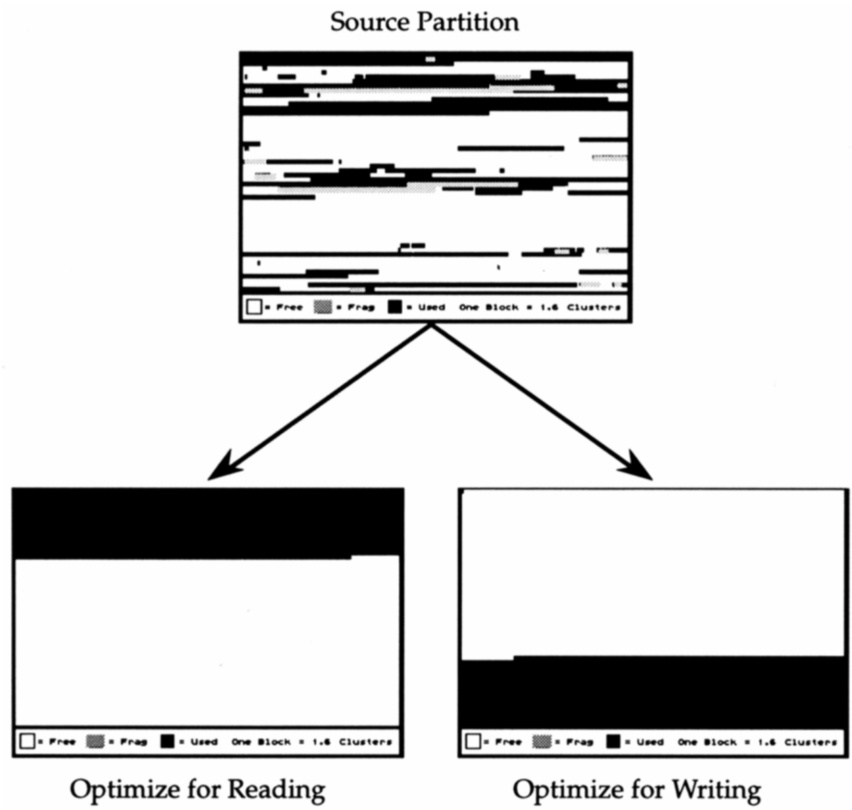
If you select **Prioritize Reading**, all of the allocated space will be moved to the beginning of the partition. This will improve the reading performance of the disk because all of the clusters assigned to files and folders will be physically closer to the FAT tables, significantly reducing the amount of disk head movement required to find and then read a file. Since disk head movement is the slowest component of any disk operation, the amount of disk head movement is critical to disk performance.

✓In addition to the normal optimization function, performing a read priority full optimization of Drive C will move all of the files contained in the **AUTO** folder and root directory sectors to the very start of the partition (since the user has typically arranged the files in the AUTO folder in a specific sequence, the order of files within the **AUTO** folder is never changed). This can dramatically speed up the boot process.

If you select **Prioritize Writing**, all of the allocated space will be moved to the end of the partition. This will improve the writing performance of the disk because the free cluster entries in the FAT tables will be at the start of the tables, and all of the free space will be physically close to the FAT tables. The operating system will not have to work very hard to find the free space and when it does the disk head will not have to move very far to write the information.

✓We highly recommend read optimization for your boot partition (normally C:). Beyond that, the choice is dependent upon how you use your disks and your personal preference. In practice, most modern hard disk drives are fast enough that either method will provide good performance, and you may wish to base your choice on other considerations. For example, backup programs that create image backups (such as CDbackup by Anodyne Software) may require more space for the backup if you choose **Prioritize Writing**.

The graphic on the next page shows the end results of the two methods.



Other Optimization Options

Optimization of a drive that contains any errors in its logical structure is not allowed, since it would probably fail and result in an unusable partition. Therefore, before optimization starts, the drive is automatically subjected to a Disk Medic pass to ensure that there are no errors. If ANY disk errors are detected in the Disk Medic pass, they must be fixed before the optimization can proceed. For this automatic Disk Medic pass, the same four options that are applicable to the normal Disk Medic also apply: **Auto-Fix Errors**, **Ignore Illegal Names**, **Save Lost Clusters**, and **Visual Update**. These function exactly as described in Chapter 4.

✓Remember to use the Preferences Dialog to set the number of seconds to pause after a Disk Medic pass without errors, before Diamond Edge continues with the optimization. If this entry is blank, the program will stop and wait for user input before continuing with the optimization.

✓Turning off visual update can speed up the optimization of your drives significantly. Updating the fragmentation map takes a lot of time because drawing to the screen is very slow relative to disk accesses. If you do not need to watch the visual display and you care about saving time then turn visual update off.

The final optimization option involves the disposition of deleted files within folders. A full description of what happens when you delete a file is given in Chapter 6. When you optimize a partition, it greatly reduces the probability of successfully recovering a deleted file; in most cases, in fact, it essentially eliminates any chance of doing so. Because of this, retaining entries for deleted files in folders usually serves no useful purpose. If you select **Remove Deleted**, deleted entries in folders will be removed. This will help speed up directory searches.

However, if you elect to keep the deleted files' directory entries, and have a valid Disk Mirror file before the optimization, and the clusters containing the file you need to recover were not overwritten during the optimization, then there is a small chance that you could recover some of the file. This could only happen if the file resided in the free space block after the optimization and the clusters were not used as swap space during the optimization.

Optimizing Your Drive

✓Before you perform an optimization there is one further step: **BACKUP YOUR HARD DRIVE!** Diamond Edge provides secure protection against, and recovery from, a wide variety of disk-related problems. However, many errors can occur which Diamond Edge cannot prevent: for example, a power outage during an optimization. In such circumstances, there is **NO SUBSTITUTE** for a valid up-to-date backup. Depending on what other hardware you have, either Diamond Back or CDbackup will provide fast and reliable hard disk backups.

You may optimize either just the active drive, or multiple drives, by selecting the appropriate item from the **Optimize** menu. Before a partition is optimized, Disk Medic automatically examines it for problems. Any problems detected by Disk Medic must be fixed before optimization will be allowed. After the disk has passed the Disk Medic examination, the optimization will begin. During optimization, if **Visual Update** is enabled, the movement of disk data is displayed in the graphic window. Diamond Edge will ring the keyboard "bell" to indicate when the optimization is complete.

6. Recovering Deleted Files

It happens to all of us sooner or later (some more frequently than others). You have just spent three hours working on an important paper and you decide to clean up your scratch directory. You start grabbing files and tossing them in the trash. Then suddenly your heart stops as you realize you just flushed the last three hours of work and all your ideas down the drain. Diamond Edge rescues you from this desperate situation by providing two different methods of recovering files that have previously been deleted, including the ability to recover fragmented files.

What happens when you delete a file?

When you delete a file, most of the information regarding the file is (at least temporarily) retained; just two things are done to the disk structures. First, in the directory entry describing the file, the first byte of the file name is replaced by the hexadecimal value 0xE5 (σ). This character tells the operating system that this file has been deleted and not to include it in the result of directory searches anymore. So, the file READ.ME would become σEAD.ME. All of the rest of the directory information is left intact. Second, all of the cluster entries allocated to the file in the FAT are cleared.

The good news is that nothing happens to the data on the disk at this point: it remains completely intact. The bad news is that the clusters have been released for use by the operating system; they can be overwritten at any time. Remember that clusters are allocated on a “first found, first used” basis. So, if your freshly deleted file happens to be the first available free space, the next time disk space is requested, part of the deleted file will be allocated, and a subsequent disk write to that cluster will overwrite the old data and make complete recovery impossible.

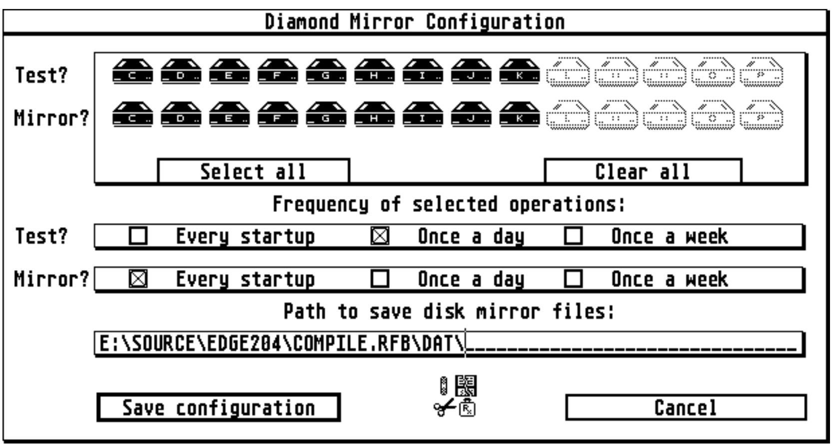
Assuming that you act before this can happen, the next problem in recovering your deleted file is knowing exactly which clusters were allocated to it. Although the directory information remains intact, so we know where the file started, the FAT cluster links have been eliminated so, if the file used to occupy more than one cluster, we do not know for certain where the rest of the file was located. If the file was not fragmented, then the clusters lie in consecutive order and recovery is relatively straightforward. However, if the file was fragmented, full recovery is almost impossible without knowledge of the FAT prior to deletion.

✓The keys to successfully recovering deleted files are: 1) knowledge of the contents of the FAT prior to the deletion and 2) speed of action. The longer you wait to undelete a file, the lower the probability of successful recovery. If you accidentally delete a file then do not perform ANY action that might write information to the disk before you use Diamond Edge to recover the file.

Diamond Mirror

As noted above, one of the keys to successful recovery of deleted files is knowledge of the FAT prior to deletion. Diamond Mirror is an **AUTO** folder program provided to save FAT and root directory information at user-specified intervals; it can also test your disk for the same errors as Disk Medic. Both of these functions can be very useful and we strongly recommend that you use Diamond Mirror.

Diamond Mirror is configured from within Diamond Edge by selecting **Configure MIRROR…** from the **Undelete** menu.



The following items can be specified:

- **What drive(s) to Test/Mirror:** Select the drive(s) that you want to Test and/or Mirror by clicking on the appropriate drive buttons. You may select as many or as few of your active devices as you wish, and you may select different drives to Test and Mirror.
- **How often to Test/Mirror**: Diamond Mirror can Test and/or Mirror the selected drives every time your machine is booted up, once per day, or once per week. You can select different schedules for Test and Mirror. Note that even if Diamond

Mirror is scheduled to run, you can cancel it any time while it is running by pressing **Control-C**.

- **Where to put your Mirror files**: Specify the folder in which the files created by Diamond Mirror files will be stored.

When you are satisfied with the configuration, click on **Save Configuration**. The new configuration will be recognized the next time that Diamond Mirror runs. If you want to exit without changing the existing configuration, select **Cancel**.

Choosing your Undelete method

Diamond Edge provides two methods of recovering deleted files: **Simple Undelete** and **Mirror Undelete**. Select **Mirror Undelete** if you have a recent Mirror file for the drive that contains the deleted file. Otherwise, you should select **Simple Undelete**.

A **Simple Undelete** calculates the number of clusters the file would have occupied on the disk. Then it locates the starting cluster of the deleted file and calculates the number of consecutive clusters from the beginning cluster that are not currently allocated to other files. These unused clusters are then recovered. This method works best when the partition is not highly fragmented.

✓Keeping your disks well optimized gives you the best chance of recovering deleted files via Simple Undelete.

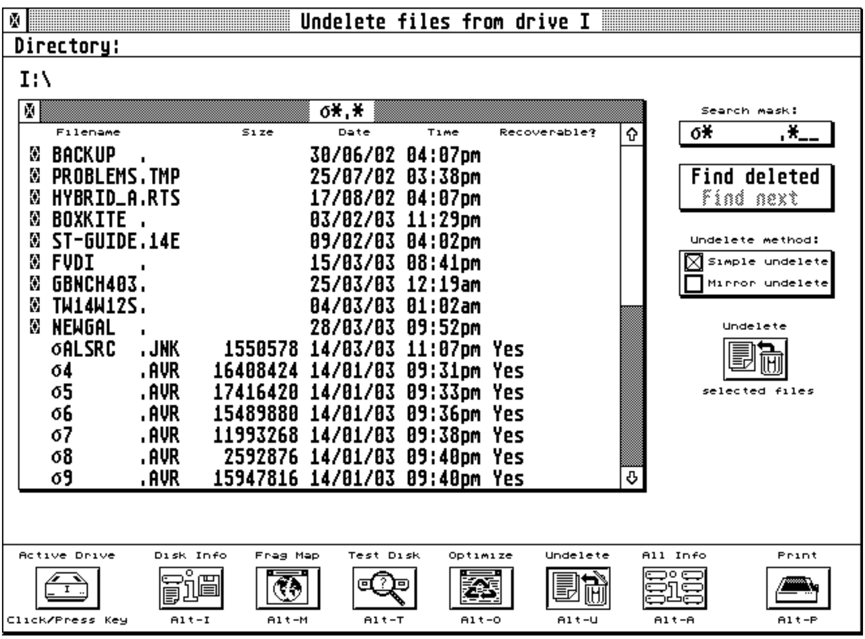
A **Mirror Undelete** uses FAT and root folder information stored in the disk Mirror files to determine exactly what clusters the file occupied prior to deletion. Diamond Edge then recovers all clusters that the file occupied that are not currently allocated to other files. This is the only method that can fully recover a fragmented file.

✓Note that even if you have a disk Mirror file for the partition in question, a Simple Undelete will sometimes be a better choice. For example, if you created a new file on the partition after running Diamond Mirror and you then deleted that file, the Mirror file would contain no information about that file. In that case a Simple Undelete would be your best chance at data recovery.

Undeleting Files

When you select **Undelete File(s)...** from the **Undelete** menu, the Undelete control screen is displayed. This functions in a similar way to the normal GEM file selector, except that only folders and deleted files are shown. To open a folder shown on the control screen, click on the entry. To move up to the parent folder again, click on the close box in the Undelete control screen window. To change the active undelete drive, select the desired drive via the button bar.

Each file that appears on the Undelete control screen has an additional entry that indicates whether or not the file will be recoverable. If all of the clusters belonging to a file can be recovered then the entry is: Yes. If none of the clusters belonging to the deleted file can be recovered, then the entry is: No. If only some of the clusters belonging to the file are recoverable, then a fraction like m/n is shown, where m is the number of recoverable clusters and n is the total number of clusters.



✓ Even if a file is marked as fully recoverable, the recovered file may not contain the expected data: for example, if you try to recover a fragmented file without a Mirror file, only the clusters prior to the first fragmentation point will be valid.

If only some of the clusters belonging to the file are recoverable, but the file in question is a text file, then partial recovery may be useful. Partial recovery of a binary or program file is seldom useful.

Diamond Edge provides a general-purpose deleted file finder within the Undelete control screen; this search will encompass all folders on the specified partition. To search for deleted files, enter a deleted file search mask in the editable field labelled Search mask. You can search for a specific file or enter a general-purpose wildcard to find all files that match the wildcard criteria.

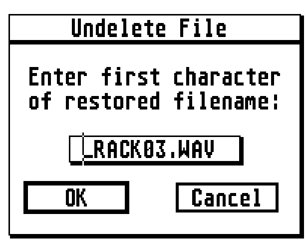
The two standard wild card characters in TOS are * and **?**. An asterisk in a wildcard mask will match files containing any character string in the asterisk's position. A question mark in a wildcard mask will match files containing any single character in the question mark's position.

For example, if you want to search for all deleted files with a .PI1 extension, you would enter *.PI1 for the Search mask. To search for all deleted files with an extension of PI1, PI2, or PI3, you could enter *.PI? as the Search mask.

To begin the search for deleted files, select **Find deleted** from the Undelete control screen (alternatively, you can press the return key). The program will search the current drive for the first file that matches the wildcard specification. If a match is located, the control screen will automatically display the folder containing the file and will highlight the file. If you want to find additional deleted files that match the current Search mask, select **Find next**.

You can also browse through the displayed folders and manually select a file to undelete by clicking on the file name. Whenever an entry is selected it is marked for undeletion. You may select multiple files in the same folder for undeletion by holding down the shift key while selecting the file. After you have selected all of the files that you want to undelete in the current directory, click on **Undelete**.

For each file selected, you will be prompted to enter the first character of the filename to be undeleted. Diamond Edge will then check if there is another file in the same folder that already has that name. If a conflict is found, you will be prompted to enter a different first character.



In order to undelete files from a folder that has been deleted, you must first undelete the folder.

When you have finished undeleting all of the files that you require, select **Cancel** to return to the Diamond Edge main window.

What to do after you undelete a file

After you have undeleted all of the files that you require, you should verify the validity of the recovered files. If you have a current validation file for the drive, then perform a validation pass to assess the state of the undeleted files. This will tell you if the undeleted file is the same as before or if the file's data has been corrupted. If you do not have a current validation file, then you should manually examine the files you just undeleted to determine if they are valid.

Verification of the undeleted file is required because even with Mirror protection, the validity of the file recovery is not 100% assured. If you deleted some files and then add other files, the "first available, first used" principle would apply and the new files would overwrite the area of disk that the deleted file occupied. Then if you deleted those new files before the next time that you run Mirror, there would be no record of that activity. The Mirror file would tell you where the originally undeleted file resided on the disk, and the operating system would say that space is unallocated. This would result in a recoverable status of Yes, even though the file's information had been overwritten.

The undeletion tools provided by Diamond Edge are designed to assist you in recovering accidentally deleted files. However, they cannot save you from every possible situation. The best protection against loss of data is to backup your hard disks on a regular basis.

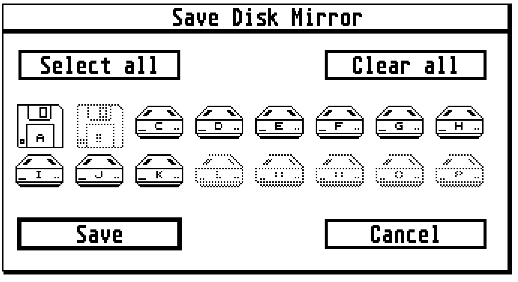
7. Preserving Critical Disk Information

Catastrophic failures of the operating system, the hard disk driver software, or applications programs, occasionally cause the total loss of critical disk information. The most often affected areas include the partitioning information located in physical sector 0 of the hard disk, the partition boot sector, the partition File Allocation Table, and the partition root directory sectors. The user data on your hard disk is often totally unaffected; however you may not be able to access ANY of it because the information that tells the operating system how to find it has been corrupted.

✓While there is still no substitute for a valid hard disk backup, the easiest and fastest way to recover from these situations is to simply reinstall a copy of the corrupted information. We **HIGHLY** recommend that you keep a current archive of disk information for all of your hard drive partitions and current SCSI partitioning information for all of your SCSI drives. We also recommend that you keep this data on a floppy disk in addition to your hard disk. The creation and regular updating of a Diamond Edge Emergency disk described earlier is an excellent catastrophe prevention strategy.

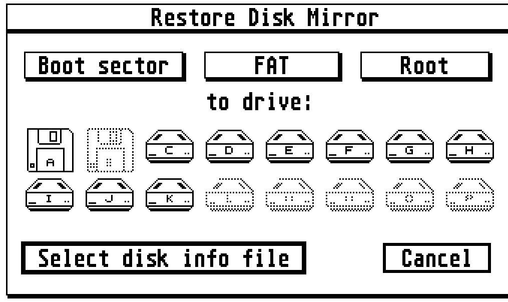
Saving Disk Information

To save critical disk partition structure information (boot sector, FAT table, directory sectors), select **Save Disk Mirror…** from the **Undelete** menu. The Save Disk Mirror dialog will appear. Select all of the drives for which you want to create disk mirror files, and then click on **Save**. A GEM file selector will appear, prompting you for the folder in which to save the mirror files. The default folder is that specified in the Diamond Edge Preferences dialog. Note that you need only select the appropriate folder, not a specific filename, since disk mirror file names are generated automatically. Select **OK** from the file selector to save the disk mirror files; select **Cancel** to abort the process.



Restoring Disk Information

To restore the critical disk information to a disk, select **Restore Disk Mirror…** from the **Undelete** menu. In the Restore Disk Mirror dialog, select which of the following disk structures you want to restore: the boot sector, the FAT, and the root directory. Then choose which drive you want the information restored to. It is often advisable to first reinstall just the boot sector, and then perform a Disk Medic check with Auto-Fix Errors off. If significant problems remain, then reinstall the FAT and root directory as well.



✓If the boot sector is severely damaged, TOS may not recognize the disk as valid. It may not be listed as active or it may not be recognized at all (you may see one less drive than you thought you had). If this occurs, it will first be necessary to reinstall a valid boot sector: refer to "Partitioning Your Hard Drive" in Chapter 4. Then you can reinstall the archived disk information.

Click on the **Select disk info file** button to choose the disk information file to restore to the selected disk. After specifying the information file to restore, the disk characteristics from the disk information file will be displayed. If this is correct then select **Proceed with restore**. If you have **any doubts at all** that the information you are about to restore is correct, select **Cancel** to abort the restore.

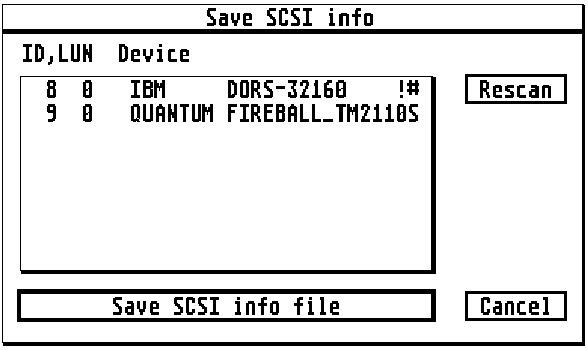
✓After restoring the disk information, it is advisable to run Disk Medic on the restored partition. Modifications to the disk (file creation, deletion, expansion, etc.) made after the creation of the disk information file will not be reflected in the restored information. This could lead to some loss of data created or modified after the disk information file was created. This information may be recoverable through the undelete function or from the lost cluster file(s) produced by Disk Medic; however there is no substitute for an up-to-date hard disk backup or an up-to-date disk mirror file.

Saving SCSI Partition Information

NOTE: this function requires an installed SCSIDRV driver. If not available, the corresponding menu entry will be greyed-out.

Physical sector 0 of each hard disk drive contains information on how the drive is partitioned. If this information is lost, then all the information in all the partitions on that drive will become unavailable! So it is highly advisable to keep a copy of this information elsewhere so that it can be restored in the event of a catastrophe. That is the purpose of Save SCSI Mirror.

To create a SCSI Mirror file, select **Save SCSI Mirror…** from the **Undelete** menu. Diamond Edge will query the SCSIDRV driver for installed hard disk devices on ACSI, SCSI, and IDE buses. The devices found will be displayed in the Save SCSI Info dialog.



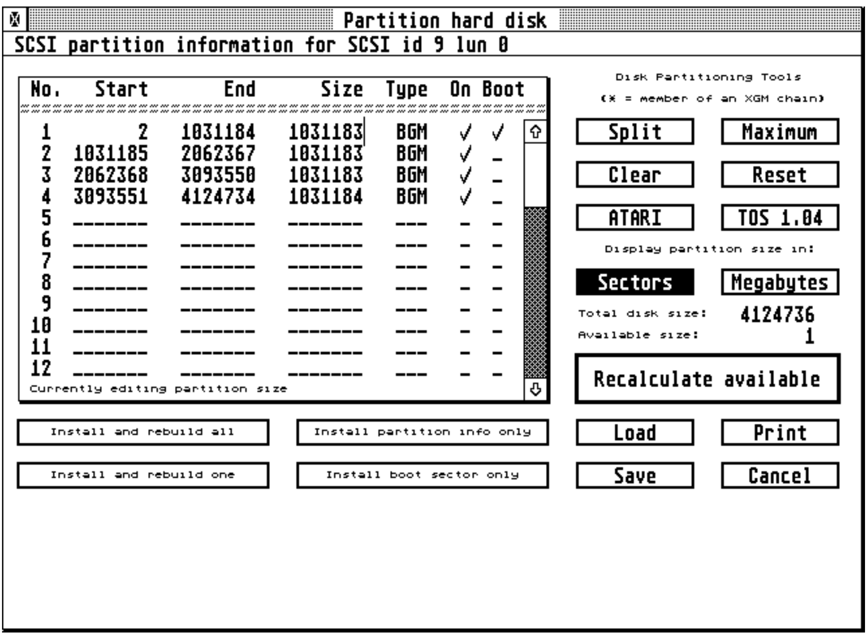
✓ If a hard disk drive that should be available does not show up in the list of available devices, choose Rescan, and Diamond Edge will request the SCSIDRV driver to rescan all buses, to try to locate it.

Select the devices that you wish to create mirror files for, and then click on Save SCSI info file. This will display a GEM file selector prompting you for the folder in which to save the SCSI Mirror files. The default folder is that specified in the Diamond Edge Preferences dialog. Note that you need only select the appropriate folder, not a specific filename, since SCSI information file names are generated automatically. Select **OK** from the file selector to save the SCSI information files; select **Cancel** to abort the process.

Restoring SCSI Partition Information

NOTE: this function requires an installed SCSIDRV driver. If not available, the corresponding menu entry will be greyed-out.

To restore the disk partitioning information to a hard disk drive, select **Restore SCSI Info** from the **Undelete** menu. Choose the physical drive that you want the information restored to, and click on **Select SCSI Info File**. A GEM file selector will appear, allowing you to select the SCSI Mirror file to restore to the selected drive. Click on **OK** to proceed. The standard hard disk partitioning screen will now appear, loaded with the partitioning information contained in the file. To reinstall the old partitioning information without affecting any other data on the disk, select “Install Partition Info Only”.



If you have **any doubts at all** that the information you are about to restore is correct, then select **Cancel** to abort the restore.

8. General Utilities

Diamond Edge provides a number of general disk maintenance utilities to help you get the most out of your disks.

Partition Copying

Diamond Edge provides two partition-copying methods for use in different circumstances.

Copy Drive Image

Copy Drive Image copies, sector for sector, an exact image of the source partition to the destination partition. The file and folder structure and the disk fragmentation characteristics of the source are exactly duplicated on the destination. The source and destination partitions must be of exactly the same size and type (both GEM or both BGM). All existing data on the destination partition is lost.

To perform a partition image copy, select **Copy Drive Image…** from the **Utility** menu. You will be prompted for the source and destination partitions. If you have Warn mode set, you will be notified that all data on the destination partition will be lost, and you will be given the opportunity to cancel. Otherwise the partition copy will begin immediately.

Copy Drive with Defragmentation

✓**Copy Drive Defrag** copies the entire contents of the source partition to the destination partition, defragmenting the partition at the same time. The result is a destination disk that has had a full optimization for reading performed. The source and destination partitions do not have to be the same size or type; thus you can, for example, perform a Copy Drive Defrag from a 10 megabyte GEM partition to a 40 megabyte BGM partition. All existing data on the destination partition will be lost.

To perform a partition copy with defragmentation, select **Copy Drive Defrag…** from the **Utility** menu. You will be prompted for the source and destination partitions. If you have Warn mode set, you will be notified that all data on the destination partition will be lost, and you will be given the opportunity to cancel. Otherwise the partition copy will begin immediately.

Forcing Media Change

TOS occasionally has difficulty detecting whether the media in a removable disk drive has been replaced, or a hard disk partition has been modified in such a way that TOS needs to update its internal information about the disk. This is especially true for floppy disks. If you suspect that TOS has not recognized such a change, you can use this option to force TOS to recognize the change. Set the drive in question as the active drive, and select **Force Media Change**. This will force TOS to rebuild all information it has about the disk.

Viewing, Printing and Browsing Files

These functions allow you to read and print text files, and to look around your disk. Selecting **View File…** allows you to view a text file on the screen. While viewing a file, the following keys control movement through the file:

- up/down arrow: move up or down a line
- shift-up/down arrow: move up or down a page
- Home: move to first line in file
- Esc: exit viewing

Alternatively, you may use the mouse for some of these functions:

- left button: move down a line
- right button: move down a page

Selecting **Print File…** will allow you to print a text file of your choice on your printer: this is useful for examining and printing Disk Medic or Validation error reports.

Selecting **Browse Disk** will give you access to the GEM File Selector to look around your disk.

Partition Zeroing

Diamond Edge allows you to zero (erase) an entire partition with one command. In order to minimize the possibility that you will do this accidentally, you must enable the zeroing functions by selecting **Enable zeroing** from the **Utility** menu.

The basic Zeroing function erases all of the information in the disk's FAT and root folder sectors. The result will be a partition that appears to be completely empty to TOS and normal application programs.

Zero Partition

To Zero a partition, set the active drive to the partition you want to zero. Then select **Zero Drive** from the **Utility** menu. Regardless of the warning level specified in the user preferences, you will always be warned before a zeroing operation. If you decide to continue with the zeroing, select **Yes**; to abort, select **No**.

✓After you have confirmed your intent to zero the partition, but before the zeroing is actually performed, all of the critical disk information will be saved to a disk mirror file. This will allow you to Unzero the partition with absolutely no loss of data if you belatedly realize that you have, for example, zeroed the wrong partition.

Unzero Partition

To Unzero a partition, set the active drive to the partition you want to unzero. Then select **Un-Zero Drive** from the **Utility** menu (this invokes the same procedure as would be used by the Restore Disk Mirror function, since they perform the same task).

After selecting the disk you want to unzero, click on the **Select disk info file** button to choose the disk mirror file to restore to the selected disk. After specifying the mirror file to restore (which will normally be the one created most recently), the disk characteristics from the disk mirror file will be displayed. If these are correct, select **Proceed with restore**. If you have **any doubts at all** that the information you are about to restore is correct, select **Cancel** to abort the restore.

✓After unzeroing the disk it is advisable to run Disk Medic and File Validation on the unzeroed partition. Any modification to the disk (file creation, deletion, expansion, etc.) made after the disk was zeroed can cause the unzeroed partition to contain a corrupted disk structure. If you Unzero a disk immediately after zeroing it, the recovery will be complete with no loss of data. If you have written anything to the disk and then Unzero it you will have at least some corrupted information.

Wipe Partition

Wiping a partition is a special kind of Zeroing. When you wipe a partition, first the FAT tables and root folder sectors are erased, and then every sector of the partition is overwritten. This allows you to completely eliminate confidential data. You should use this function with care: if you **Wipe** a partition, Diamond Edge will not be able to recover the lost data.

To Wipe a partition, set the active drive to the partition you want to wipe. Then select **Wipe Drive** from the **Utility** menu. Regardless of the warning level specified in the user preferences, you will always be warned before a wipe operation. If you decide to continue with the wipe, select **Yes**; to abort, select **No**.

Hotkeys

For ease of use, keyboard equivalents are provided for every major program function, as follows:

Button Bar

Change Active Drive	Drive Letter (A thru P)
Disk Information	Alt-I
Fragmentation Map	Alt-M
Test Disk	Alt-T
Optimize Disk	Alt-O
Undelete Files	Alt-U
All Disk Information	Alt-A
Print	Alt-P

File Menu

Preferences	Alt-F
Open Window	Alt-W
Quit	Control-Q

Medic Menu

Test Disk Structure	Alt-T
Test Multiple	Control-T
Map Bad Drive	Alt-B
Map Bad Multiple	Control-B
Create CRC File	Alt-R
Create Checksum File	Alt-C
Validate Files	Alt-V
Validate Multiple	Control-V
Partition Hard Disk	Alt-H

Optimize Menu

Optimize Drive	Alt-O
Optimize Multiple	Control-O

Undelete Menu

Configure Mirror	Alt-N
Save Disk Mirror	Alt-S
Restore Disk Mirror	Alt-Y
Save SCSI Mirror	Control-S
Restore SCSI Mirror	Control-Y
Undelete Files	Alt-U

Utility Menu

Copy Drive Defrag	Control-C
Copy Drive Image	Control-I
Force Media Change	Control-M
View File	Control-F
Print File	Control-P
Browse Disk	Control-R
Zero Drive	Control-Z
Un-Zero Drive	Control-X
Wipe Drive	Control-W

Help Menu

File Help	F1
Medic Help	F2
Optimize Help	F3
Undelete Help	F4
Utility Help	F5

During functions that scroll data such as creating a validation file or validating files you may pause the display by selecting Control-S; pressing Control-Q will restart the process. Control-C is the universal abort key and applies to every abortable function, such as Mapping Bad Sectors or Validating a disk drive. For safety, Optimizing and Disk Medic functions are **not** abortable via Control-C.

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