BootMaster User's Guide

(for Version 5.0x)

BootMaster Partition Recovery

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Introduction

About 75% of all hard drive booting problems, partition access failures, and generic "hard drive failures" are the result of an overwritten or otherwise corrupted Master Boot Record or partition boot sector.

With this in mind BootMaster Partition Recovery was designed as a simple expert system to provide a safe, easy-to-use method for recovering from MBR and boot sector related failures.

BootMaster also provides powerful diagnostics, advanced recovery functions and timely, aggressive technical support to diagnose and solve far more complex and difficult problems.

BootMaster performs the following functions:

1) Master Boot Record reconstruction for hard disk drives hosting FAT and NTFS partitions.

2) Safe backup and restore of the Master Boot Record.

3) Restore of FAT32 and NTFS partition boot sectors.

4) Full manual editing of partition tables and FAT & NTFS boot sectors.

5) Zeroing of the Master Boot Record and Track 0 (exclusive of the Master Boot Record).

6) Comprehensive, advanced partition diagnostics.

7) Advanced repair procedures via interpreted repair scripts.

8) Safe UNDO of any changes made by BootMaster to the Master Boot Record or partition boot sectors.

9) Viewing of partitions' file systems (FAT16/32 and NTFS) from within BootMaster as an aid to troubleshooting and identification of partitions.

10) File undelete and light (directory at a time) recovery from FAT & NTFS partitions.

Compatibilities

BootMaster is compatible with Windows version 9x, ME, NT3.5, NT4, 2000 and XP. It designed to run from a bootable floppy disk or CDROM.

The program supports BIOS-accessible ATA, SATA and SCSI hard disk drives 1 (80H) thru 8 (87H). The entire drive must be accessible via the BIOS interrupt 13 functions in order for Bootmaster to work reliably. BootMaster supports hard drives of any size up to 2 terabytes.

While USB external hard disks are supported if they are accessible via system BIOS we recommend that a diagnostic report be submitted before undertaking repairs on external drives. In some cases BIOS may misreport parameters of USB external drives, causing repair failure.

BootMaster recognizes FAT12, FAT16, FAT32, and NTFS basic partitions for purposes of rebuilding a corrupt MBR. It will not be able to correctly reconstruct the MBR on a system containing other partition types, however the MBR backup and restore functions will work regardless of the partition types involved.

It is recommended that users contact BootMaster technical support prior to using BootMaster on systems employing Dynamic Drive Overlays (ie, Disk Manager, EZ BIOS or others), GoBack partitions, NTFS dynamic partitions, or software RAIDs.

Note that when rebuilding a corrupted MBR, Bootmaster uses Microsoft "standard" IPL code. If the user was running a multi-booter or other form of custom IPL, it will be necessary to reinstall it after running BootMaster.

Using BootMaster

On starting BootMaster from the diskette or CDROM or from a DOS the program will read and analyze the Master Boot Record. If obvious corruption of the MBR is noted, a warning will be displayed....

```
Warning!

MBR appears to be corrupt!
```

Corrupt MBR Warning

If no corruption is noted, or on pressing a key after reading the warning message, the Master Boot Record work screen will be displayed.

```
                        MASTER BOOT RECORD - Drive 80H

            Start                    End        Relative        Total
 Active  C    H   S    Type     C    H   S     Sectors        Sectors

   Yes    0    1   1  FAT32x   509  254  63          63        8193087
   No   510    0   1  FAT32x  1019  254  63     8193150        8193150
   No  1020    0   1  EXTNDx  1023  254  63    16386300       22892625
   No     0    0   0    NONE     0    0   0           0              0

 Current LBA:  0                                        Signature: AA55

 Drive 80h Parameters                           Actions
 Cylinders:          2444       F2 - Backup MBR         F8 - Zero MBR
 Heads:               254       F3 - Partition Summary  F9 - Reset
 Sectors:              63       F4 - Restore Backup     F10 - Change Drive
                                F5 - Build Virtual MBR  F11 - Undo
                                F6 - Toggle Active      F12 - Diag File
                                F7 - Change Type    CTRL+F7 - Edit
```

BootMaster Main Screen

Explanation of Partition Table data fields

"**Active**" refers to the value of the "active" byte in the partition record. A value of 80H indicates that the partition is bootable (indicated by the word “Yes”). A value of 0 indicates that a partition is not bootable (indicated by “No”). No other value is allowed in this field. The presence of a value other than 80H or 0 will cause BootMaster to issue the corrupt MBR warning.

"**Start C H S**" indicates the cylinder, head, and sector coordinates of the first sector in the partition.

"**Type**" refers to the value of the type byte in a partition record. BootMaster recognizes the following partition types: 1 (FAT12); 4, 6, and 14(FAT16); 11 and 12 (FAT32); 7 (NTFS basic partition); 5 and 15 (Extended Partition Boot Record). Note: NTFS "Dynamic" partitions may be detected as type 7 (NTFS basic). If this occurs, the partition may be changed via the F7 key.

"**End C H S**" refers to the cylinder, head, and sector coordinates of the last sector in the partition. Note that these values (as well as the Start C H S)are meaningless when the partition starts or ends beyond the 8 GB CHS addressing threshold.

"**Relative Sectors**" refers to the value of the "Relative" DWORD in the partition record. This value is the logical block address (LBA) of the first sector in the partition relative to the address of the MBR of an Extended Boot Record.

"**Total Sectors**" is (fairly obviously) the total number of sectors contained in the partition.

The "**signature**", which always has a value of AA55H is the signature word found at the end of all MS boot sectors. (It is not a part of the partition table).

Selecting Partitions

From this point in the program, you may select a partition by moving the highlight bar with the UP and DOWN arrow keys. Pressing ENTER on a normal partition will display that partition's boot sector. Pressing ENTER on an Extended partition will display the Extended Partition Boot Record. You may move through all of the partitions and Extended partitions on the hard disk in this manner. Use the ESC key to backtrack.

Function Keys

F1: Help

Displays the relevant section of this manual.

F2: Backup

Creates the MBR backup files. Two files are written. For example, for the 1st hard disk the files are MBR80.DAT, which contains the backup copy of the Master Boot Record, and VOL80.DAT, which contains information about the partitions on the disk. VOL80.DAT is used to prevent inappropriate replacement of the MBR, for example, on a drive other than the one the backup files were created on, or after the drive's partitioning scheme has been changed but the backup files not updated.

F2: Accept

If the user has built a virtual MBR via F5, then the F2 key definition will change to "Accept." Initiating "Accept" will cause the virtual MBR to be written to the disk. See Rebuilding the MBR.

This action requires registration.

CTL+F2: Repair Script Interpreter

Invokes the repair script interpreter. Repair scripts are provided by FileRecovery.Biz after analysis of diagnostic files and are able to recover problems that are too complex for the normal automated methods.

This action requires registration.

F3: Partitions Summary

This key will display the Partitions Summary Screen containing a list of the partitions which are accessible using the data in the current MBR. It also provides diagnostic information about the state of those partitions and the condition of the partitions' boot sectors. FAT32 and NTFS partition boot sectors can be repaired from this screen, assuming that the file system's backup boot sectors exist.

This screen is useful in verifying that the current MBR's partition tables are accurate and complete.

F4: Restore Backup

This key will restore the Master Boot Record for the current drive from the backup copy, if the backup files exist in the default path. BootMaster evaluates the disk's partitions based on the coordinate data in the partition table of the backup MBR and compares the result to the partition data contained in the VOL80.DAT or VOL81.DAT file. The backup copy of the MBR is written to the disk only if the compare is successful. This prevents the possibility of damaging a system by writing the wrong partition data in the case where the backup was made on a different computer or the hard disk partitioning has been changed, but the backup not updated.

F5: Build Virtual MBR

Scans the current hard disk for existing partitions and creates a virtual Master Boot Record in memory. For details see **Rebuilding the MBR**.

F6: Toggle Active

Pressing F6 will toggle the active byte of a selected primary partition on disk 1 (80H). This allows designation of the bootable partition in the case where a rebuilt MBR is written to the disk.

F7: Change Type

Allows entering a new partition type for the selected partition. This is primarily useful for the case where a manufacturer's diagnostic partition has been defined as a standard FAT partition in a rebuilt MBR. For example, Dell systems have a small FAT16 partition as the initial partition on the disk. BootMaster will detect this partition as a type 6 (FAT16), but the diagnostic partition is defined by Dell as a type 222 (DEh). Other vendors (Compaq, HP) also provide such partitions. Users should consult their system documentation or vendor tech support to determine the correct type number for a diagnostic partition.

The user can also use this function to hide a partition from the operating system, which is useful during troubleshooting and can prevent damage to a partition which might be caused by auto-startup of CHKDSK or SCANDISK during the boot process. Just select "Hide" from the menu. Note: use of a "hidden" partition type does not hide a partition from BootMaster.

F8: Zero MBR

F8 will display a dialog from which the user can choose to zero the Master Boot Record.

We recommend zeroing the MBR under the following circumstances:

1) the MBR is badly corrupted or 2) the BIOS returned an error code when BootMaster attempted to read the MBR. (BootMaster will notify the user at startup if either of these situations exists).

Following the MBR being zeroed, BootMaster will prompt for a reboot. The user should always accept a reboot after this action is performed.

For information on clearing Track 0, see CTRL+Z below

F9: Reset

Restarts the program. Useful when you have built a virtual MBR in memory but want to return to a display of the original MBR.

F10: Change Drive

If there are two drives in the system pressing F10 will toggle the current drive between Drive 1 (80H) and Drive 2 (81H). If the system contains 3 or more drives pressing F10 will display a pick list from which the appropriate drive may be selected.

F11: Undo

Runs the BootMaster undo utility. Every change made to a hard disk by BootMaster is recorded in a file named UNDO.DAT. Copies of both the original and the changed sector are saved, along with the date and time of the change, the location (as a Logical Block Address), and the name of the program module that made the change.

F12: Diag File

On pressing F12 the user is offered two choices: Create a new diagnostics file or Read an existing file (if a diagnostic report already exists - otherwise, this dialog is skipped).

On selecting Read the user will be presented with a list of existing diagnostic files for the currently logged drive.

Selecting Create runs the diagnostic file creation utility, BMD.EXE. There are two cases where it is useful to create a diagnostic file: 1) if the user prefers to have the recovery guided by an expert rather than undertaking it alone, and 2) in those cases where damage to a hard disks partitioning structures is too extensive for BootMaster to perform a successful recovery in automatic mode.

On startup, BMD.EXE offers the user a choice of 3 scan modes: Normal, Quick, and Deep. "Normal" is the default choice and will be correct mode in most cases. "Quick" mode can be used if the hard disk contains only NTFS, but no FAT, partitions. "Deep" mode should be used only if there are damaged FAT partitions on the hard disk that are not found by a Normal scan.

BMD.EXE creates a text file which contains the diagnostic report. The file name will be BMDnn.TXT, where "nn" is number between "00" and "32". The numbers are assigned sequentially, so the most recent file created is the one with highest number.

The report file should be zipped and attached to an email addressed to support@filerecovery.biz. The report will be evaluated and a solution will be provided by return email.

CTRL+F7: Edit. Runs the BootMaster Partition Editor.

CTRL+Z: This action key provides a dialog from the user can clear Track 0 (ie, write nulls to all sectors of Track 0, exclusive of the Master Boot Record), backup Track 0 to a file or restore Track 0 from the backup file.

The ability to clear Track 0 is useful in a few limited circumstances, such as when removing a DDO from a hard drive.

Partitions Summary Screen

This screen is displayed by pressing the F3 key from the MBR display screen. It provides a list of all partitions on the current drive that are found using the partition coordinates in the current Master Boot Record. It also provides some diagnostic information about the partition boot sectors and metadata structures.

```
                        Partition Summary Drive 80h

      Volume                                                Boot
       Name        Type      Start LBA    Size (MB)    Sectors   Mount

    SYSTEM      FAT32(12)             63       4195      OK        OK
    MEDIA       FAT32(12)        8193150       4195      OK        OK
    PROGRAMS    NTFS(7)         16386363       5239      OK        OK
    DATA        NTFS(7)         26619768       1045      OK        OK
    UTILITY     NTFS(7)         28660023       5338      OK        OK
    SCRATCH     FAT12           39086208          8      OK        OK


     Drive 80h Parameters                              Actions

  Cylinders:          2444                     ENTER - View Details
  Heads:               254                        F2 - Repair
  Sectors:              63                        F3 - View Partition
  Total Sectors:  39108825
```

Partition summary Screen

Explanation of column headings

"Volume Name" is the partition name or label as recorded in the boot sector's BIOS Parameter Block or (for NTFS partitions) the partition’s $Volume metadata file. If the name shown is "Unknown", then the boot sector either was not found or is corrupt.

"Type" is the partition type. The type is shown as both a name, ie, "FAT32" and a number, ie, "(12)". The name records the partition type as determined by BootMaster. The number is the type as recorded in the partition record.

"Start LBA" is the logical block address (LBA) of the first sector of the partition.

"Size" is the size in megabytes of the partition.

"Boot Sectors" displays the status of the partition's boot sector(s). The status will be either "OK", "Invalid," or "Repair."

"Invalid" means that the boot sector (and for FAT32 and NTFS partitions, the backup boot sector as well) was either not found or is corrupt. BootMaster does not auto-repair boot sectors marked as "Invalid," but invalid bootsectors can usually be rebuilt with the editor.

"Repair" means that the boot sector is corrupt but a valid backup boot sector exists. The backup can be used to repair the boot sector by pressing the F2 key.

"Mount" indicates whether or not major metadata structures of the partition could be located via coordinate data in the boot sector's BPB. If "No" is indicated here, the partition is either corrupt or is not a valid partition at all. If "Primary" or "Backup" is indicated as the Mount status, this means that the partition could be mounted with the data in the indicated boot sector, but not with the other.

Function Keys

F2: Repair/Status

Pressing F2 will either replace the boot sector of the selected partition, if indicated, or will display a brief message describing the partition's status.

This action requires registration.

ENTER:

Pressing ENTER will display the boot sector(s) detail for the selected partition.

F3: View Partition:

This function will display a file system viewer for a FAT16/32 or NTFS partition as appropriate. The viewer can be used to identify partitions by the file system contents, locate partitions containing specific files, and as an aid to troubleshooting.

Backing Up the Master Boot Record

To back up the Master Boot Record, follow these steps...

1. First, ensure that the MBR's partition tables are correct. If you are unsure of this, return to the top of this document and read the entire manual.

2. Start BootMaster. Be sure that the correct hard drive is selected (use the F10 key to change drives).

3. Press F2 to back up the MBR for the current drive.

Restoring the Master Boot Record

1. Start BootMaster. Be sure that the correct hard drive is selected (use the F10 key to change drives).

2. Press F4 to restore the MBR for the current drive.

Undoing Changes Made by BM

If it should necessary to undo changes made by BootMaster, just run the executable BMUNDO.EXE from the F11 key while in BootMaster or from the command line.

Rebuilding the MBR

To rebuild a corrupted Master Boot Record, follow these steps...

1. Start BootMaster. Be sure that the correct hard drive is selected (use the F10 key to change drives).

2. Press F5 to begin the rebuild process. Answer Yes (press "y") to the "Use Fast Scan?" dialog that appears. A progress bar will be displayed while BootMaster searches the hard disk for existing partitions.

When a candidate partition is found, the Accept dialog is displayed.

```
Found FAT32 partition MEDIA at LBA 8193150

                Accept? [y/n]
```

Found partition dialog

For most systems the user can just accept the partitions as they are found. However, in some cases BootMaster will find defunct partitions that are relics of reapportioning the hard disk or resizing partitions with tools like Partition Magic. So accepting the correct partitions is dependent on the user and the user's knowledge of just what partitions should currently reside on the drive.

3. When the search terminates, the MBR work screen will display the details of the virtual MBR (it exists only in memory at this point) that was created.

At this point press F3 to view the Partitions Summary Screen. This screen will display a list of the partitions that will be accessible if the just-created virtual MBR is written to the disk. Pressing F3 again at this point will start the File System Viewer for the partition that is currently highlighted. The Viewer is very helpful in identifying and verifying partitions.

If the user is satisfied that all existing partitions are identified, then press ESC to return to the MBR work screen. Then press F2 to accept the virtual MBR and answer "y" to the write dialog. Note that registration is required prior to writing the MBR. If the user is not satisfied, then return to the MBR work screen and press F5 to begin another rebuild search, and make different selections when candidate partitions are found.

Once the user is satisfied and has written the rebuilt MBR to disk, then reboot the computer and verify that all existing partitions are accessible.

Then restart BootMaster and create a backup of the MBR.

Don't forget to set an active partition (F6), if the MBR was rebuilt for Drive 1 (80H).

4. If the MBR cannot be successfully rebuilt, which is possible

if there is extensive damage to the boot chain structures or if the disk had non-standard partitioning, then run BootMaster Diagnostics (BMD.EXE). This can be done from within BootMaster (F12). This program will create a diagnostic file, BMDnn.DAT, in the BootMaster files directory (A:\PLUS (or for the CD version) Z:\). Zip this file and attach it to an email to support@filerecovery.biz. We will evaluate the file and offer a solution or our best advice, if the solution is beyond our capabilities.

Restoring a FAT32 or NTFS Boot Sector

To restore a corrupted FAT32 or NTFS boot sector, follow these steps...

1. First, ensure that the MBR's partition tables are correct. If you are unsure of this, return to the top of this document and read the entire manual.

2. Start BootMaster. Be sure that the correct hard drive is selected (use the F10 key to change drives).

3. Press F3 to display the Partitions Summary Screen.

4. If a restorable boot sector exists, you will see "Repair" under the "Boot Sector" heading for that partition.

Partitions on Drive 80h

Volume Name	Type	Start LBA	Size (MB)	Boot Sectors	Mount
SYSTEM	FAT32(12)	63	4195	OK	OK
MEDIA	FAT32(12)	8193150	4195	Repair	OK

5. Use the UP/DOWN Arrow keys to highlight that partition.

6. Press F2 to restore the boot sector. Answer "Yes" to the dialog. The boot sector will then be restored from the file system's backup copy. This action requires registration.

Special Partition Types

Windows Dynamic Disks

Windows Dynamic Disks are indicated by partition type 42h (66d). BootMaster will flag the presence of a Dynamic Disk at startup (even if the partition table is corrupted, the presence of a Dynamic Disk can often be determined by locating associated metadata). We recommend that, if a Dynamic Disk is present, the user should prepare a diagnostic report for the drive and send it to BootMaster support for evaluation prior to making any changes to the master partition table.

Dynamic Drive Overlays

DDOs, as they are usually called, provide hard disk BIOS replacements that allow a system to access drives larger than its own BIOS can handle. The most common DDOs are EZ-BIOS (type 55h/85d) and Disk Manager (type 54h/84d).

In general, DDOs cannot be repaired by standard partition recovery tools, because they use both custom boot code and indirect partition pointers. In some cases BootMaster can be used with EZ-BIOS, but the user should email a diagnostic report to BootMaster support for evaluation before attempting any changes. BootMaster can always be used to uninstall EZ-BIOS, but, again, consultation with our support is necessary.

BootMaster should not be used in the presence of Disk Manager.

GoBack

GoBack is a recovery tool that can return a Windows installation to a prior stable condition in the event of a problem. It is of interest to BootMaster users, because GoBack installs a custom partition table in the Master Boot Record.

Problems with GoBack often result in boot failures. These can usually be overcome by reverting the GoBack custom partition table to a normal one, which can be done simply by using the F5 scan in BootMaster. After booting is restored, GoBack should be uninstalled then reinstalled.

If the presence of a GoBack partition is flagged on startup of BootMaster, the user should prepare a diagnostic report and email it our support for evaluation before making any changes to the partition table.

Special Error Conditions

Dirty Volume

The "dirty volume" error message means that Windows has terminated abnormally with unwritten data in the disk buffers. This may result in corruption of the file system that can prevent Windows from mounting the volume or from booting properly.

If this error is present, the user should perform any needed repairs to the Master Boot Record/partition tables or boot sectors, then run CHKDSK to repair the affected volume’s file system. We recommend making a backup of any valuable files on the volume befroe running CHKDSK.

BIOS Translation Error

This error is reported when the heads and sectors values reported by the BIOS are different from those reported in the BPB of boot sectors on the disk, and indicates that the translation has changed since the disk's partitions were originally formatted.

This condition can cause boot failures. When it is reported the user should prepare a diagnostic report and forward it to BootMaster tech support.

Active DDO

This error message indicates that an active DDO has been detected in memory. Disk utilities like BootMaster cannot operate correctly in the presence of an active DDO. If this error is reported, then the system must rebooted directly from the floppy disk or CD, which will prevent the DDO from loading.

Drive Capacity Exceeded

BootMaster has detected a partition that ends beyond the last addressable sector on the disk. In our experience this problem is normally associated with partition re-sizing and relocating operations, though it can have other causes, such as a drive larger than 138GB being run on a system with BIOS that is not 48 bit LBA capable.

If this error occurs prepare a diagnostic report and forward it to BootMaster tech support for evaluation.

Windows BSODs

If the system's start-up is halting with a blue screen error message, then the basic boot process is working and the problem preventing a successful start-up is probably located within the Windows file system. BootMaster will not be able to make repairs in this case. The user should contact Microsoft support.

Corrupt MFT

The "Corrupt MFT" error message is issued by the NTFS file system viewer. It indicates that one or more problems have been detected in the Master File Table of the NTFS partition the user is trying to inspect, and that the viewer will not be able to display the entire file system, though it may be able to accomplish a partial display.

In most cases an NTFS file system with a damaged MFT will not be mountable by Windows. Also, running CHKDSK with a damaged MFT may result in data loss.

We recommend using a good file recovery tool to copy out any unbacked files, and since the MFT is damaged the tool should be capable of RAW mode recovery.

After backing up files, the user can attempt to repair the volume with CHKDSK. If CHKDSK is unable to accomplish repairs, the partition can be reformatted and restored from backup or by a Windows reinstallation.

BootMaster and other 3rd party utilities are not able to repair a corrupt MFT.

BootMaster Diagnostic Reports

Our support effort is based on BootMaster Diagnostics (BMD), our powerful partition diagnostic scanner. A copy of BMD is included on every BootMaster rescue disk. BMD can be executed from from within BootMaster (via the F12 key). Each BMD scan results in the creation of a text report file. The file name takes the form "BMDnn.TXT", where nn is a digit pair. The reports are numbered sequentially with the most recent report having the highest number - ie, BMD00.TXT, BMD01.TXT, BMD02.TXT, etc.

The report files will be saved to the A:\PLUS directory on floppy

disk-based versions of BootMaster. The reports are saved to the Z:\ directory for BootMaster on CD. CD users can transcribe the report data into an email or use a digital camera to create screen snapshots of the report, attaching the image files to email. Diagnostic reports can be read with scrolling by using the "Read existing reports" option of the diagnostic program.

Just attach the report file to an email and send to support@filerecovery.biz

Registration

BootMaster may be registered from...

http://bootmaster.filerecovery.biz

Immediately following registration user will receive an email containing a 10 character registration code.

When staring BootMaster in the free evaluation mode this dialog will be displayed...

```
1 - Start in Evaluation mode
2 - Enter Registration Code
```

License dialog

Simply press "2" to invoke the registration dialog, where the 10 character registration code may be entered.

The registration dialog can also be invoked by CTRL+R after starting the demo version.

Unusual license status indications - "Missing License," Invalid License," etc., should be referred to support@filerecovery.biz for resolution.

Using The BootMaster NTFS & FAT File System Viewers

BootMaster provides file system viewers for both NTFS and FAT file systems. The viewers provide a visual method to positively identify partitions, verify the file systems, recover files from damaged file systems, and undelete files.

The viewers are accessible from the Partition Summary Screen. Just highlight the partition to be viewed and press F3.

```
                                SYSTEM:\

 $EXTEND      <DIR>       05-28-2002 02:011  --HSD---  $Extend
 .            <DIR>       03-23-2003 04:33a  ARHSD---  .
 DOCUME~1     <DIR>       03-23-2003 05:11a  A---D---  Documents and Setting
 FOLDER~1     <DIR>       11-28-2002 10:30p  --HSD---  Folder Settings
 MICROS~1     <DIR>       03-12-2003 11:19p  A---D---  Microsoft UAM Volume
 PROGRA~1     <DIR>       02-08-2003 11:46p  AR--D---  Program Files
 RECYCLER     <DIR>       12-03-2002 08:20p  --HSD---  RECYCLER
 TEST         <DIR>       02-10-2003 06:27p  ----D---  test
 WINNT        <DIR>       02-08-2003 11:46p  A---D---  WINNT
 WORK         <DIR>       02-09-2003 00:04a  ----D---  work
 $ATTRDEF           2560  05-28-2002 02:01p  --HS----  $Attrdef
 $BADCLUS              0  05-28-2002 02:01p  --HS----  $BadClus
 $BITMAP          159896  05-28-2002 02:01p  --HS----  $Bitmap
 $BOOT              8192  05-28-2002 02:01p  --HS----  $Boot
 $LOGFILE       28296158  05-28-2002 02:01p  --HS----  $LogFile
 $MFT           15429632  05-28-2002 02:01p  --HS----  $MFT
 $MFTMIRR           8192  05-28-2002 02:01p  --HS----  $MTFMirr
 $SECURE               0  05-28-2002 02:01p  --HS----  $Secure
 $UPCASE          131072  05-28-2002 02:01p  --HS----  $UpCase
```

Partition Viewer Directory Browser Screen Shot

The two viewers are very similar in appearance and, for the most part, in operation. The following discussion applies to both viewers except where specifically indicated.

On startup the NTFS viewer first reads the volume's Master File Table (may take a minute), displays the directory browse screen.

The FAT viewer goes directly to the directory browse screen on startup.

From the browse screen, the viewers' browse, search and file recovery functions are available.

Browsing the File System

The viewer provides a simple interface for moving around in the volume's directory tree. The current directory can be navigated using the Up Arrow, Down Arrow, PageUp, Page Down, Home and End keys.

The current directory can be changed by moving the highlight bar to a directory line (as the directory "WINNT" is highlighted above) and pressing the ENTER key. Pressing F4 (regardless of the location of the highlight bar) will return to the current directory's parent.

Individual files (including deleted files) may be extracted and written to other media from the browser by simply moving the highlight bar onto the file and pressing ENTER. Note: deleted files are displayed in bright blue in the browser display, normal files are displayed in black.

The programs' search, save and other functions are available via the **Function keys:**

F1: Displays Quick Help screen

F2: Displays Search Dialog

The user may enter from one to sixteen search terms in the data entry field for each search. Multiple terms must be separated by semi-colons, and wild- cards are allowed.

*.do?; *.xl?

Search dialog

As an example, the search defined above will locate Word and Excel files.

During searches the directory currently being searched is indicated on the bottom line of the display.

F3: Resume Search

Restarts the search to locate the next file/directory matching the search term(s).

F4: Open Parent Directory

Move up to and displays the contents of the parent of the current directory.

F6: Display Normal File List

Places NTFS viewer in "Normal" mode (default). Displays all file and directories (including deleted files) accessible via the Master File Table.

For the FAT viewer F6 toggles display of deleted files on or off.

F7: Display Deleted File List

Places NTFS viewer in "Deleted" mode. Display is limited to deleted files only.

For the FAT viewer, F7 toggles the active FAT (FAT1 or FAT2) being used by the viewer.

F8: Display Orphan Files

Places NTFS viewer in "Orphan" mode. Displays files and directories that have become detached from the normal file system tree because of corruption of the Master File Table. Note: "orphaned" files can normally be restored to the file system by CHKDSK, if the NTFS volume on which they reside is mountable by the operating system. CHKDSK will place them in the root directory.

For the FAT viewer, F8 steps the sectors per cluster value in effect to the next power of 2 (i.e., 1, 2, 4, 8, 16, 32, 64, 128, 256, then back to 1).

F9: Enter Save Path

Displays the "Save Files to..." dialog.

Here the user enters the pathname to which saved files will be written. The path must reside on FAT formatted media. Note: this dialog will be displayed automatically by the viewers as needed, if the user has not already entered a pathname.

F10: Save Files Dialog

The Save Files function performs a search for files with names matching the File Mask(s) and saves them to the destination save path when found. Optionally, the original directory may recreated on the destination.

As with the Search function, up to 16 terms may be entered in the "File Mask" field, separated by semi-colons. Files within the current directory which match the search term(s) will be saved.

After exiting from this dialog, the user will be prompted for the save path and also may elect to restore the original pathnames when files are saved.

Note that NTFS pathnames may be considerably longer than can be recreated in DOS. If a pathname of excessive length (more than 66 characters for the directory pathname exclusive of the filename) is encountered, the save will terminate on an error.

During save file operation the directory currently being searched or the file currently being saved is indicated on the bottom line of the display.

F11: Select Volume

Displays the Select Volume dialog so that the user can change volumes.

F12: Read Manual

Display the DOS version this manual.

ENTER:

Pressing ENTER when a directory is highlighted will open that directory and display its contents in the browse windows.

Pressing ENTER when a file is highlighted will save that file to the current save path.

Long File Names

Long file and directory names will be preserved during file save or undelete operations.

Using BootMaster Partition Editor

The BootMaster Partition Editor provides an interface for manually editing partition tables in the Master Boot Record or Extended Partition Boot Records and FAT (12/16/32) and NTFS partition boot sectors.

Partition editing is an advanced procedure that requires a thorough understanding of partition tables, extended partition records, and operating system boot sectors. We recommend that users contact BootMaster technical support before attempting to make changes to a disk with BootMaster Partition Editor.

```
                         BootMaster Partition Editor [1.0]

                          MASTER BOOT RECORD - Drive 80H

            Start                    End        Relative        Total
  Active  C    H   S    Type     C    H   S     Sectors        Sectors

     0     0    1   1  FAT32x   509  254  63          63        8193087
     0   510    0   1  FAT32x  1019  254  63     8193150        8193150
     0  1020    0   1  EXTNDx  1023  254  63    16386300       22892625
     0     0    0   0    NONE     0    0   0           0              0

  Current LBA:  0                                        Signature: AA55

  Drive 80h Parameters                           Actions

  Cylinders:          2433       F2 - Write Changes      F8 - Zero MBR
  Heads:               254       F3 - Clear              F9 - Reset
  Sectors:              63       F4 - Insert             F10 - Change Drive
  Total Sectors:  39108825       F5 - Delete             F11 - Undo
  Disk size:         19.93GB     F6 - Auto Fill          F12 - Diag File
                                 F7 - Calculator

  F1 - Help            Use SPACE BAR to toggle active flag      ESC to Quit
```

Editor screen

Explanation of column headings

"**Active**" refers to the value of the "active" byte in the partition record. A value of 80H indicates that the partition is bootable. A value of 0 indicates that a partition is not bootable. No other value is allowed in this field. The presence of a value other than 80H or 0 will cause Boot Master to issue the corrupt partition warning.

"**Start C H S**" indicates the cylinder, head, and sector coordinates of the first sector in the partition.

"Type" refers to the value of the type byte in a partition record. BootMaster recognizes the following partition types: 1 (FAT12); 4, 6, and 14 (FAT16); 11 and 12 (FAT32); 7 (NTFS basic partition); 5 and 15 (Extended Partition Boot Record). Note: NTFS "Dynamic" partitions may be detected as type 7 (NTFS basic). If this occurs, the partition type may be changed via the F7 key.

"End C H S" refers to the cylinder, head, and sector coordinates of the last sector in the partition. Note that these values (as well as the Start C H S)are meaningless when the partition starts or ends beyond the 8 GB CHS addressing threshold.

"Relative Sectors" refers to the value of the "Relative" DWORD in the partition record. This value is the logical block address (LBA) of the first sector in the partition relative to the address of the "parent" boot record (the MBR or an Extended Boot Record).

"Total Sectors" is (fairly obviously) the total number of sectors contained in the partition.

The **"signature"**, which always has a value of AA55H is the signature word found at the end of all MS boot sectors. (It is not a part of the partition table).

Selecting Partitions

From this point in the program, you may select a partition by moving the highlight bar with the UP and DOWN arrow keys. Pressing ENTER on a normal partition will display that partition's boot sector. Pressing ENTER on an Extended partition will display the Extended Partition Boot Record. You may move through all of the partitions and Extended partitions on the hard disk in this manner. Use the ESC key to backtrack.

Editing keys

0 - 9: Data input

Up ARROW, Down ARROW: Move from one partition record to another

Left ARROW, Right ARROW: Move non-destructively in the current edit field

Backspace: Destructive backspace

Insert: Toggle character insert mode (default is insert off)

Delete: Delete character at current cursor position

TAB: Move to next edit field

SHIFT+TAB: Move to previous edit field

ENTER: Go to object described by current partition record, ie, to a partition sector or Extended Partition Boot Record

SPACE BAR: When in the Active Byte field, pressing the SPACE BAR will toggle the value of the active byte (0 or 128).

When in the Type field, pressing the SPACE BAR will display the partition type selection menu.

Action Keys

F1: Help - Display user's guide

F2: Write Changes - Write changes to disk

F3: Clear - Set all fields to zeros. This a "virtual" operation which takes place in memory only. It is not the same as the Zero MBR function, which zeros out the Master Boot Record on disk.

F4: Insert - Insert blank partition record at current line

F5: Delete - Delete partition record at current line

F6: AutoFill - Fill in partition table with a single keystroke

F7: Calculator - Display LBA/CHS calculator

F8: Zero MBR - Write zeros to the Master Boot Record

F9: Reset - Remove changes from memory

F10: Change Drive - Change the current drive

F11: Undo - Run the BootMaster Undo utility to remove written changes from the hard drive

F12: Diag file - Run BootMaster Diagnostics to create a new diagnostic file

LBA/CHS Calculator

```
                    BootMaster Partition Editor [1.0]

                     MASTER BOOT RECORD - Drive 80H

           Start                    End        Relative        Total
Active  C    H   S    Type     C    H   S     Sectors        Sectors

   0     0    1   1  FAT32x   509  254  63          63        8193087
   0   510    0   1  FAT32x  1019  254  63     8193150        8193150
   0  1020    0   1  EXTNDx  1023  254  63    16386300       22892625
   0     0    0   0    NONE     0    0   0           0              0

Current LBA:  0                          LBA/CHS Calculator [1.0]

Drive 80h Parameters                LBA: 63             0 to 4294967295

Cylinders:          2433      Cylinder: 0              0 to 267348
Heads:               254          Head: 1              0 to 254
Sectors:              63        Sector: 1              1 to 63
Total Sectors:  39108825
Disk size:         19.93GB    F10: Change Params           ESC to Quit


F1 - Help            Use SPACE BAR to toggle active flag      ESC to Quit
```

Editor screen with calculator

The LBA/CHS calculator provides a convenient means to convert between LBA and CHS coordinates and/or to perform simple arithmetic (addition and subtraction) on coordinate values.

Changes to LBA values are reflected in the CHS fields in real time, and vice versa.

To perform addition or subtraction, move the cursor to the field to be changed, press "+" or "-" as applicable, type in the value to add or subtract, then press "=".

The F10 key allows the user to change the head and sector parameters in effect (default is the system BIOS reported values) for calculations. Parameter values changes are local to the calculator and are not reflected into the editor itself, which always uses the values reported by the system BIOS.

Boot Sector Editing

```
                    BootMaster Partition Editor [1.0]

Jump                58EB90h       Sectors per FAT       9718
OEM                 MSWIN5.0      FS Version            0.0
Bytes per sector    512           Root start cluster    2
Sectors per cluster 16            FSInfo sector         1
Reserved Sectors    32            Backup Boot Sector    6
Number of FATs      2             Drive number          80h
Media Type          F8h           Ext boot sig          29h
Sectors per track   63            Volume SN             61A36770h
Heads               255           Volume Label          SYSTEM
Hidden Sectors      63            File system           FAT32
Total Sectors       19920537      Boot sector ID        AA55h

      Editor Status                             Actions

Editing FAT32 boot sector           F2 - Save         F9  - Reset
Source file: NA                     F3 - Template     F11 - Undo
   Template: NA                     F4 - Copy Backup  F12 - Diagnostics
      Drive: 1
        LBA: 63

F1 - Help                                                   ESC to Quit
```

Boot sector editor

Editing keys

0 - 9: Data input

Up ARROW, Down ARROW: Move from one partition record to another

Left ARROW, Right ARROW: Move non-destructively in the current edit field

Backspace: Destructive backspace

Insert: Toggle character insert mode (default is insert off)

Delete: Delete character at current cursor position

TAB: Move to next edit field

SHIFT+TAB: Move to previous edit field

Action Keys

F1: Help - Display user's guide

F2: Write Changes - Write changes to disk

F3: Template - Edit a boot sector template

F4: Copy Backup - Copy the backup boot sector into the editor

F9: Reset - Remove changes from memory

F11: Undo - Run the BootMaster Undo utility to remove written changes from the hard drive

F12: Diag file - Run BootMaster Diagnostics to create a new diagnostic file

The boot sector editor provides a means of editing FAT and NTFS boot sectors or of rebuilding the boot sectors from scratch. Fields available for edit include the initial jump instruction, the OEM string, the BIOS Parameter Block (BPB) values, and the boot sector id.

The BPB structure varies depending on the file system involved. Supported file systems are FAT12, FAT16, FAT32, and NTFS. The following tables provide details of the BPB fields for each file system. Values shown in normal text are "standard" and will rarely, if ever, be other than what is shown here. Values in bold text are specific to the particular partition. These values must be determined prior to editing the boot sector. They will normally be specified in a BootMaster diagnostics report or can be derived from the data in the report.

FAT16 Boot Sector

Offset	Description	Value
0x00	Jump/NOP	58EB90h
0x03	OEM String	"MSDOS5.0"
0x08	Bytes per sector	512
0x0D	**Sectors per cluster**	**64**

0x0E	Reserved sectors	1
0x10	Number of FATs	2
0x11	Root entries	512
0x13	Total sectors (small)	0
0x15	Media descriptor	F8h
0x16	**Sectors per FAT (small)**	**256**
0x18	**Sectors per track**	**63**
0x1A	**Number of heads**	**255**
0x1C	**Hidden sectors**	**63**
0x20	**Total sectors (large)**	**8193150**
0x24	BIOS drive number	80h
0x25	Reserved	0
0x26	Extended boot signature	29h
0x27	**Volume serial number**	**38F2EF9Ah**
0x2B	**Volume label**	**"SYSTEM"**
0x36	Operating system	"FAT16"

FAT32 Boot Sector

Offset	Description	Value
0x00	Jump/NOP	58EB90h
0x03	OEM String	"MSDOS5.0"
0x08	Bytes per sector	512
0x0D	**Sectors per cluster**	**8**
0x0E	**Reserved sectors**	**32**
0x10	Number of FATs	2
0x11	Root entries	512
0x13	Total sectors (small)	0
0x15	Media descriptor	F8h

0x16	Sectors per FAT (small)	0
0x18	**Sectors per track**	**63**
0x1A	**Number of heads**	**255**
0x1C	**Hidden sectors**	**63**
0x20	**Total sectors (large)**	**8193150**
0x24	**Sectors per FAT (large)**	**7986**
0x28	Flags	0
0x2A	File System Version	0.0
0x2C	**Root Cluster**	**2**
0x30	Offset to FSInfo sector	1
0x34	Offset to backup boot sector	6
0x36	Reserved	0
0x40	BIOS hard drive number	80h
0x41	Reserved	0
0x42	Extended boot signature	29h
0x43	**Volume Serial Number**	**51DFA255**
0x47	**Volume label**	**"SYSTEM"**
0x52	Operating system	"FAT32"

NTFS Boot Sector

Offset	Description	Value
0x00	Jump/NOP	52EB90h
0x03	OEM String	"NTFS"
0x08	Bytes per sector	512
0x0D	**Sectors per cluster**	**8**
0x0E	Reserved sectors	0

0x10	Reserved (always 0)	0
0x13	Unused	0
0x15	Media descriptor	F8h
0x16	Reserved (always 0)	0
0x18	**Sectors per track**	**63**
0x1A	**Number of heads**	**255**
0x1C	**Hidden sectors**	**63**
0x20	Unused	0
0x24	Unused	80008000h
0x28	**Total sectors**	**10233341**
0x26	**Pointer to $MFT**	**4**
0x27	**Pointer to $MFTMirr**	**639583**
0x40	**Clusters per FRS**	**F6 (see Note)**
0x44	**Clusters per Index**	**1 (see Note)**
0x48	**Volume serial number**	**29DE739AFE331DA4h**
0x50	CRC	0

Note: The values Clusters per FRS (File Record Segment) and Clusters per Index will be negative in the case where the sectors per cluster is greater than size of the FRS or Index record. In the case described here the value in the Clusters per FRS field is F6h or -10. The actual size of the record is then calculated as 2 ^ (-1 * -10) or 1024 bytes (2 sectors).

Using Boot Sector Templates

The editor currently has 4 boot sector templates available: NTFS, FAT32 for Win 98, FAT32 for XP/2000, and FAT16 for DOS/Win (which can also be used, if needed, for FAT12).

The user will be prompted to select a template in the event that the editor cannot identify a corrupted boot sector.

```
NTFS XP/2000
FAT16 Win98
FAT32 XP/2000
FAT32 Win98
```

Template selection dialog

Also, the user can copy a template into the edit screen at any time by pressing F3. When installing a template via F3, the user also has the option to use the complete template, the IPL part only, or the BPB part only.

```
Full Template
IPL Only
BPB Only
```

Template type dialog

Note that values that are normally consistent for all boot sectors are already filled in. Values showing zero value must be provided by the user. These can normally be derived from the BootMaster Diagnostics report.

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Appendix A - A List of Partition Type Codes

This is a list partition type codes most commonly encountered on hard drives on Windows computers. The list is not exhaustive.

01 - DOS FAT12

04 - DOS FAT16 (up to 32MB)

05 - Extended Partition (CHS)

06 - DOS FAT16 (32MB to 2GB) (CHS)

07 - NTFS

0Bh (11) - FAT32 CHS

0Ch (12) - FAT32 LBA

0Eh (14) - DOS FAT16 (LBA)

0Fh (15) - Extended Partition (LBA). This partition is typically used in the Master Boot Record's partition table only. 05 is used in Extended Partition Tables.

12h (18) - Configuration partition. Used by Compaq and several other manufacturers.

3Ch (60) - Partition Magic Recovery Partition. Sometimes called a PQRP partition, this is a temporary code written to the partition table by Partition Magic during change operations on a hard drive. It is only encountered if the PM process aborted for some reason.

42h (66) - Windows Dynamic Partition

44h (68) - GoBack Partition

54h (84) - Disk manager DDO

55h (85) - EZDrive DDO

84h (132) - Hibernation partition, used with various laptop models. A0h is also used in some cases.

DB (219) - Dell Restore Partition

DEh (222) - Dell Utility Partition