



Apple Software Restore

How To

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Overview

This document is not official Apple documentation, but instead, provides some guidelines for using Disk Copy and ASR. Tommy Hann, Consulting Engineer for Apple Computer, wrote the document and comments may be sent to hannt@apple.com.

Apple Software Restore (ASR) is an Apple utility for restoring a standard software configuration to a Macintosh. With ASR and another utility called Disk Copy, you can make a restore image from a working Macintosh and later restore that image to other Macintoshes, assuming they are of the same model. For example, you might need to configure a large number of iMacs with the same Mac OS and certain applications that you have licenses for. Using ASR and Disk Copy, you could configure all of these Macintoshes with the exact same configuration so that the software is the same on each. Basically, you are creating a full backup of one machine and restoring it to other like machines.

The first step of this process is to create a *restore image* (similar to a backup) using Disk Copy. Once you have created the image, you must then determine how to distribute that image using ASR. The simplest example of distributing the image is to create a bootable CD containing ASR and the restore image. To restore the image to a computer, you would boot from the CD and launch ASR. However, as more and more information is being stored on Macintosh hard disks, a CD isn't large enough in some cases to hold an entire image. In this case, an external storage device such as a FireWire Disk Drive could be used as an alternative. Finally, servers can be used to store and distribute the images. The following sections describe each of these distribution methods.

The versions of Disk Copy and ASR that you will be using are as follows:

Disk Copy 6.5 or later

Apple Software Restore (ASR) 2.2.5 or later

Along with Disk Copy are several AppleScripts: "Scan X-only image for ASR", "Scan X+9 image for ASR", "ImageScan" and "Set UDIF segment size". When using Disk Copy to create a restore image, you must store these scripts in a folder called "Scripts" that is located in the same folder as the Disk Copy application.

These versions of Disk Copy and ASR allow you to create a restore image containing Mac OS 9, Mac OS X or both. However, you will be using Mac OS 9 to create the restore image and to restore it. Also note that the tools included do not allow you to make a multi-CD restore image. The entire image, or the segments that make up an image, must be stored on a single CD, external hard drive or server volume.

Restoring from a CD

The restore image is stored on a bootable CD. To restore the image to a given machine, you boot the machine from your restore CD by holding down the “C” key at boot up. Once booted, launch ASR and restore the image to the machine.



Restoring from an External Disk Drive

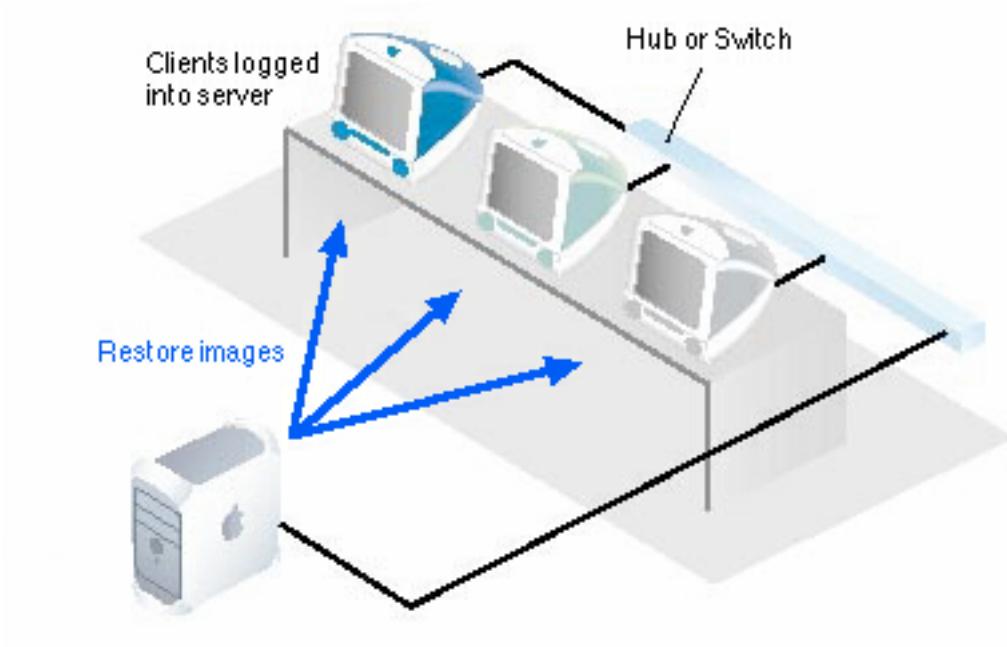
The process for restoring from an external disk drive is the same as restoring from a CD, except that the restore image is stored on an external disk drive such as a FireWire hard disk. The main difference is that it can hold images that wouldn't otherwise fit on a CD (i.e. Larger than 650 MB). For this process to work correctly, the user must be able to boot from a System Folder other than the one on the volume to be restored (i.e. external disk drive, CD or a second partition).



Restoring from a Server Volume

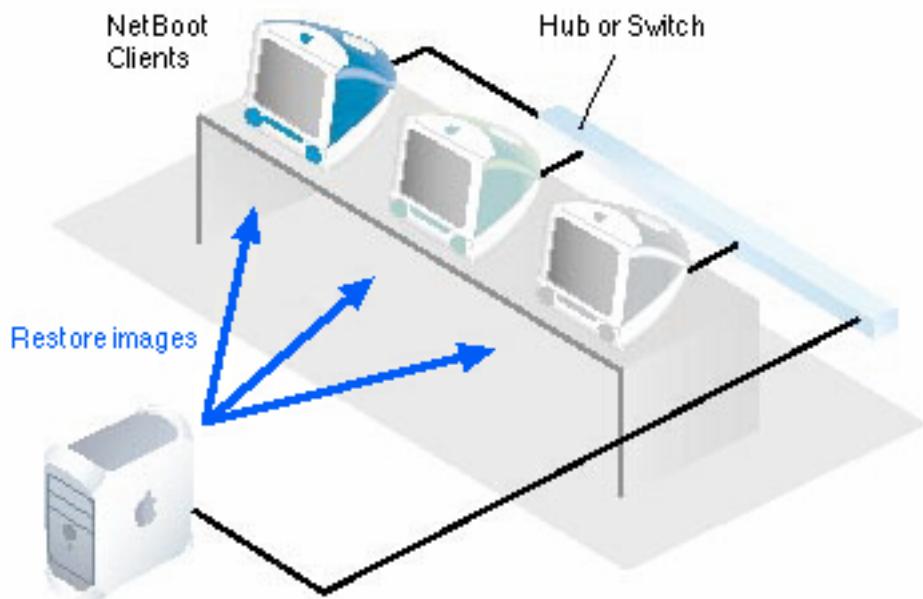
The restore image is stored on a server volume such as a Mac OS X Server volume. This allows several people to restore large images across the network at the same time. For this process to work properly, the user must be able to boot from a System Folder other than the one on the volume to be restored (i.e. external disk drive, CD or a second partition). The process is straight forward: first boot from a System Folder other than the one on the volume to be restored, mount the server volume containing ASR and the restore image, then launch ASR from the server just like you would launch ASR from a CD as in the description above. Once the process is complete, you can reboot using your new software. Using AppleScript, you can automate this entire process. Note that your image cannot be greater than 2GB if it is

going to be restored from an AFP (Apple Filing Protocol) volume such as that on a Mac OS X Server. However, you may segment the image into segments smaller than 2GB, then store all of the segments on the AFP volume. See the section below called Segmenting your Image in Advanced Topics for more information on segmentation.



Restoring from a NetBoot Server

The restore image is stored on a NetBoot server. This allows several people to restore large images across the network at once, but does not require an alternate System Folder from which to boot. You simply reboot the Macintosh while holding down the 'N' key and the Macintosh will boot from the NetBoot server. Once booted, you then run ASR and select the correct restore image for the Macintosh you are configuring. For more information on setting up a NetBoot server, see Apple's web site.



Creating and Distributing an ASR Image

There are 3 basic steps in creating and distributing a restore image. The first step is to configure a Macintosh with the operating system(s) and applications you want included in the restore image. After you are sure that this machine is functioning properly, the second step is to create a restore image from this Macintosh. Third, you should determine how to distribute the image as described in the overview above and configure it appropriately. The steps that follow, describe how to create an image of an entire volume, then restore that image to multiple Macintoshes. Here are the steps to configure a Macintosh:

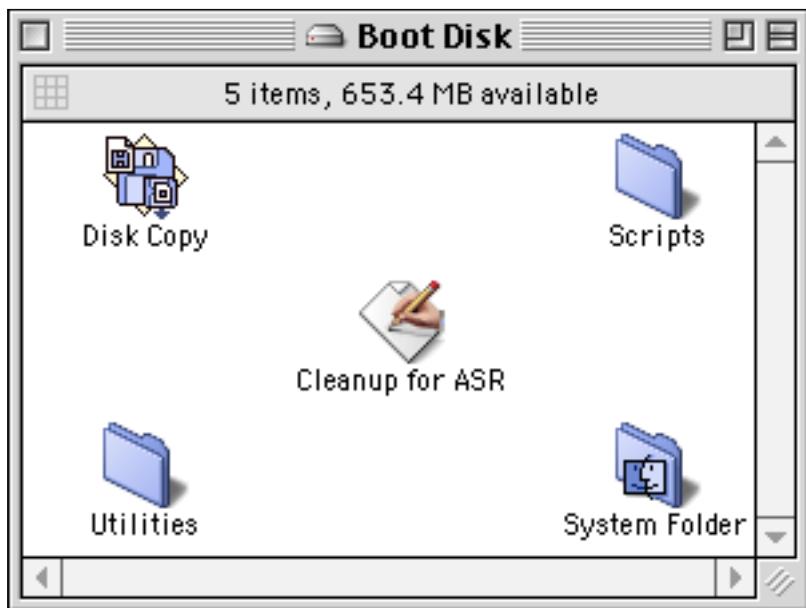
Step 1: Configure your Macintosh

1. Install Mac OS 9, Mac OS X, or both operating systems on your Macintosh as you normally would.
2. Change all settings to match your specific environment. For example, set the time zone in the Date & Time control panel and set appropriate network settings for your network.
3. Install any additional software that is appropriate for your site. **Note:** if you intend to restore this image to multiple machines, be sure you have a software license for each of those machines.
4. Test your machine to make sure all of the applications work properly. Be sure to open every application you installed and test several actions that you might perform in each of these applications. If you have installed Mac OS X with support for Classic, be sure to launch Classic at least one time before creating your image. See the section called Machine Specific Settings below in Advanced Topics for a discussion of settings that are specific to an individual machine and may not transfer properly to other machines.
5. Be sure to open the Startup Disk Control Panel (Mac OS 9) or the Startup Disk System Preference (Mac OS 10) and select the Operating System from which you want each of the restored machines to boot.

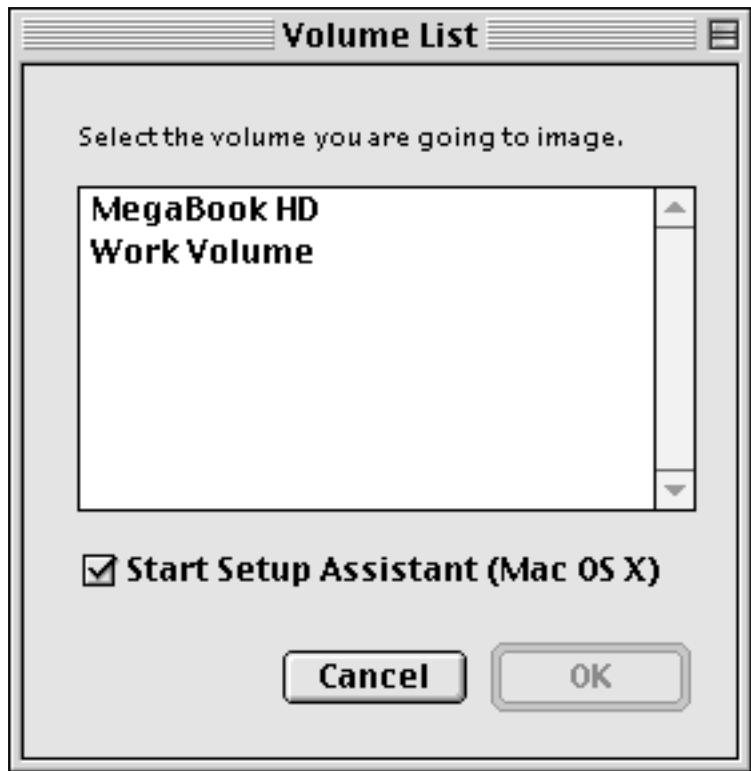
Step 2: Create a restore image

After you are sure the Macintosh is working properly and as expected, perform the steps below to create the image:

1. Create a Mac OS 9 boot disk containing Disk Copy, the accompanying scripts folder and Cleanup for ASR. You should also include a utilities folder containing Disk First Aid and any other disk utilities you may want to use. This boot disk can be a CD, external hard drive, a second partition or any other boot device except for the volume from which you will create the restore image. Here is what your boot volume might look like:



2. Boot your computer from the disk or volume created in step one.
3. Launch Cleanup for ASR and select the volume from which you will create the restore image. This program will delete hidden files that are not needed for the restore image. If you have installed Mac OS X and would like for the Startup Assistant to launch on first boot, select the check box labeled "Start Setup Assistant".



4. Launch Disk First Aid and check the volume from which you are going to create the image to make sure there are not problems with it. Also rebuild the desktop file on this volume. Finally, for performance considerations, you can also de-fragment this volume with a defragmentation utility.
5. Launch Disk Copy from a volume other than the volume from which you are going to make your restore image. If the Mac OS 9 boot disk you created in step one above contains Disk Copy, you can launch it from that boot disk.
6. Select “Set UDIF segment size” from the “Scripts” menu, and type “0” (that’s a zero) in the space provided. This will cause Disk Copy to create a single file for the disk image. See the advanced section for more information concerning the UDIF segment size.
7. Select “Create Image from Folder...” from the “Image” menu. **Note:** It’s important to select this option even though you are creating an image of a volume. Selecting this option helps insure the fastest possible restore. For more information on this topic, see the section called Image from Device vs. Image from Volume in Advanced Topics below.
8. Select “Read-Only” or “Read-Only Compressed” from the “Format” popup menu. While selecting the compressed option will result in a smaller restore image, it will take longer to create. **Note:** You must have 2 times the amount of disk space needed to store the restore image.
9. Select a location to save the image that is not on the volume from which you are making the image. This volume could be an external disk drive or maybe even a second volume on your internal hard drive. Now click save and Disk Copy will create a restore image of your volume.

10. Finally, after the image has been created, select the appropriate scan script from the scripts menu:
 - a. If your image contains just Mac OS X, select “Scan X-only image for ASR” from the “Scripts” menu.
 - b. If your image contains just Mac OS 9, or both Mac OS 9 and Mac OS X, select “Scan X+9 image for ASR” from the “Scripts” menu.

Step 3: Distribute your image

The last step is to determine how you are going to distribute your image. While there are many ways to distribute the image, we will discuss four ways to prepare a restoration package:

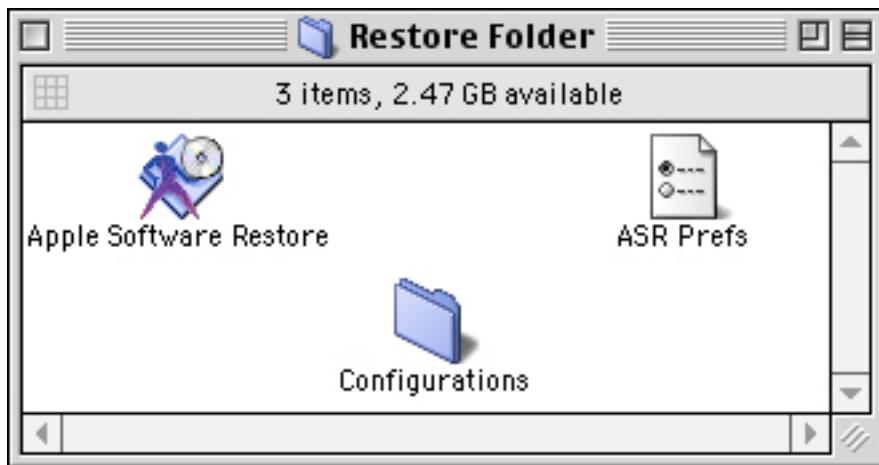
1. Creating a bootable restore CD
 - a. Create a bootable CD by following the directions provided by the manufacturer of your CD-R drive. You will need the following on the CD:
 - A valid System Folder (Mac OS 9.1 or later) that will allow you to boot the restore machine from the CD.
 - The Apple Software Restore application and the ASR preferences file.
 - A folder called Configurations containing the restore image you created above.
 - Optionally, you could also include utilities such as Disk First Aid and Drive Setup on this CD. Here is how your CD should look:



- b. After the CD finishes burning, you are now ready to restore the image to another Macintosh. To begin the restore, put the CD into the Macintosh to which the image will be restored and reboot while holding down the "C" key. This will cause the Macintosh to boot from the CD.
 - c. Skip to step 5 below to continue the restore.
2. Configuring a bootable disk drive (or second volume).
This process requires that you either have an external hard drive from which your Macintosh can boot, or that you have created a second volume on your Macintosh.
 - a. Place a valid System Folder on your external disk drive (or second volume) and test to make sure it will boot the Macintosh you wish to restore. Remember, the System Folder must be Mac OS 9.1 or later.
 - b. Your volume should also contain the same files and folders that the bootable CD contains in step one above. Here is what your bootable disk drive should look like:



- c. After you have finished copying the files to the external disk drive, you are ready to use the drive to restore the image to another Macintosh. Connect the drive to the Macintosh to which you want to perform the restore. Select the drive in the "Startup Disk" control panel as your startup disk and reboot. Make sure the Macintosh actually reboots from the external drive.
 - d. Skip to step 5 below to continue the restore.
3. Distributing the image via a server
 - a. Mount the server volume on which you will store ASR and the restore image. An example would be a Mac OS X Server volume.
 - b. Create a folder called Restore Folder on this server volume.
 - c. Copy ASR and the ASR preferences file to this folder. Now create a folder called Configurations and copy the restore image to this folder. Here is what your folder should look like:



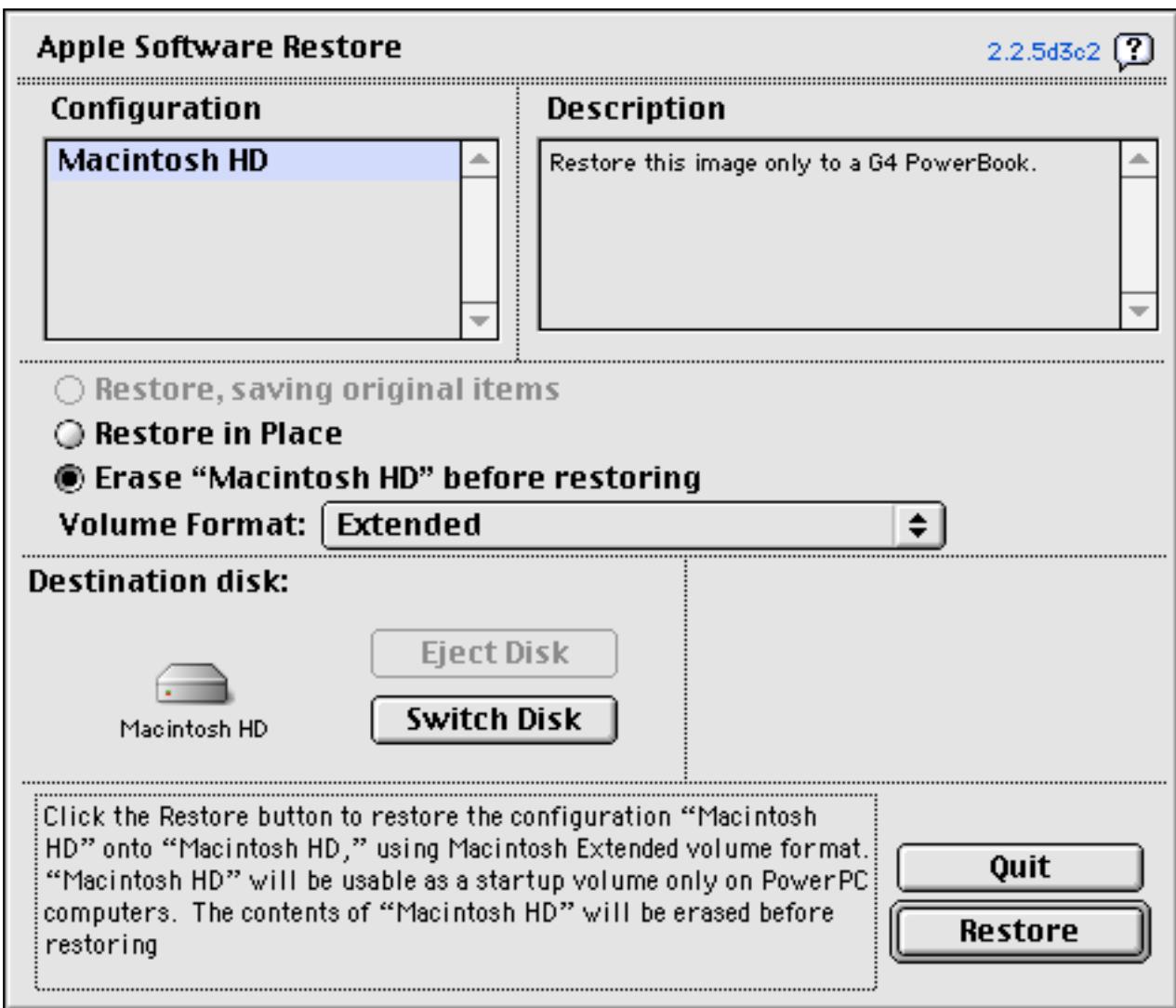
- d. After you have finished copying the files to the server folder, you are ready to use the server to restore the image to another Macintosh. Boot the Macintosh to which you will perform the restore making sure you boot from a volume other than the volume you will restore. For example, boot from a CD or an external disk drive. Make sure your server client software is also installed on this bootable device. For example, if you are restoring from a Mac OS X volume, make sure the AppleShare client is installed on the boot volume.
- e. Mount the server volume containing ASR and the restore image, then continue to step 5 below to perform the restore.

4. Distributing the image via a NetBoot server

- a. Mount the NetBoot server volume where you will store ASR and the restore image. Make sure you can write to this volume. See the NetBoot documentation for more information on how to install applications to a NetBoot image file.
- b. As in step 3 above, create a folder on this volume and copy all of the necessary files to this folder. These files could be inside the image from which the Mac NetBoots, or it could be on a separate server volume.
- c. After you have finished copying the files to the server folder, you are ready to use the NetBoot server to restore the image to another Macintosh. NetBoot the Macintosh to which you will perform the restore and make sure you have access to the volume where you placed ASR.

5. Continue the restore

- a. At this point, you should be ready to restore an image to your Macintosh. You should have booted from the restore CD, booted from the external disk drive, mounted the server volume containing ASR, or NetBooted to the server containing ASR. If you have not completed one of these processes, go back to steps 1, 2, 3 or 4 above.
- b. Launch ASR and you should see a window similar to the following:



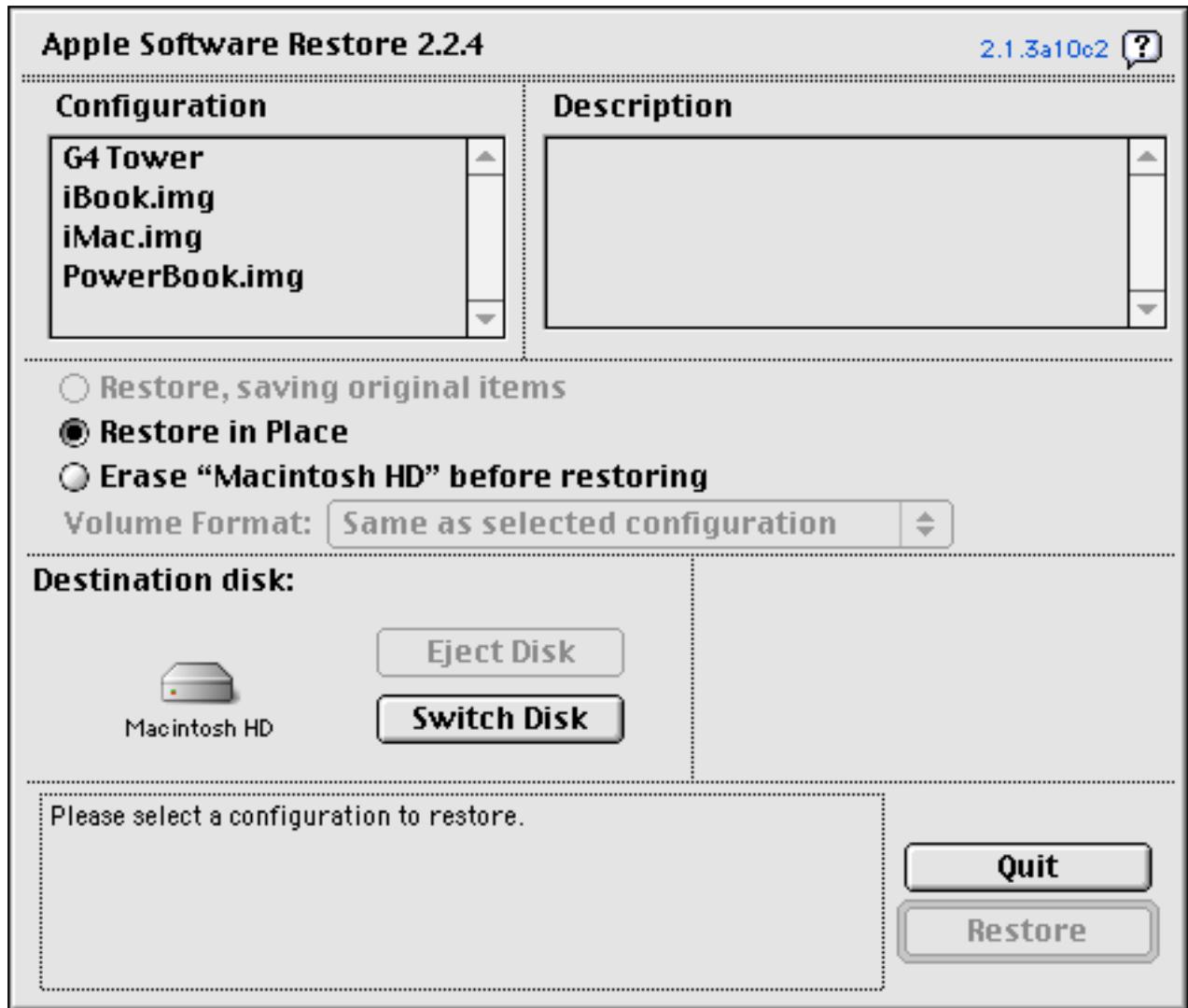
- c. First, select the volume to which you want to restore the image by clicking the "Switch Disk" button.
- d. Since this document is assuming that you will be restoring an entire volume so that it looks exactly like the original volume, be sure to select the radio button labeled 'Erase "Macintosh HD" before restoring'. This will erase the volume before restoring.

Once the process is complete, you will have a Macintosh with the exact same software configuration as the Macintosh from which you created the image. Simply reboot and verify that the ASR restore worked properly.

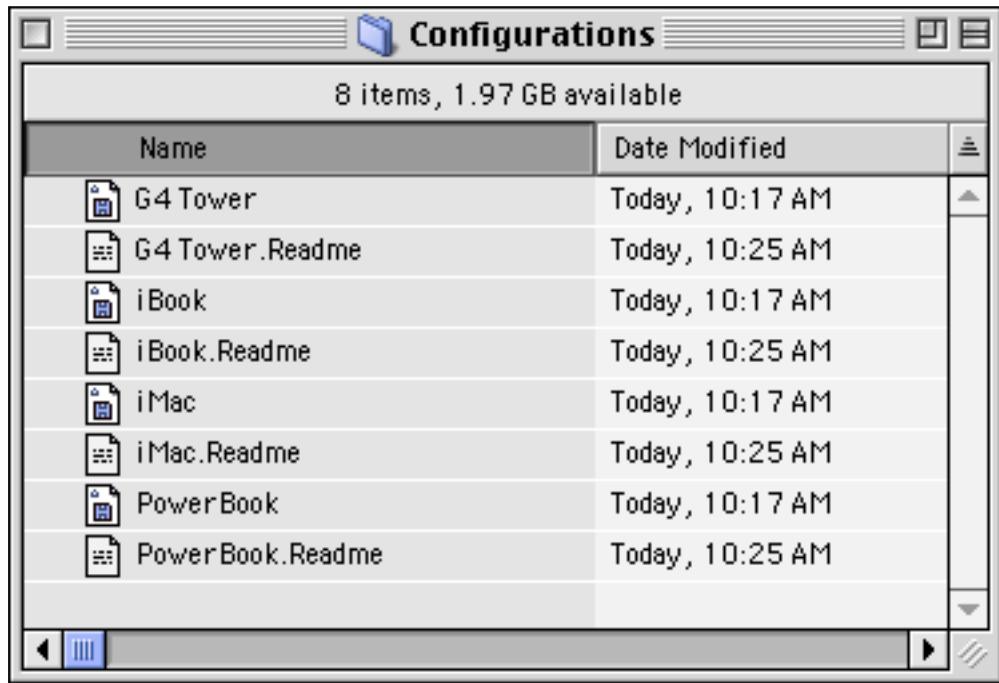
Advanced Topics

Multiple images and description files

It is possible to allow a user to select the appropriate restore from a list of restore images. For example, you might create restore images for several models of Macintoshes and allow the user to select the appropriate one from a list. Here's an example:



To do this, simply name your restore images with descriptive names and copy all of them to the Configurations folder located in the same folder as ASR. In addition, you can create a description for each image that will show up in the description window to the right of the image selection window. Simply create a text file containing your description and name it the same name as the corresponding image file with an extension of ".Readme". When naming your image files, do not use an extension such as ".img". Here is an example of the configurations folder:



Machine Specific Settings

Some applications may not work properly when you restore your image to other Macintoshes. This could be caused by machine specific settings or preferences such as a serial number. For example, some serial numbers are associated with the Ethernet MAC address of the specific machine on which it was registered, so it won't work on other machines. If you find an application that does not work properly when restored to another machine, check with the developer of that application to see if there is some workaround.

Image from Device vs. Image from Volume

The instructions above focus on creating an image from a single volume, then restoring that image to a single volume. Disk Copy and ASR allow you to create an image of an entire device and restore that image to another device. This process is useful if you have partitioned your hard disk with multiple volumes. The process for imaging a device is the same as imaging a volume except that to create the image in Disk Copy, you would select "Create Image from Device..." instead of "Create Image from Folder..."

When you restore your device image containing multiple volumes, all but the last volume will be the same size as the original volumes. The last volume will consume the remaining free space on the hard disk. This is called a stretchable image because the resulting volume could be larger or smaller than the original volume. (Note that when you create an image from a folder, it is also a stretchable image.) Let's look at an example.

Say you are creating an image of a Macintosh with a 12GB hard disk containing three volumes. The first volume is 2GB in size, the second is 4GB and the last volume is 6GB. If you were to restore this image to a

disk drive that was 20GB in size, the first and second volumes would be 2GB and 4GB respectively, just like the original hard disk. However, the last volume would be 14GB, which takes up the remaining free space of the hard disk. In other words, the last volume “stretches” from the original 6GB to 14GB to use up all of the remaining hard disk space. A stretchable image can also be restored to a smaller hard drive as long as there is enough room to store all of the data from the original hard drive.

Post actions

After completing a restore using ASR, it might be desirable to perform some other action before rebooting the restored Macintosh. For example, you might want to change the volume creation date on each of the restored volumes so that they are not all the same. This is necessary if the Macintoshes are going to be used in a Macintosh Manager environment. The process of changing the creation date can be automated using an ASR Post Action.

To create a Post Action, create a folder called “Actions” in your “Configurations” folder and inside that folder, create a folder called “Post”. Any programs that you copy to this folder will be executed after the ASR restore finishes. To continue with the example above, you would place the “SetVolCreateDate” application in the Post Actions folder.

Included with this software release is “Startup Disk 9.2.3” which can also be used for a Post Action. If you put this application in the Post Actions folder, the resulting Macintosh will boot into Mac OS X regardless of previous settings.

Changing the volume creation date for Macintosh Manager

When ASR restores an image to a volume on a Macintosh, that volume will have the same creation date as the volume from which the image was created. If the restore image will be restored to Macintoshes that will be used in a Macintosh Manager environment, it is important to change the volume creation date for every hard disk. To do this, run a program called “SetVolCreateDate” after performing the restore. One method for automating this process is to create a post-action that runs “SetVolCreateDate” on the restore volume after it is restored. To learn how to create a post-action, see the instructions above.

Segmenting your images – How? When? Why?

As mentioned above, an image larger than 2GB cannot be restored from an AFP server volume. However, you can segment a large image into 2GB or smaller chunks and still be able to restore the image from the server. To segment your images, use the menu item “Set UDIF segment size” under the “Scripts” menu in Disk Copy. Instead of typing in 0 as instructed above, type in the maximum size in megabytes for your segments.

ASR preferences file

It is possible to customize ASR with a preferences file. (Note that if you have never used ResEdit, you should probably not change any of the preferences.) ASR's configurable options are stored in a resource of type 'CFIG', with ID 9000, in the preferences file or inside ASR itself. The preferences file is found by

type/creator and should be stored in the configurations folder. These instructions direct you to copy the ASR preferences file to the same folder or volume as the ASR application. You can place the file here, in the configurations folder, or even in the Preferences folder inside of the Systems Folder – it will work in any of these locations. You can customize ASR by changing the resource found in the ASR application itself instead of changing the resource found in the preferences file. If modifications are made in both places, the settings found in the preferences file will override the preferences found in the ASR application. Important Note: All bits listed as "Unused" should be left unset (e.g. zero). Set=1 Unset=0

Version

A number representing the current configuration version. Should be set to 1 (one).

BoxFlag Disposition

Should always be set to 0.

Set auto-action to restart

This will cause the machine to auto-restart if the “Allow shutdown after restore” and “Auto-shutdown after restore” bits are set.

Skip Desktop Rebuild Errors

If set, then errors which occur while installing the desktop information do not cause the restore to fail. Note that if such errors occur while this is set, it is likely that the Finder will rebuild the desktop on the target volume the next time it is launched and the volume is mounted.

Use Explicit File System Setting

If set, then the value of the next setting ("Use HFS+ for New Volume") will determine what the 'Volume Format' popup menu will display by default. If unset, then the 'Volume Format' popup menu will default to 'same as selected configuration'. Note: don't use HFS standard for OS X.

Use HFS+ for New Volume

If set, and the 'Explicit FileSystem Setting' is also set, then the 'Volume Format' popup menu will default to 'Macintosh Extended' volume format. If unset, and the 'Explicit FileSystem Setting' is also set, the 'Volume Format' popup menu will default to 'Macintosh Standard' volume format. If the 'Explicit FileSystem Setting' is not set, this preference has no effect. Note: don't use HFS standard for OS X.

Copy Boot Blocks from resource

If set, then the boot blocks are written from the System file's 'boot' 1 resource, instead of from the source release's boot blocks. This option is only valid if the source release is an image or whole volume. If the source is an old-style Custom Mac bundle, then the boot blocks must come from the 'boot' 1 resource. Should be set to 0 (zero).

Auto Shutdown after restore

If set, the machine will automatically shut down after performing a successful restore. The shutdown will occur after the number of seconds indicated in the Shutdown Delay field. Note that this will only take effect if the next 'Allow Shutdown after restore' is also set.

Allow Shutdown after restore

If set, then a button labeled "Shutdown" appears in the dialog box which is presented after a successful restore. If the "Auto Shutdown after restore" flag is also set, then the button will flash automatically when the auto-shutdown kicks in.

Show Splash Screen

If set, a dialog box with an attractive picture is displayed when the application is first launched. Otherwise, the main selection dialog will appear right away. The picture is taken from a resource of type 'PICT', either in the ASR preferences file or from the application itself. If Color QuickDraw is available, then a resource with name "Color Splash Screen" is used. If Color QuickDraw is not available, or if that resource could not be found, then a resource with name "Splash Screen" is used. This should be set to 1.

Show Expert Controls

If set, then the main selection dialog will show the check-boxes which control which parts of the image to restore. Otherwise, the boxes will not appear, and depending on the value of the "Lock Expert Toggle" flag, there will either be nothing in their place or a triangle control which the user can click to make them appear. This should be set to 0.

Lock Expert Toggle

If set, the visibility of the check-boxes which control which parts of the bundle to restore may not be changed; i.e. if the previous flag is set, then the check-boxes are visible and cannot be hidden. If it is clear, then they are hidden and cannot be revealed. This flag does not prevent user from changing the values in the check-boxes if they are visible. This should be set to 1.

Allow Autopilot

If set, then a restore will begin right away and bypass the main selection dialog if there is only one valid disk image to select, and only one mounted drive eligible for restoration. If there is more than one disk image, then this flag is ignored.

Show Erase Disk Control

If set, the check-box which controls whether or not the target volume is erased is shown, allowing the user to change the setting. Otherwise, the setting is given by the Erase Target Volume flag (below) and cannot be changed by the user.

Barcode mode

If set, the main selection dialog will not select one of the configurations from the list when it detects type-ahead characters until it gets an exact match for one of the files. If it detects a return key character when it has not made an exact match, it will beep and flash a large x in the barcode graphic above the Configurations field.

Additionally, the Ok button in the confirm erase dialog can be selected if a barcode of "ok" is scanned, and the Cancel button in the Confirm erase dialog can be selected if a single return is scanned, or if a barcode of "Cancel" is scanned. The final dialog's buttons (Quit and optionally Shutdown) can also be selected via a barcode of their names. If this flag is clear, then type-ahead selection is as normal, similar to standard file dialog boxes. This should be set to 0 (zero).

Restore To Folder

Does nothing if the EraseTargetVolume flag (below) is set. However, if this flag is set and the EraseTargetVolume flag is clear, then instead of putting the original contents of the target volume into a backup folder, the original contents stay where they were, and the files which are restored are placed in a folder on the target volume called "Restored Items".

It is recommended that the Restore AppleEvent specifying the specific folder desired be used instead of this preference. The AppleEvent is more flexible.

Skip Checksum

If not set, the checksum of the restored release is calculated and compared to the value contained in the bundle folder name. If they don't match, an error is reported. For images, the checksum is compared to the value taken from the 'cSum' resource in the image. For both images and disk cloning, an additional checksum is performed on the filenames and FileID's of those file names. This should be set to 1.

Leave Unwanted Files

If set, then the files whose names are given in 'STR#' resource 9006 will not be touched. Otherwise, these files are removed from the target volume after the final checksum is performed. The files listed by default should always be left in. Additional unwanted files and folders can be specified by adding more STR# entries. If a folder is specified then its contents are deleted/moved as well. The string " $\text{f} \neg$ " (opt-b, opt-l) represents the blessed folder, so if the resource contains " $\text{f} \neg$ " then that folder will be removed. To remove the Extensions folder you can put " $\text{f} \neg:\text{Extensions}$ ". This should be set to 0.

Copy Rest of bundle

If set, the contents of the release outside the System Folder are included as part of the restore. Otherwise, they are ignored. This option may be overridden by user actions (see Show Expert Controls).

Copy System

If set, the contents of the System Folder (if there is one) are included as part of the restore. Otherwise, the System Folder is ignored. This option may be overridden by user actions (see Show Expert Controls). This should be set to 1.

Erase Target On Failure

If this option is set, and Erase Target Volume is set also, then if a failure occurs during the restore (and once the target volume has been touched), then the target volume will be entirely erased before quitting the application. Note that this will not be done if the user holds down the option key during the final dialog (invoking the "Try Again" feature).

Restore In Place

If set, the contents of the source configuration image will be copied to the target volume, overwriting any file in the same place with the same name. Note that there is no checking performed against the copy, e.g. it does not matter if the file is newer, older, or a higher/lower version. If it has the same name as the source file it is overwritten. Additionally, the Erase Target Volume checkbox is disabled when this option is checked. This should be turned off.

Skip Erase Warning

Does nothing if the EraseTargetVolume flag is clear. If the EraseTargetVolume flag is set, then if this flag is unset there will be a warning dialog box before the contents of the target volume are erased. If both flags are set, then there will be no warning, and the disk will be erased silently. Be very careful when changing this option.

Erase Target Volume

If set, then the contents of the target volume are erased before the restore takes place, as if by a disk initialization. This option may be overridden by user actions (see Show Erase Disk Control).

Auto shutdown time (seconds)

How much time to wait (in seconds) before shutting down when the auto shutdown after restore option is set

Thermometer update ticks

How often in ticks (60th of a second) the status barber pole should update while calculating the checksum and rebuilding the desktop. Set to 0 for fastest possible restore.