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Subject: Progress Report for Ripping and Burning Audio CDRs Efficiently and Reliably

Dear Dr. Norman:

This is a progress report for my EH 301 project. I am working alone to produce a 1-document report, which will consist of a manual and an annotated bibliography. The subject matter of the report is the extraction of audio (ripping) from CDs and the copying (burning) of audio to recordable CDs (CDRs). The manual will be a guide to transferring audio from an original CD to a blank CDR on a Windows-based PC. The annotated bibliography will satisfy the research requirement of the project, and provide technological information which is more detailed and advanced than will be required in the manual. The CDR manual and annotated bibliography will consist of 10-15 pages combined, and will be delivered December 7, 2001.

This report describes the progress of the project to date. It briefly describes the project's purpose and audience, shows work completed on the project, and what remains to be done.

Project Description

The purpose of my project is to provide a manual which describes the best way to copy audio CDs. The manual will first outline the necessary hardware and software, along with my recommendations regarding the best of each. The manual will then provide instructions for ripping the audio from a CD, and then burning that audio to a CDR. Suggestions for software and hardware settings which help in achieving error free copies will be given throughout the instructions.

My CDR manual will be useful to those interested in condensing their CD collections from 100 or 200 CDs to just a dozen or so CDRs. The section on audio extraction will be useful to audiophiles who are determined to get perfect audio, and need to know the best software settings and techniques to get error free audio transfers from one CD to another. The annotated bibliography will provide more detailed and in depth information about CDR technology to those who need it; specifically, certain sections of the CDR manual will refer the reader to the annotated bibliography.

Analysis of Tasks

I have followed the attached task schedule (Enclosure 1) religiously. It provides a quick reference of the work that I have and have not completed. The tasks are broken down into more detail below.

Task 1: Print Research

Status: Almost complete

I have obtained almost all the sources I need for the project, and have attached a preliminary bibliography (Enclosure 2). The sources are of the following three types:

- Specification sheets from hardware company home pages.
- Product reviews from hardware sites.
- Articles about CDR technology in general.

The main product of the print research effort will be the annotated bibliography. I have finished nine of the annotations already (Enclosure 3).

Task 2: Primary Research

I am using my own CD burner (a Plextor PlexWriter 12/10/32A) to conduct primary research for the project. There are two parts to this research.

CD Copy Method Comparison

Status: Complete.

To determine (and highlight) the effectiveness of various tweaks and error checking software related to CD copying, I produced two sets of CDR copies from the same original set of CDs.

I first used Exact Audio Copy to rip the audio from the original CDs twice, once with error checking on, and once with error checking off. I then burned the two sets of copies to CDRs. One set of CDRs was burned with optimal software settings (BURNproof, PIO mode), and one was burned with nonoptimal settings.

I then listened to both sets of CDs and noted any flaws in the copies which were not present in the originals. The attached table (Enclosure 4) summarizes the results.

Manual Test on Live Subject

Status: Not started

Once I have written a draft of my manual, I will test its usefulness on a friend of mine, XXXX XXXXX. I will give him the manual and the CDs and instruct him to copy them to CDRs using the manual as his guide. If he has any problems with the manual, I will make notes which I will use in the revision process.

Task 3: Manual

Status: Partially complete

I have completed the outline of my CDR manual (Enclosure 5). I believe that with my previous experience with CDRs, and the primary research I have done, I am sufficiently prepared to write the manual.

Task 4: Oral Presentation

Status: Not started

During my oral presentation, I will discuss the optical storage industry, and the reasons why CDRs have become so popular. I plan to describe the hardware needed to burn CDRs, as well as the media itself. I will also identify the various software packages used to rip and burn audio, including Exact Audio Copy, Easy CD Creator, Nero, and CloneCD. I will then note the problems involved in burning CDRs, such as bad media and buffer underruns, and how to solve them. Finally, I will discuss the future of the industry, and the technologies which are fighting to replace the CDR.

Appraisal

So far I have had no trouble staying on schedule. I am confident that I will finish this project in the time allotted.

Sincerely,

XXXX XXXXXX

Enclosures:

1. Preliminary Bibliography
2. Task Schedule
3. Annotations
4. CDR Burning Results
5. Manual Outline

Preliminary Bibliography

- Aopen Inc. 2001. AOpen CRW 1232A data sheet page. Aopen Inc.
<<http://www.aopen.com/products/optical/cdrw/crw1232A.htm>> Accessed 2001 Sep 14.
- Plextor America [Undated]. CD-RW drives: PlexWriter 12/10/32A. Plextor America.
<http://www.plextor.com/english/products/12_10_32.html> Accessed 2001 Sep 14.
- Decker, Logan. 2001. Beyond the x rating. Maximum PC. 6(9): 40-48.
- TDK Electronics Corp. 2001. TDK: VeloCD 12X/10X/32X specifications page. TDK Electronics Corp.
<<http://www.tdk.com/velocd-new/12specs.htm>> Accessed 2001 Sep 14.
- Volkel, Frank. 2001 Aug. Serious burn: copying CDs in just 3 minutes. Tom's Hardware.
<<http://www4.tomshardware.com/storage/01q3/010823/index.htm>> Accessed 2001 Sep 14.
- Volkel, Frank. 2001 Aug. The outer limits: CD-Rs with 80, 90, and 99 minutes. Tom's Hardware.
<<http://www4.tomshardware.com/storage/01q3/010830/index.html>> Accessed 2001 Sep 14.
- Yamaha. 2001. Yamaha product catalog: CRW2100EZ. Yamaha Corporation of America.
<http://www.yamaha.com/cgi-win/webcgi.exe/DsplyModel/?gHDR00007CRW2100EZ>> Accessed 2001 Sep 14.
- Zakharov, Tim. 2000 Sep. Plextor PX-W1210TA. . Storage Review.
<http://www.storagereview.com/welcome.pl/http://www.storagereview.com/articles/200009/20000928PX-W1210TA_sp.html> Accessed 2001 Sep 14.
- Zakharov, Tim. 2001 Jan. Yamaha CRW2100E. Storage Review.
http://www.storagereview.com/welcome.pl/http://www.storagereview.com/articles/200101/20010117CRW2100E_sp.html> Accessed 2001 Sep 14.

Task Schedule: Ripping and Burning Project

Task	Finished	In Progress	Remaining
Conduct print research.	X		
Conduct primary research		X	
a) Rip audio from test CDs		X	
b) Burn audio to CDRs.		X	
c) Compare sets of CDs.		X	
Write draft manual.			X
d) Recommend hardware and software.			X
e) Outline topics for audio ripping section			X
f) Outline topics for audio burning section.			X
g) Fill in sections			X
Write annotated bibliography	X		
Prepare oral report.			X
Test and revise manual			X

Annotated Bibliography Optical Storage Technology

October 23, 2001

If you are interested in researching CDR technology, the listings in this bibliography should prove helpful. The magazine and website articles are good places to begin learning how CDR works. Should you decide to purchase a burner, there are also specification sheets and product reviews to aid you in choosing one. All materials are current as of October 2001, and only 2001 materials were included.

Aopen Inc. 2001. AOpen CRW 1232A data sheet page. Aopen Inc.
<<http://www.aopen.com/products/optical/cdrw/crw1232A.htm>> Accessed 2001 Sep 14.

This is the specification sheet for Aopen's 12x burner. Aopen calls their buffer underrun prevention circuitry "Just Link". It comes bundled with Nero, a popular CD burning program.

Plextor America [Undated]. CD-RW drives: PlexWriter 12/10/32A. Plextor America.
<http://www.plextor.com/english/products/12_10_32.html> Accessed 2001 Sep 14.

This is the specification sheet for Plextor's 12x burner. This is the cream of the crop. Plextor pioneered the buffer underrun technology with their BURNPROOF circuitry, and they are still considered the leader. It comes bundled with Easy CD Creator, which is even more popular than Nero.

Decker, Logan. 2001. Beyond the x rating. Maximum PC. 6(9): 40-48.

This article discusses the future of optical storage, and takes a look at four technologies which are competing to become the next standard. They include Sony's Double Density CD-R/RW, TDK's Multilevel CD-R/RW, Pioneer's DVD-RW, and Ricoh's DVD+RW. The article examines all four in detail and, for each one, provides such information as the storage capacity, drive and media cost, compatibility, and the expected arrival date.

TDK Electronics Corp. 2001. TDK: VeloCD 12X/10X/32X specifications page. TDK Electronics Corp.
<<http://www.tdk.com/velocd-new/12specs.htm>> Accessed 2001 Sep 14.

This is the specification sheet for TDK's 12x burner. This drive is virtually identical to the Aopen one, and even uses the same Just Link circuitry.

Volkel, Frank. 2001 Aug. Serious burn: copying CDs in just 3 minutes. Tom's Hardware.
<<http://www4.tomshardware.com/storage/01q3/010823/index.htm>> Accessed 2001 Sep 14.

This article looks at four of the fastest CDR burners available, up to 24x. However, there are not any significant new features, just increased speeds (and price). While the additional write speed is often impressive, does the average user really need to copy CDs "in just 3 minutes"?

Volkel, Frank. 2001 Aug. The outer limits: CD-Rs with 80, 90, and 99 minutes. Tom's Hardware.
<<http://www4.tomshardware.com/storage/01q3/010830/index.html>> Accessed 2001 Sep 14.

This article describes a way to "cheat" and get 99 minutes of audio onto a single CDR (as opposed to the standard 74 or 80 min.). It is not particularly difficult to do, but it is not particularly reliable either. Therefore, much of the article is devoted to determining which burners and CD players are compatible with the "oversized" CDRs. Most older burners produce coasters when they try to burn them, and many older CD players choke when they try to play them.

Yamaha. 2001. Yamaha product catalog: CRW2100EZ. Yamaha Corporation of America.
<http://www.yamaha.com/cgi-win/webcgi.exe/DsplyModel/?gHDR00007CRW2100EZ>> Accessed 2001 Sep 14.

This is the specification sheet for Yamaha's 16x burner. Yamaha was the first to release a 16x burner. Other than the write speed, its features are similar to the other burners, except that it has no buffer underrun circuitry. To offset this, it features an enormous 8MB buffer.

Zakharov, Tim. 2000 Sep. Plextor PX-W1210TA. . Storage Review.
<http://www.storagereview.com/welcome.pl/http://www.storagereview.com/articles/200009/2000928PX-W1210TA_sp.html> Accessed 2001 Sep 14.

This is an excellent review of Plextor's 12x burner, the first to feature BURNPROOF circuitry, which, as the author notes, "just plain works." They run an extensive set of benchmarks on the drive, and find that it beats more expensive models in many benchmarks. Storage Review recommends this drive as a "Safe Buy."

Zakharov, Tim. 2001 Jan. Yamaha CRW2100E. Storage Review.
http://www.storagereview.com/welcome.pl/http://www.storagereview.com/articles/200101/20010117CRW2100E_sp.html> Accessed 2001 Sep 14.

This is Storage Review's review of Yamaha's 16x burner, the first available at that speed. The author has mixed feelings about the drive. It is the fastest drive on the market, but it still falls short of its advertised speeds. He also says it is unbelievably loud. Instead of buffer underrun circuitry, Yamaha gave their drive an 8MB buffer. The author recommends waiting for 16x drives, unless having the absolute fastest drive is a necessity.

Experiment Results

Features*	Optimal Settings	Non optimal Settings
Settings	EAC's "Secure Mode", CRC checking ON, DMA OFF, BURNPROOF ON	EAC's "Burst Mode", CRC checking OFF, DMA ON, BURNPROOF OFF
Speed	Approx. 1.5 min to rip a 5 min song with error checking. Approx. 6 min to burn a full CD.	Far faster ripping with error checking off. Approx. 45 sec to rip a 5 min song. Same burning speed. Approx. 6 min for a full CD.
Audio Quality	All CDs were virtually indistinguishable in Audio Quality from the originals.	Two CDs had very slight pops and "hiccups." One was a total "coaster"; it refused to play at all. The other two had no detectable flaws.

*CDR brand: Two sets of 5 PNY 16x 700 MB CDRs

Manual Outline

- 1) Introduction
 - a) Hardware and Software Requirements
 - b) Hardware and Software Recommendations
 - i) Burners
 - ii) Rippers
 - iii) Media
- 2) Audio Extraction (Ripping)
 - a) Exact Audio Copy
 - i) Downloading
 - ii) Installing
 - iii) Starting
 - b) Optimal Software Settings
 - i) DMA
 - ii) CRC Error Checking
- 3) CDR Writing (Burning)
 - a) BURNPROOF
 - b) EZ CD Creator
 - c) CloneCD