Constructing a Bootable CD

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Phoenix ®

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Revision History				
Rev	**Date**	**File Name**	**Author**	**Description**
0.5	June 6, 1995	MAKECD.DOC	Curtis E. Stevens	Initial Release
1.0	July 5, 1995		Curtis E. Stevens	Changed section 4.8 list item 8a to account for a missing byte.

1. Overview

The El Torito CD-ROM Boot Specification defines requirements for formatting CD-ROMs in a manner which allow the BIOS's to boot from a CD. Unfortunately, because the specification is ahead of the CD-ROM mastering software industry, there is no simple procedure for creating a bootable CD. This paper describes a process for making a bootable CD which operates under DOS and uses today's mastering packages.

2. Scope

The reader should be familiar with the Phoenix/IBM El Torito CD-ROM Boot Specification and the Phoenix BIOS Enhanced Disk Drive (EDD) specification. The reader should also be familiar with DOS.

3. Introduction

Creating a bootable CD is a 2 pass procedure. First, the CD must be organized so the positions of all the files can be predetermined. This will allow the author to build a Boot Volume Descriptor which contains an absolute pointer to the Boot Catalog, and will also allow the author to build a Boot Catalog with absolute pointers to the bootable images. In the second pass proper data can be placed on the CD. The instructions which follow *assume* that the reader has a CD-ROM mastering system that is capable of the following:

- Writing a boot volume descriptor on the CD at physical sector 17. This capability must allow the user to pass the mastering software a file that is 2048 bytes long with an image of the boot volume descriptor.

- Performing a simulation of the target CD which yields a directory file that is accessible to the user. This file must contain the volume descriptors and the path tables.

- Place all the files and descriptors in the same place on the CD through multiple invocations of the mastering simulation.

4. The Building Process

Complete the following checklist to build a bootable CD.

Create a Bootable Target Image
Move to the Mastering System
Create a Dummy Boot Volume Descriptor
Create a Dummy Boot Catalog
Initiate a Simulation
Terminate the Simulation
Create a Proper Boot Volume Descriptor
Create a Proper Boot Catalog
Burn the CD

Before this process begins the author must create a bootable Floppy or Hard drive with the target image. The author must also guarantee the following:

- The image is bootable

- *The target does not attempt to write the target drive letter.* If the image is a hard drive it must not attempt a write to drive C. If the image is a floppy it must not write to drive A.

- If the target is a hard drive it must have only one partition. This partition must be a standard DOS partition, and it must be the first entry in the partition table.

4.1 Create a Bootable Target Image

Take the bootable floppy or hard drive and copy all the tracks and sectors to a DOS file. One way to accomplish this task is to use Norton DISKEDIT, select the physical mode and instruct it to copy all the sectors to a file. Name this file OSBOOT.IMG.

4.2 Move to the Mastering System

Take OSBOOT.IMG and place it on the mastering system. From this point forward all steps apply to the mastering system

4.3 Create a Dummy Boot Volume Descriptor (BVD)

Create a file called BVD.BIN that is exactly 2048 bytes long. This file should have the following hex bytes at the beginning:

- 00 43 44 30 30 31 01 45 - .CD001.E
- 4C 20 54 4F 52 49 54 4F - L TORITO
- 20 53 50 45 43 49 46 49 - SPECIFI
- 43 41 54 49 4F 4E 00 00 - CATION

The remaining bytes in this record must be 0.

4.4 Create a Dummy Boot Catalog

Create a file called BOOTCAT.BIN that is exactly 2048 bytes long. This file should have the following hex bytes at the beginning:

- 01 00 00 00 50 68 6F 65 - ....Phoe
- 6E 69 78 20 54 65 63 68 - nix Tech
- 6E 6F 6C 6F 67 69 65 73 - nologies
- 20 4C 54 44 34 E4 55 AA - LTD4_U¬

The remaining bytes in this record should be set to 0.

4.5 Initiate a Simulation

Instruct the CD-ROM mastering software to perform a simulation with the following parameters:

- BVD.BIN is a boot volume descriptor. This volume descriptor must reside at sector 17
- BOOTCAT.BIN is a file which goes on the CD
- OSBOOT.IMG is a file which goes on the CD.

4.6 Terminate the Simulation

Terminate the CD simulation in a manner which makes the ISO-9660 header information accessible via a DOS file. We will call this file ISO.DIR.

4.7 Create a Proper BVD

Search the file ISO.DIR for the absolute location of the Boot Catalog on the CD. This can be achieved using Norton DISKEDIT as follows

1. DISKEDIT ISO.DIR
2. From the TOOLS menu select the FIND option
3. Search for "BOOTCAT"
4. Count back 31 characters. This can easily be achieved by placing the cursor on the letter "B" and moving the cursor up 2 lines and to the right 1 space.
5. Write down the next 4 bytes
6. Exit DISKEDIT
7. DISKEDIT BVD.BIN
8. At offset 47h enter the 4 bytes you wrote down in number 5.
9. Save changes and exit.

At this point the file BVD.BIN has the correct data to make this CD bootable.

4.8 Create a Proper Boot Catalog

These instructions are for making a hard drive (C drive) image. Search the file ISO.DIR for the absolute location of the Bootable Image on the CD. The can be achieved using Norton DISKEDIT as follows

1. DISKEDIT ISO.DIR
2. From the TOOLS menu select the FIND option
3. Search for "OSBOOT"
4. Count back 31 characters. This can easily be achieved by placing the cursor on the letter "O" and moving the cursor up 2 lines and to the right 1 space.
5. Write down the next 4 bytes
6. Exit DISKEDIT
7. DISKEDIT BOOTCAT.BIN
8. At offset 20h enter the following hex bytes:
   A. 88 04 00 00 00 00 01 00
   B. The 4 bytes copied down in step 5.
9. Save changes and exit.

At this point the file BOOTCAT.BIN has the correct data to make this CD bootable. This process can also work for a bootable floppy by changing the hex 04 value to match the type of floppy image as described in the El Torito Specification.

4.9 Burn the CD

At this point BOOTCAT.BIN and BVD.BIN have live data. Instruct the CD-ROM mastering software to make the CD using the same parameters given in the step Initiate a Simulation.