FIRESAGE SOLUTIONS

MBRWizard Suite

User Guide

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Chapter 1

Introduction

What is MBRWizard Suite?

The Master Boot Record (MBR) is a small section at the beginning of the disk, and maintains the layout of a hard disk structure, which arguably makes it the most important area of the hard disk. So why is the MBR so frequently ignored, seldom backed up, and always taken for granted? If everyone understood the role played by this very small section of the disk, this practically unknown area would be treated very differently, namely regularly backed up in case disaster strikes. There are many threats to the MBR such as boot viruses and other malware, testing dual boot scenarios with Linux and other operating systems, simple disk failure, or even changes made by standard applications. Regardless of how changes are made, if the MBR is removed, becomes damaged, or inadvertently altered, you could permanently lose your photos, financial information, documents, and all other important data. To prevent the unthinkable, simply follow this guide to start safeguarding your data… NOW!

MBRWizard has been designed as an intuitive graphical Windows application that simplifies the process of basic operations by breaking them down into tasks. Included in the suite is the MBRWizard Boot Builder that helps create a bootable WinPE ISO, and can be burned to CD/DVD to repair systems that can no longer boot due to MBR problems.

Safeguarding the integrity of the MBR and recovering from disaster are only a couple of the options provided by MBRWizard. Check out the following list of available features performed by MBRWizard for suggestions to prevent downtime and improve the usability of your computer

- Backup and Recover the MBR in case of corruption or unwanted changes
- Store MBR backup archives directly to the Firesage Cloud
- Repair a corrupt or missing MBR
- Backup the Volume Boot Record of individual partitions
- Update the disk signature
- Change the partition type
- Set individual partitions as bootable
- Hide partitions from unwanted access
- Sort the partition entries in the MBR
- Securely wipe sections of the disk, including the MBR, GPT, individual partitions, or the entire disk.
- Save/Copy/Restore any sector on a hard disk
- Safely prevent changes to the MBR with boot-times alerts when the MBR is changed

What is the MBR?

The Master Boot Record (MBR) is a small, dedicated section at the beginning of the hard disk, located before any partitions on the disk, and structured to hold the boot information and partition layout for the entire disk. The complete MBR is only a single physical sector in length (512 bytes), but is essential to creating or maintaining partitions on the disk or booting the computer. The following describes the different sections of a valid MBR, which helps to clarify the importance of the MBR.

Partition Table

A disk partition is a logical division of the disk, into which a file system can be created in order to install an operating system (such as Windows or Linux), or store various types of files. The partition table effectively retains the individual details for each primary partition on the disk, such as starting position, size, type, status, etc. A standard MBR reserves space for up to four partitions, although only one is necessary for proper operation of the computer.

Boot Code

Most of the first 446 bytes of the disk are dedicated to telling the computer how to boot. When a machine firsts boots up it attempts to locate the necessary operating system files on the hard disk, and looks to the boot code for that information. The boot code is actually a small program that identifies the active (bootable) partition then redirects the boot process to that location. MBRWizard is able to repair the boot loader in case it gets overwritten or corrupted.

Disk Signature

Located at byte 440, this is simply a unique identifier for the disk. This is typically used by Windows to remember the assigned drive letters for each partition, but is also used by various operating systems to identify the correct boot volume.

Magic Number

Located in the final two bytes of the MBR (511-512), this section must contain the hex value AA55, which officially classifies this as a valid MBR. An invalid magic number indicates a corrupt or missing MBR, therefore these bytes are critical to booting or using the disk. The Magic Number is a hexadecimal number and is often represented as 0xAA55 or AA55h, but when viewed in a hex or disk editor it is typically displayed as: "55 AA".

When any part of the MBR is missing or corrupt, the machine will not be able to boot. For example, if the partition table isn't populated with correct partition information, not only will the boot loader be unable to locate the partition for booting, but the partition and all the contents (files, folders, data) will effectively be lost. Similarly, if the boot loader code becomes corrupt, the boot process cannot be properly handed off and the machine will not be able to boot.

Chapter

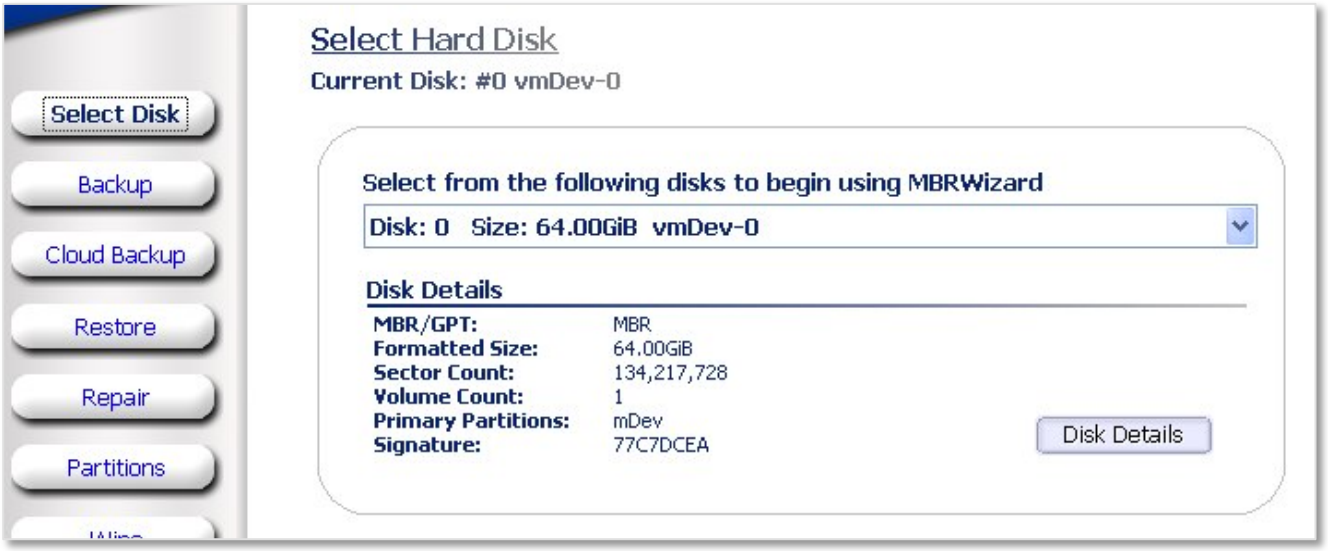
2

Operations

Selecting a Disk

Modifying the MBR is always a daunting task, primarily because making unwanted changes could cause further damage to the MBR. First and foremost you want to make sure you are making changes to the correct disk, otherwise you may be in a worse situation than when you started. In order to help prevent unwanted changes, MBRWizard has been designed to select a single disk for updated, allowing edits to occur only to a single disk at a time.

At program startup you will find the MBRWizard options are disabled, simply select a disk from the available list of disks to enable the buttons and unlock the features.



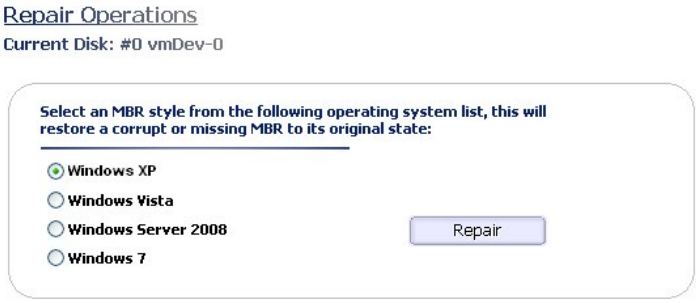
Disk Details

Displays the disk and partition information detected by MBRWizard for the selected disk. You may also select to print the details from this location, which would provide a hard-copy method to rebuild the partition table if necessary.

MBR Repair

As mentioned above, the boot code section of the MBR contains the instructions r
equired to hand-off the boot process to the operating system. If the MBR boot code becomes corrupt due to malware or other causes, the boot process will abruptly end without the proper instructions.

MBRWizard provides the capability to repair the boot code of any disk attached to the machine, effectively returning the boot code back to the original state when Windows was installed. This process repairs any inconsistencies in the code, and removes any boot virus entrenched in the MBR. Note, the MBRWizard repair process will not modify the partition layout or disk signature in the MBR, as it leaves the partition table intact while updating the boot code. This provides a simple method to repair the MBR without modifying the existing partition structure on the disk.



Support for the major Microsoft MBR types is provided, including Windows XP, Vista, Windows 7, and Server 2008 formats. However, newer MBR formats are backward compatible, meaning that it is generally safe to repair a Windows XP disk with a Windows 7 MBR.

Backup Operations

MBRWizard provides the features to create backup copies of the necessary disk structures, which can be restored in case disaster strikes. Since the MBR contains the partition structure for the disk this will be our primary focus, but we support the following sections for backup:

- MBR – Disk sector 0, containing the boot record, partition table, and the disk signature.
- Track 0 – Comprising the first 63 sectors of the hard disk.
- Boot Record – Captures a backup of the volume boot record (VBR), located at the beginning of each partition and contains the boot record for the selected partition. Support is currently provided for FAT, FAT32, and NTFS partition types.
- Range of sectors – Provides you with a method to specify a range of sectors to include in the backup file.

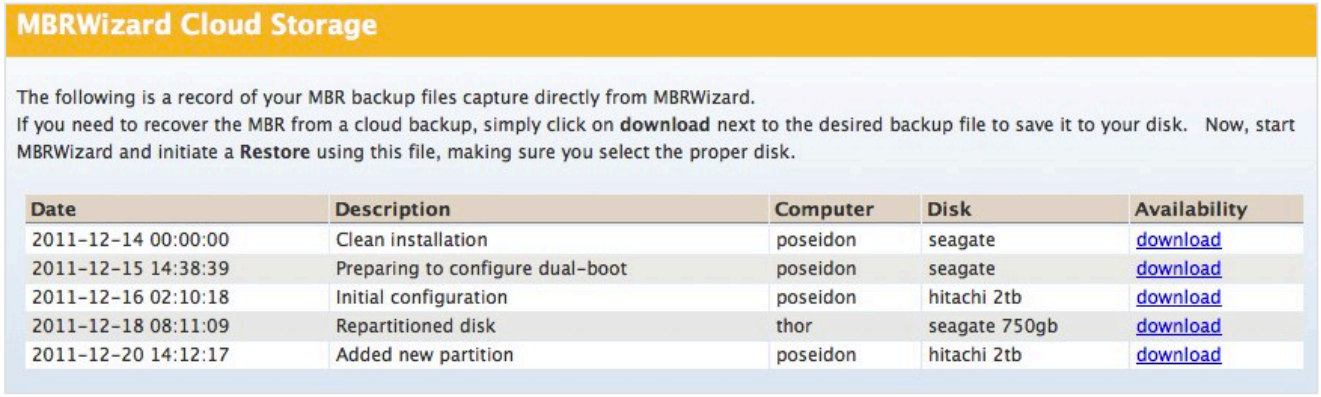
To create the backup file, you may enter a filename in the space provided, or browse for a filename by clicking on the folder icon to the right of the filename field. Clicking *Save* will immediately save the archive file to the location specified.

Cloud Backup

In order to help you further protect your disks and data, we now provide a simple method to capture and store an online backup of your MBR. New with version 4.0, MBRWizard provides an easy way to create a backup of each disk directly to our servers over the Internet. This process keeps a backup of your MBR in a safe location, away from disasters that may strike your local disks or backup media.

Start by selecting the option *Cloud Backup* from the main MBRWizard interface, and enter a brief description to help you remember the details about this backup. We also record the machine, disk, and date/time of the backup to help you locate the proper backup for your hard disk.

If disaster strikes, simply login to your account at http://firesage.com/cloud.php, where you will find a list of archives available for immediate download. Simply click on ***download*** to download the file to your computer, which can be used to recover the MBR on your hard disk.



MBRWizard Cloud Storage

The following is a record of your MBR backup files capture directly from MBRWizard.
If you need to recover the MBR from a cloud backup, simply click on **download** next to the desired backup file to save it to your disk. Now, start MBRWizard and initiate a **Restore** using this file, making sure you select the proper disk.

Date	Description	Computer	Disk	Availability
2011-12-14 00:00:00	Clean installation	poseidon	seagate	download
2011-12-15 14:38:39	Preparing to configure dual-boot	poseidon	seagate	download
2011-12-16 02:10:18	Initial configuration	poseidon	hitachi 2tb	download
2011-12-18 08:11:09	Repartitioned disk	thor	seagate 750gb	download
2011-12-20 14:12:17	Added new partition	poseidon	hitachi 2tb	download

Restore Operation

As mentioned above, the boot code section of the MBR contains the instructions required to hand-off the boot process to the active partition and associated operating system. If the MBR boot code becomes corrupt due to malware or other reasons, the boot process will abruptly end without the proper instructions. The Restore process is designed to restore the MBR to a point in time when the MBR was valid.

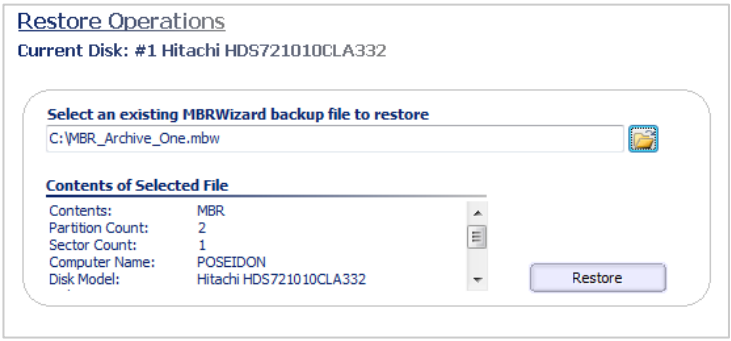


Figure 1 - MBR Restore

Working with files captured from the backup process, the restore procedure will recover the file contents back to the respective locations on disk. Start by selecting the file to restore, either by manually typing the filename or browsing the file system. Once located, a description of the contents will be displayed for review. The following options will be offered based on the file contents:

- MBR – The contents will be restored to sector 0 of the selected disk.
- Track 0 – This file will be restored to the first 63 sectors of the selected disk.
- Boot Record – A list of partitions on the selected disk will be provided for selection. The contents of the backup file will be restored to the selected partition.
- Range of sectors – Once a file with a range has been located, you can enter the target sector where you would like to start ther recovery. The entire file will be restored starting at this location.

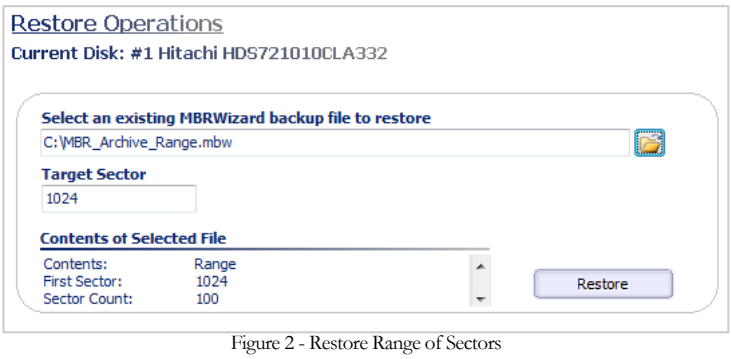


Figure 2 - Restore Range of Sectors

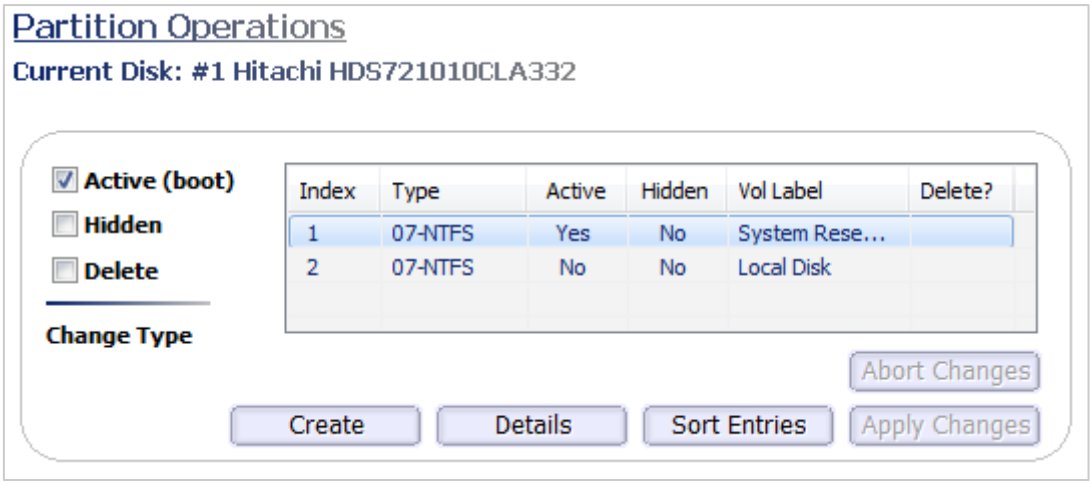
Note, as most operating systems read the MBR only when booting up, the computer will need to be rebooted in order for MBR changes to take effect in Windows.

Partition Operations

MBRWizard provides basic partition management by updating the settings located in the MBR, including deleting, hiding, or creating partitions, as well as setting the boot partition for the selected disk. This page lists the available partitions on the selected disk, simply click on the desired partition, at which point you will be presented with the following options:

- Active / Boot – Based on the MBR specification, only a single partition may be set *active*, which means that the machine will boot from this partition. When set as active, the MBR will turn control over to this partition at boot time. Make certain this partition has a operating system installed, otherwise the machine will fail to boot, and display one of several error messages. See the troubleshooting section below for more information on resolving this problem.

- Hidden – Initially designed to hide the partition from the operating system, this option isn't typically effective on newer operating systems such as Windows 7, as support for these modified partition types has been included in the latest OS versions.
- Delete – This option simply deletes the partition from the MBR. Be careful with this option, as it will effectively remove all data located within this partition. Once deleted, Windows will typically continue to see this partition until the machine is rebooted.



- Change Type – Allows the partition type to be modified within the MBR. In some instances, a given partition may carry the wrong type to remain undetected to the operating system, this option will allow you to change it to the desired type. Note, this procedure does not change the file-system type, nor does it make any modification to the file table.
- Create – This process will wipe the disk, and create a single, bootable partition that spans the entire disk. Frequently used to create bootable flash drives, but also valuable to reinitialize a used disk as new. Once the partition has been created, the machine must rebooted for changes to take effect, or in the case of removable media simply unplug and reinsert the flash drive.
- Sort entries – This option sorts the entries in the partition table according to their placement on the disk.

Wipe Operations

In situations where you need to securely remove data from the disk, you can select the wipe operation to remove data from one of the following areas of disk: MBR, Track0, GPT, or the entire disk. Keep in mind that the wiped data will be permanently removed from the disk, so make sure you have the correct disk selected, and understand what you are trying to accomplish.

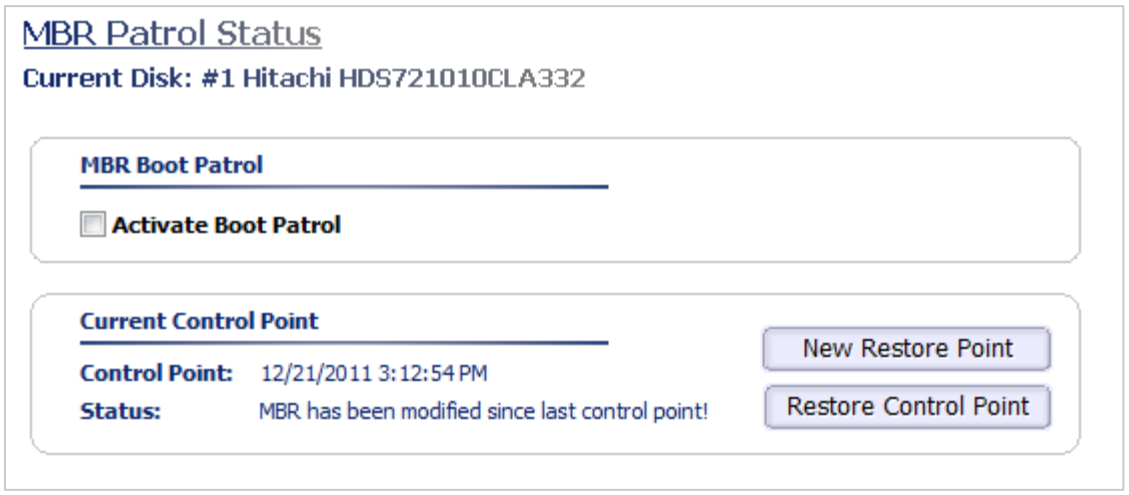
Depending on the size of disk, wiping an entire disk can be a time-consuming process. This feature was added primarily for flash drives and other removable media, but will work on any available disk.

Disk Signature

The disk signature is a unique identifier utilized by Windows to identify a disk to Windows. Each time Windows boots up, it uses this identifier to determine which drive letter to assign to a given partition. You may want to generate a new disk signature if you use disk cloning tools, and want Windows to rescan the layout of the disk. Additionally, some server-based applications depend on this disk signature to license the app to a given disk, MBRWizard allows you to manually modify this identifier to maintain these settings.

MBR Patrol

With many viruses and other malware targeted to hijack the MBR, we have added a new safety feature designed to protect the primary master boot record, called **MBR Patrol**. When activated, MBR Patrol automatically runs when the computer is booted, and validates the system MBR against a known control point for any undesired changes. If a change is identified, a warning will appear, and you be given the option to restore the MBR to a previous control point.

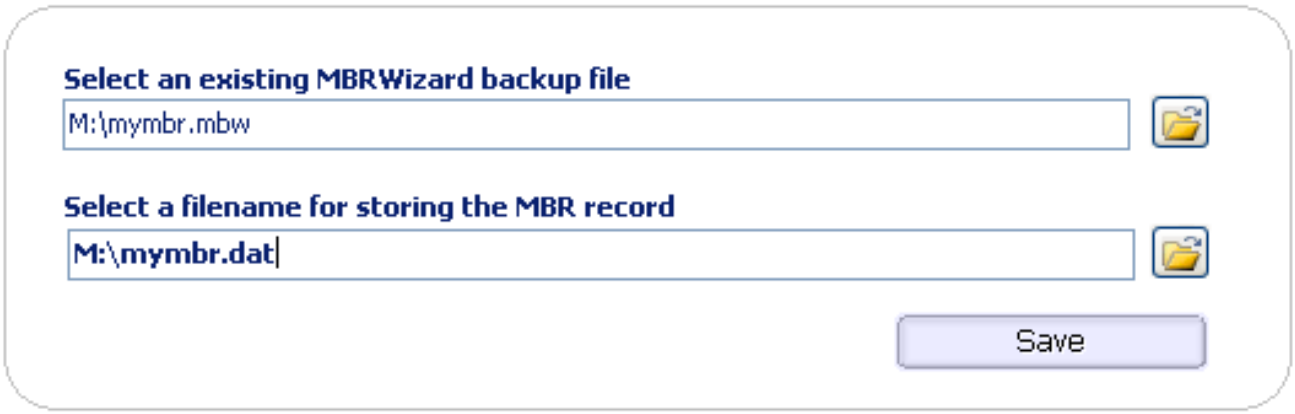


This option can easily be activated or deactivated, and allows you to set new control points with the click of a button.

When MBR Patrol is activated on Windows 7 machines with User Access Control (UAC) enabled, you will be prompted to let MBRWizard run each time the machine is booted. This is known limitation running on machines with UAC enabled, and will be addressed in a future version.

Strip File Header

In addition to the captured disk data, MBRWizard backup files also contain specific details about the machine, disk, and other information to help you identify the contents of the file at a later date. *Strip File Header* allows you to create a new file containing only the actual disk data, without the file header information.



Advanced Options

Auto-Backup the MBR

The Auto-Backup option provides a method to automatically backup the current MBR before MBRWizard makes a modification. This action takes place when restoring, repairing, or wiping the MBR.

Exclude Header

The MBRWizard file format includes metadata in each backup file, which help identifies the contents of the archive file, and helps make sure you restore it back to the correct disk and location. In certain situations you may not want this metadata, checking this box will exclude the metadata from the backup file.

Show Hints

By default, we provide popup hints when the mouse hovers over specific buttons for a short period of times. Unchecking this option will prevent the hints from being displayed.

Boot Media

Included with MBRWizard Suite 4.0 is a link to download a WinPE bootable iso file (an image archive of a CD), containing both versions of MBRWizard for offline MBR management. This iso image can be burned to CD/DVD, and provides a secondary method for booting your computer in situations when your computer can't boot on it's own.

In order to perform restore or repair operations from this bootable media, you must first enter your license key to unlock these features. A secondary option is to use the WinPE Boot Builder included with MBRWizard; using this product to build the bootable media will create the ISO pre-licensed with your registration information, which prevents the need to enter your license each time the machine boots. You will find the Boot Builder option under Start->MBRWizard->Boot Builder, but make sure you download and install the prerequisite Microsoft Windows AIK beforehand.

Chapter 3

Troubleshooting

This section describes potential error messages generated by MBRWizard, as well as steps to help you understand and resolve the underlying problems.

MBRWizard Error Messages

Error 506

This error indicates a problem writing to the specified area of the disk, typically the MBR. If encountered while repairing the MBR or attempting to restore an archive file, the disk may be failing, or the MBR sector (0) has failed.

Error 507

This indicates a problem saving data to specific areas of the disk. Similar to error 506, this error typically relates to sectors other than the MBR.

Errors 508, 509

These errors indicate a problem reading from a backup archive.

Common MBR Problems

Operating System Not Found, or Missing Operating System

Upon starting your Windows based computer you receive the error message that the operating system is missing or not found. This error typically indicates a corrupt or missing MBR, or could also indicate that no active (bootable) partition exists on the hard disk. In any case, the BIOS is unable to transfer control to a valid boot record and displays this error message before terminating. Start with the following steps to resolve such error messages:

1. Confirm there is an active partition on the disk
2. Repair the MBR

MBR has been compromised with a boot virus or other malware

The boot code in the MBR is automatically loaded at each boot, and is used to control over to the operating system or boot loader. In case the boot code gets infiltrated with a boot virus or other malware, you can replace this code with standard code but using the Repair operation. This process will repair the boot code, but leave the existing partition intact. See MBR Repair.

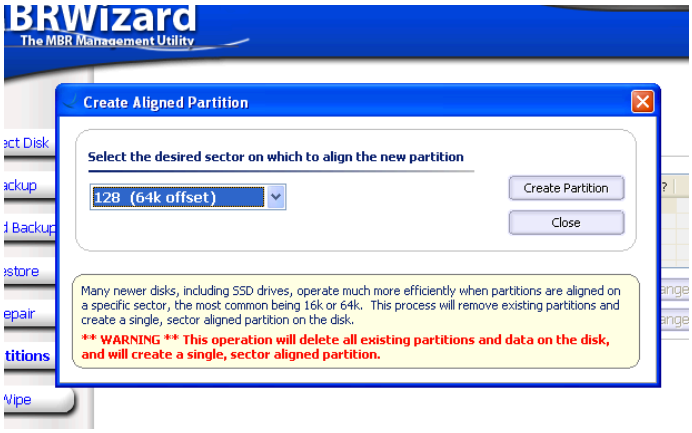
Chapter 4

How Do I?

This section details common tasks, and describes the recommended resolutions to solve common problems.

Create a USB flash drive as bootable

1. Using MBRWizard, select the flash drive from the list of available disks. If the flash disk isn't located, unplug the drive, wait a few seconds, and plug it back into the computer… preferably into a differently USB slot. Press F5 to refresh the list of disks in MBRWizard.
2. Select the Partition button and click on *Create*.
3. You will be presented with the option to select the partition offset, which is set at 128k by default. You can leave the default setting, or select 4k offset as a secondary option, either are suitable for removable flash drives.
4. Start the process by clicking Create, which removes the existing partition structure and all data from the disk. This process also creates a new, bootable partition structure on the disk.



5. Unplug the removable disk, and wait a few seconds before plugging it back into the computer. Windows will identify this as a new, blank disk, and will likely prompt you to format the disk. If not prompted, you can manually start the format process by right-clicking on the disk in My Computer, and selecting Format. You may select either FAT or NTFS format.
6. Once the disk has been successfully formatted, you can copy the operating system and other files necessary to make this drive bootable.

Create a bootable CD/DVD containing MBRWizard

The MBRWizard Boot Builder will create a bootable WinPE ISO file, containing the bootable environment and MBRWizard toolset. The ISO file is an exact image of a CD, and must be burned to CD/DVD as an image file. We recommend ImgBurn to create the CD, although any third party utility that can burn CD images should work without issue.

Create a bootable flash drive containing MBRWizard

The simplest method to create a bootable flash drive containing MBRWizard is to using the steps listed above, using the files created from the MBRWizard boot CD/DVD. Start by following the process listed above to Create a flash drive as bootable, then copy the contents of the CD created in the process Create a bootable CD/DVD containing MBRWizard to the flash drive. Make sure to copy all files and maintain the folder structure from the CD.

Contact

For further information and the most up-to-date examples, please check our website at http://firesage.com/mbrwiazrd.php, or you can reach us at the following page with any questions or comments: http://firesage.com/contact.php.