Shambhala Archives

Audio Recovery Project

An Implementation Plan

Draft 1.2

Prepared by

Chris Levy

Mark Keller

November 2000

Overview – How shall we begin?

Phase 1 of the Audio Recovery project focuses on the digitization of existing analog audio reels and audio cassettes. The digitization process yields sound files ultimately stored on CD ROM and 8mm Exabyte tape.

Phase 2 of the Audio Recovery project focuses on archiving the collection back to analog reels. This is a safeguard against the potential instability of digital files which, while easy to work with and of outstanding quality, inherently either work or don't work with no middle ground in between for disaster recovery. Ideally, the creation of archival reels would happen *now* as we begin Phase 1. This is by far the most efficient and ultimately the least expensive way to accomplish this important task of analog re-mastering. Does the cost of reel stock preclude us from doing this now?

Audio Filename Nomenclature

To understand the flow of digital audio files through the existing computer infrastructure is to understand the work flow of the project altogether. This understanding also provides the basis for knowing how to expand the computer infrastructure and accelerate the completion of this large project. The native audio file formats used for the project are Microsoft Windows Wave, MP3, and Real Audio files. Their file extensions are .wav, .mp3, and .rm respectively.

Example filename: 20001008VCTR1024.wav

Breaks out as:

```
20001008 VCTR 1 024 . wav
                          |  file type (.wav, .rm, .mp3)
                      |  bit depth (.wav) or bit rate (.rm or .mp3)
                  |  talk number in a given day
              |  4 digit speaker abbreviation
      |  6 digit date code (yyyymmdd)
```

For .wav files, bit depth will either be 024 or 016 for 24 bit/44.1 and 16 bit/44.1 sound files respectively.

For .rm and .mp3 files, the bit rate will be either 016, 064, or 128 for 16, 64, or 128 kilobits per second respectively.

It will sometimes be the case that the audio files are too large to fit on one CD. When this is the case, the files will be broken into 2 or more files with an A and B filename suffix. Particularly:

Talks that are less than 72 minutes fit on 1 data CD and 1 audio CD

Talks that are greater than 72 minutes But less than 81.5 minutes	fit on 1 data CD and 2 audio CDs
Talks that are greater than 81.5 minutes	fit on 2 data CDs and 2 audio CDs

Therefore, a 90 minute talk would yield the following files for production and archiving:

20001008VCTR1024.wav	stored as data file on Exabyte tape
20001008VCTR1024A.wav	stored as data file on data CD
20001008VCTR1024B.wav	stored as data file on data CD
20001008VCTR1016A.wav	stored as red book audio file on audio CD
20001008VCTR1016B.wav	stored as red book audio file on audio CD
20001008VCTR1016.rm	stored as data file on data CD
20001008VCTR1064.rm	stored as data file on data CD
20001008VCTR1128.mp3	stored as data file on data CD

An 80 minute talk would yield the following files for production and archiving:

20001008VCTR1024.wav	stored as data file on Exabyte tape
20001008VCTR1016A.wav	stored as red book audio file on audio CD
20001008VCTR1016B.wav	stored as red book audio file on audio CD
20001008VCTR1016.rm	stored as data file on data CD
20001008VCTR1064.rm	stored as data file on data CD
20001008VCTR1128.mp3	stored as data file on data CD

A 70 minute talk would yield the following files for production and archiving:

20001008VCTR1024.wav	stored as data file on Exabyte tape
20001008VCTR1016.wav	stored as red book audio file on audio CD
20001008VCTR1016.rm	stored as data file on data CD
20001008VCTR1064.rm	stored as data file on data CD
20001008VCTR1128.mp3	stored as data file on data CD

The Deliverable

Generally, the 24 bit bit/44.1 wav file is the highest quality file (highest resolution) and the parent of all subsequently created files. It therefore is archived with the highest amount of redundancy. It is stored on 8mm Exabyte tape and on CD ROM with a backup. The original is only used (or even handled) when the back-up fails. This 24 bit/44.1 CD is a prime candidate for off-site storage. A master and listening copy master of the Red book audio CD will also be made. When the listening copy fails, it can be re-created with no generation loss from the master Red

Book audio CD. If that master fails, we can make another master from the back-up 24 bit/44.1 CD. There is ample redundancy built into the system following best-in-class archiving practices.

In summary, the deliverable is:

24 bit/44.1 .wav file on Exabyte 8mm tape
24 bit/44.1 .wav file on CD Master
24 bit/44.1 .wav file on CD Master back-up
16 bit/44.1 Red Book audio CD listening master
16 bit/44.1 Red Book audio CD listening master back-up
*Analog Re-master on Reel

Infrastructure

The current system primarily uses the Terma 1 and Terma 2 computers for digital capture and light editing. Files that need heavy audio processing can be transferred to the Sonic Solution machine for more robust audio clean-up tasks. We should investigate Windows compatible high-end plug in's for some of these tasks, however, to supplement/replace the type of work being done by the Sonic Solutions station. The following summarizes the current hardware configuration:

	owner	notes	Terma 1	Terma 2	Sonic
Celeron 533 w/ 128 MB RAM	Archives	gift from MK	x	x	
MidiMan Digital I/O	Archives	gift from MK	x		
Plextor Plexwriter CD burner	Archives	gift from MK		x	
15" Monitor	Archives	gift from MK	x		
Soundblaster Live sound card	MK	on loan		x	
17" Monitor	Ojai	on loan		x	
Apogee 24 bit A/D converter	Ojai	on loan	x		
Exabyte Tape Drive	Archives	-	x		
Sonic Solutions MacIntosh	Archives	-			x
Troisi 20 bit A/D converter	Archives	-			x
Troisi 20 bit D/A converter	Archives	-			x

The natural expansion of this system would be to buy a third Windows computer so that Terma 1

would be dedicated to digital input, Terma 2 would be dedicated to file processing and data entry, and Terma 3 would be dedicated to making CDs. This third machine could be put together with as little as $1200 Canadian…

The Protocol

This is the directory structure for Terma 1 and Terma 2. It has been optimized for simplicity.

Terma 1 Computer	Terma 2 computer

• Shared
  • VCTR Cued Exabyte
  • VROT Cued Exabyte
	• Shared
	  • Cued Files
	  • MP3
	  • Real Audio
	  • Transcripts

The procedures conveyed here focus on one talk alone. These steps can be performed on multiple files in batch processes once there is complete familiarity with the nuances of the process. It is strongly suggested that the project proceeds ONE TALK AT A TIME for now until complete familiarity is achieved. Here are the procedures for the Audio Recovery project and audio object accessioning.

Stage 1 – Digitization

1 Decide on which material is to be digitized – default is chronological. Check for existing records in DB. If there is no record of a talk, create a new Event and Component record.
2 Consolidate and pull items from the vault.
3 Load Reel/Cassette.
4 Prepare WaveLab for digital input
5 Check slate against Reel and/or Cassette label. Update label on reel or cassette by hand if information on slate is different than label.
6 Check tape output and digital input levels and make adjustments if necessary.
7 Fast forward to Q & A to check if tape is double channel. If questions are on a separate channel, the talk must be brought in stereo and the channels must be merged into mono. If there are separate talks on the left and right channel, two talks can be brought in at the same time on the L and R channel.

8 Begin digitization – create 24 bit/44.1 .wav file.
9 Update “Items” in DB against slate/label information.
10 End digitization

The result is the following file and directory structure:

• Shared 19710804VCTR124.wav • VCTR Cued Exabyte • VROT Cued Exabyte	• Shared • Cued Files • MP3 • Real Audio • Transcripts

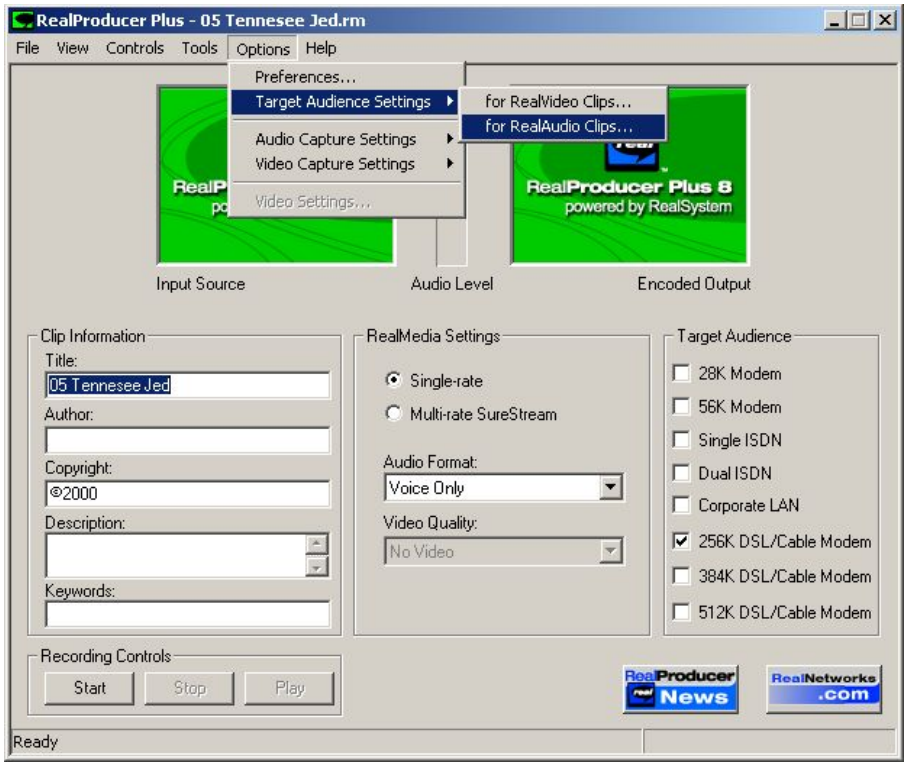
Stage 2 File Processing

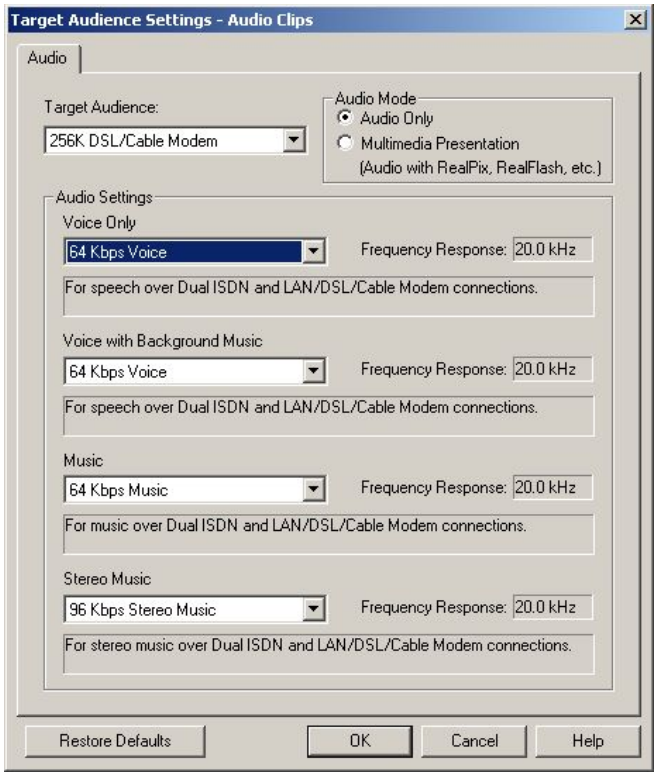
The goal of this stage is to create a 16 bit/44.1 file, the MP3 files, and the Real Audio files from the high resolution 24 bit parent file.

1 Perform rough edit of 24 bit file. This involves deleting white space at the beginning and end of the .wav file. Save file.
2 If the file is in stereo, merge it into mono.
3 If two talks were captured at one time, then “save special” as left and right mono.
4 Save the file as a 16 bit/44.1 .wav file

• Shared 19710804VCTR1024.wav 19710804VCTR1016.wav • VCTR Cued Exabyte • VROT Cued Exabyte	• Shared • Cued Files • MP3 • Real Audio • Transcripts

5 Create .mp3 file from the 24 bit .wav file in WaveLab, saving at the 128 kps codec.
6 Create .rm files from the 16 bit .wav file using Real Producer, saving at the 16 kbs and 64 kbs “Voice Only” codecs. Use Options/for Real Audio Clips to double check the audio settings.





Having done that, the directories and files will appear as follows:

• Shared 19710804VCTR1024.wav 19710804VCTR1016.wav 19710804VCTR1016.rm 19710804VCTR1064.rm 19710804VCTR1128.mp3 • VCTR Cued Exabyte • VROT Cued Exabyte	• Shared • Cued Files • MP3 • Real Audio • Transcripts

Stage 3 – File transfers

This stage is optimized so that file transfers can occur at one time across the network in one and only one process. The logical time to do this is during a lunch break or at night.

1 Transfer contents of Terma 1/Shared over network to Terma 2/Shared.
2 Move 24 bit/44.1 .wav parent file to Terma 1/Shared/VCTR Cued Exabyte directory.
3 Delete remaining files for a given talk from the Terma 1/Shared directory.

The result is the following:

• Shared • VCTR Cued Exabyte 19710804VCTR1024.wav • VROT Cued Exabyte	• Shared 19710804VCTR1024.wav 19710804VCTR1016.wav 19710804VCTR1016.rm 19710804VCTR1064.rm 19710804VCTR1128.mp3 • Cued Files • MP3 • Real Audio • Transcripts

Please note that the 24 bit/44.1 parent .wav file is in a “Cued” directory. Files will accumulate in this directory until approximately 4.5 Gigabytes of data is in “cue”. Then the contents of this directory will be archived to an 8mm Exabyte tape and accessioned into the vault. Similarly, the next step is to move the compressed audio files (.mps and .rm) into their respective “cued” directories. The same principle applies; files will accumulate in these directories until approximately 650 Megabytes of data exist, at which time they will be burned to a CD and accessioned into the vault.

4 Move .rm and .mp3 files on Terma 2 into the Cued Files/Real Audio and Cued Files/MP3

directories respectively.

• Shared • VCTR Cued Exabyte 19710804VCTR1024.wav • VROT Cued Exabyte	• Shared 19710804VCTR1024.wav 19710804VCTR1016.wav • Cued Files • MP3 19710804VCTR1128.mp3 • Real Audio 19710804VCTR1016.rm 19710804VCTR1064.rm • Transcripts

Stage 4 – File Editing

1 If the talk duration is less than 72 minutes – proceed to "Stage 5 – CD Creation 1"

2 If the talk duration is between 72 minutes and 81.5 minutes, then it is necessary to split the 16 bit/44.1 .wav file into two parts for two CDs. This is done by placing two markers in WaveLab at or around the 72 minute mark, roughly 5 to 10 seconds apart. Highlight from the 2nd marker to the beginning of the talk, then copy and paste and save into a new file with an "A" suffix. Then, in the original file, highlight from the 1rst marker to the end of the file, then copy, paste, and save into another new file with a "B"suffix. This will yield the following:

• Shared • VCTR Cued Exabyte 19710804VCTR1024.wav • VROT Cued Exabyte	• Shared 19710804VCTR1024.wav 19710804VCTR1016.wav 19710804VCTR1016A.wav 19710804VCTR1016B.wav • Cued Files • MP3 19710804VCTR1128.mp3 • Real Audio 19710804VCTR1016.rm 19710804VCTR1064.rm • Transcripts

3 If the talk duration is longer than 81.5 minutes, then it is necessary to split the 24 bit/44.1 parent .wav file into two files as well. This is done by placing a marker in the 72-81.5

minute range. Highlight from the marker to the beginning of the file, copy, paste, and save into a new file with an "A" suffix. Then highlight from the marker to the end of the file, copy, paste, and save into a new file with a "B" suffix. This will produce the following:

• Shared • VCTR Cued Exabyte 19710804VCTR1024.wav • VROT Cued Exabyte	• Shared 19710804VCTR1024.wav 19710804VCTR1016.wav 19710804VCTR1024A.wav 19710804VCTR1024B.wav 19710804VCTR1016A.wav 19710804VCTR1016B.wav • Cued Files • MP3 19710804VCTR1128.mp3 • Real Audio 19710804VCTR1016.rm 19710804VCTR1064.rm • Transcripts

Stage 5 – CD creation I

We now have produced all the files necessary to archive the talk.

1. Pull 4, 6, or 8 CDs from stock depending on whether the talk is <72, >72 but <81.5, or >81.5 minutes in length respectively. Note the CD serial numbers. Assign an available accession number to each serial number.
2. **Carefully** update the database and produce the appropriate number of labels.
3. Burn the Data CDs and Audio CDs using the appropriate files in the Terma 2/Shared directory.
4. Assemble Jewel case, jewel tray, and tray insert for each CD.
5. After burning all necessary CDs, delete the files for the given talk from the Terma 2/Shared directory.
6. In the components DB, **mark the talk as complete and enter the completion date**. The field names are ARP Phase 1 complete (enter "Y") and Completion Date (enter date). This will allow us to quantify our progress using the "Production" layout in the DB. When completely finished the, directory will look like this:

• Shared	• Shared

• VCTR Cued Exabyte 19710804VCTR1024.wav • VROT Cued Exabyte	• Cued Files • MP3 19710804VCTR1128.mp3 • Real Audio 19710804VCTR1016.rm 19710804VCTR1064.rm • Transcripts

You are now ready to either repeat the process with a new talk, create an MP3 or Real Audio archive disk, or create an Exabyte tape.

Part 6 – Exabyte Tape Creation

As you digitize a number of talks, audio files will begin to accumulate in the Terma 1/Shared/VCTR Cued Exabyte and Terma 1/Shared/VROT Cued Exabyte directories.

4 out of every 5 talks digitized shall be VCTR talks.
1 out of every 5 talks digitized shall be VROT talks.

Therefore the Terma 1/Shared/VCTR Cued Exabyte directory will accumulate files 4 times faster than in the VROT Cued Exabyte directory. A directory that has accumulated 4.5 Gigabytes of files will look something like this:

• Shared • VCTR Cued Exabyte 19710804VCTR1024.wav 19710805VCTR1024.wav 19710806VCTR1024.wav 19710807VCTR1024.wav 19710808VCTR1024.wav 19710821VCTR1024.wav 19710822VCTR1024.wav 19710822VCTR2024.wav • VROT Cued Exabyte 19770322VROT1024.wav 19770323VROT1024.wav	• Shared • Cued Files • MP3 19710804VCTR1128.mp3 19710805VCTR1128.mp3 19710806VCTR1128.mp3 19710807VCTR1128.mp3 19710808VCTR1128.mp3 19710821VCTR1128.mp3 19710822VCTR1128.mp3 19710822VCTR2128.mp3 • Real Audio 19710804VCTR1016.rm 19710804VCTR1064.rm 19710805VCTR1016.rm 19710805VCTR1064.rm 19710806VCTR1016.rm 19710806VCTR1064.rm 19710807VCTR1016.rm

	19710807VCTR1064.rm 19710808VCTR1016.rm 19710808VCTR1064.rm 19710821VCTR1016.rm 19710821VCTR1064.rm 19710822VCTR1016.rm 19710822VCTR1064.rm 19710822VCTR2016.rm 19710822VCTR2064.rm • Transcripts

1 When 4.5 Gigs of data have accumulated in the Terma 1/Shared/VCTR Cued Exabyte directory, create a label and make an Exabyte back-up. Remember that you must enter the accession number of the Exabyte tape in cue for all talks as they are being accessioned. That is to say, one must make an Exabyte entry in the DB for every talk *as you do them* and while the files accumulate in the Exabyte directories.

2 After completing the Exabyte back-up, delete the .wav files from this directory and start anew.

VROT Exabyte creation

• VCTR Cued Exabyte 19710830VCTR1024.wav 19710831VCTR1024.wav 19710901VCTR1024.wav • VROT Cued Exabyte 19770322VROT1024.wav 19770323VROT1024.wav 19770323VROT1024.wav 19770401VROT1024.wav 19770401VROT2024.wav 19770402VROT1024.wav 19770403VROT1024.wav 19770404VROT1024.wav 19770405VROT1024.wav	• Shared • Cued Files • MP3 19710804VCTR1128.mp3 19710805VCTR1128.mp3 19710806VCTR1128.mp3 19710807VCTR1128.mp3 19710808VCTR1128.mp3 19710821VCTR1128.mp3 19710822VCTR1128.mp3 19710822VCTR2128.mp3 19710830VCTR1128.mp3 19710831VCTR1128.mp3 19710901VCTR1128.mp3 • Real Audio 19710804VCTR1016.rm 19710804VCTR1064.rm

	19710805VCTR1016.rm 19710805VCTR1064.rm 19710806VCTR1016.rm 19710806VCTR1064.rm 19710807VCTR1016.rm 19710807VCTR1064.rm 19710808VCTR1016.rm 19710808VCTR1064.rm 19710821VCTR1016.rm 19710821VCTR1064.rm 19710822VCTR1016.rm 19710822VCTR1064.rm 19710822VCTR2016.rm 19710822VCTR2064.rm 19710830VCTR1016.rm 19710830VCTR1064.rm 19710831VCTR1016.rm 19710831VCTR1064.rm 19710901VCTR1016.rm 19710901VCTR1064.rm • Transcripts

3 When the Regent's talks have accumulated in Terma 1/Shared/VROT Cued Exabyte, make a backup and clear the directory of files as in steps 1 and 2.

4 After 5 VROT Exabyte tapes have been created, send them to the Satdharma Archive in Ojai, CA. Be sure to make an Exabyte item entry in the DB as you go and send a copy of the appropriate records in the "Items" DB. The Shambhala DB should have "OJAI" listed as the storage location for these accessioned items.

Part 7 – CD Creation II

This section addresses the accumulation of audio files in the Terma 2/Shared/Cued Files/MP3 and the Terma 2/Shared/Cued Files/Real Audio directories. As these directories approach 650 MB in size, the files must be archived and erased.

1 Always have two CDs put aside and labeled as the accessioning objects for the two "Cued" file directories (Real Audio and MPs). Remember that when entering information in the DB for each talk, one must create a record for both .rm files and each .mp3 file noting the **accession number and serial number** for the Real Audio and MP3 archive CDs. *Only then can you create an accurate label*.

2 Create label and check it against the files listed in the Terma 2/Shared/Cued Files directories.

3 Create CDs and delete files in the "Cued" file directories so that work can begin anew.

Part 8 – SORM Transcripts

The idea of "Cued" directories applies equally to other accessioned digital media types as well. As transcripts, for instance, are gathered and accumulated by the Shambhala Archives in digital form, they should also be put in these "Cued" directories. As they accumulate, data CDs can be made for people working with these transcripts. We could begin this process with the work that will be done by Liz Munson on the Sakyong's material. This can be done in conjunction with her database project that will be led by the direction of the Shambhala Archives.

Quality Assurance

Great care must be taken to be accurate when inputting data in the DB. Particularly, people who are accessioning must pay careful attention to the **slates** and make sure they jive with the information about a given talk in the database. Additionally, *all other resources* should be brought to bear when updating the database. This means that when a reel or cassette is pulled for digitization, all available sources of information should be checked for accuracy. This includes transcripts, videos, and any and all information housed by Recordings and Pubs.

Also, particular attention should be paid to the Event to Component relationships that are established by the EventKey field in the DB. Please take nothing for granted regarding their accuracy and always check ALL items in the DB to insure that Talk Components are linked to Events properly.

CDs should randomly be checked for quality using the CD analyzer.

People who are accessioning should regard their work as an awareness practice and apply mindfulness at all times. The importance of data entry accuracy cannot be emphasized enough.

Hardware Maintenance

Exabyte machines should be cleaned at regular intervals. The front panel controls should be monitored for warning lights daily.

Reel to Reel players should have their heads cleaned regularly to insure that the best signal is being digitized. Capstans and rollers should be periodically cleaned.

Hard drives should be de-fragmented regularly to insure that the hard drives are packed well. This improves system performance in general and decreases data latency when CDs are created.

Production Monitoring

There are fields in the "Component" DB called {ARP Phase 1 complete} and {date completed) which require a "Y" entry and the date when a talk has been finished and archived. There is a

layout called “production” in the DB which lists the event title, talk title, talk date, speaker, and date archived. By doing a find on ARP Phase 1 completed = “Y”, sorted by date completed, we can track progress.

Appendix A – Accession Item Prefixes

Below are the accession item prefixes and their meaning:

EX – exabyte tapes
DD - data CD for 24 bit .wav files
CD - redbook audio CDs made from 16 bit .wav files
MP - MP3 audio file CDs
RM - Real Audio file CDs
AR - audio reels
AC - audio cassettes
TR - digital transcripts CDs
PH - photographs