



Community Archiving Workshop

Webinar # 7: Audio Digitization Kit

Southwest Region IMLS + NEH Cohorts

Shahed is a 2018 graduate of NYU's Moving Image Archiving and Preservation masters program and currently works as an audiovisual archivist for California Revealed, based in Sacramento at the California State Library. California Revealed helps universities, archives, libraries, and other cultural heritage organizations across California digitize, preserve, and provide access to their collections.

Audio Digitization Kit

August 4, 2021

Presenter: Shahed Dowlatshahi

In this session, participants will be introduced to a portable audio digitization kit. The main components of the kit are an analog/digital converter, an audio cassette deck, a MacBook Pro, speakers, headphones, a hard drive, and necessary cables and connectors housed inside a watertight Pelican case. The kit includes an audio cassette deck but is capable of digitizing other analog audio formats (such as 1/4" open-reel audio) with the addition of the appropriate playback deck.

#cawesome

Hi Everyone, my name is Shahed Dowlatshahi and I was happy to help put together the digitization and film inspection kits for this project and also to present 3 webinars demonstrating the components and use of the kits. In this session, participants will be introduced to the portable audio digitization kit.

The main components of the kit are an analog/digital converter, an audio cassette deck, a MacBook Pro, speakers, headphones, a hard drive, and necessary cables and connectors housed inside a watertight Pelican case. The kit includes an audio cassette deck but is capable of digitizing other analog audio formats (such as 1/4" open-reel audio) with the addition of the appropriate playback deck.

Overview

4 Portable Kits:

- 1 audio digitization kit (today)
- 1 video digitization kit (webinar on aug 18)
- 2 film inspection and repair kits (webinar on sep 1)

Overall, four kits were created, one audio digitization kit, one video digitization kit, and two identical film inspection and repair kits. Today we will be focusing on the audio digitization kit.

Outline

Audio Kit Components/Hardware

Audio Kit Applications/ Software

Audio File Types

Audio Kit Setup and Demonstration

Discussion and Questions

Here is a general outline of what I'll talk about today for about an hour: I'll start with a set of slides summarizing some of the main kit components, move on to talking about some of the software used in the kit, talk about the two main types of audio files that we would ideally create in a digitization project, and then show a recorded video of the kit setup and demonstration. Then we can open it up for questions and discussion.

Audio Digitization Kit

Components



So let's jump in. First, let's take a moment to go over the contents of our audio digitization kit. Here you can see the pelican case that holds all the components and is about the size of a carry-on or small suitcase, very portable.

Kit Components

Case
Audio Cassette Deck
A/D Converter
MacBook Pro
Speakers
Headphones
External Hard Drives
Cables and Connectors

Here is a basic overview of the contents of the kit. We'll go through all the components, what they do, and how to set them up to digitize some audio cassettes. All kit components are labelled and I've tried to make it as easy as possible to identify components and connect the cables. Before moving on to a full demonstration of the kit, let's take a closer look at each of the components.

Audio Cassette Deck

Marantz Professional
PMD-300CP
New
\$160



When digitizing any physical media, an essential component is a playback deck. Today, most playback decks for analog media (VHS, umatic, etc.) are no longer manufactured. However, new audio cassette decks are still being made. This audio digitization kit uses a newly manufactured Marantz Professional deck with the model number PMD-300CP and they cost about \$160 to purchase. Older audio cassette decks also work fine in this kit, but it's good to have a device where we are confident that the playback heads are clean and not yet heavily used. It's a fairly simple deck with two playback slots.

For our purposes we will only be using one of the playback slots. On the back of the deck there are a set of outputs (which the analog audio signal will be coming out of) and a set of inputs (to connect an instrument or microphone and record directly on tape, which is outside the scope of our work). There is also a digital USB output, this can be used to directly transfer audio tapes to digital files without the use of an external converter - but we will not be utilizing this method as we have a separate external analog/digital

converter which yields better results and more control over the digitization process.

I also want to emphasize that although this kit comes with this particular audio cassette deck, if you have a different playback deck and would like to digitize a different format, you can use this kit to digitize that format, as long as you have RCA outputs on the deck (which almost all analog audio equipment have).

A/D Converter

Focusrite Scarlett 2i2 -
Third Generation

New

\$200



The next critical component is the A/D converter or analog/digital converter (I'll just refer to this as the converter going forward). The function of this device is to convert an incoming analog signal into an outgoing digital signal, just like the name suggests. So the analog signal that we are taking out of the cassette deck will be coming into this device, the device will convert it into a digital signal, and another cable will carry out the digital signal to the computer where it will be written to a hard drive as a digital file. There are many brands and varieties of these devices as they are widely used in audio recording and engineering today- the one in this kit is the Focusrite Scarlett 2i2 - third generation, purchased as new for about \$200.

MacBook Pro

13-inch Model

M1 Chip

16GB RAM

256GB Hard Drive

New

\$1500



We also need a computer to be able to run the software to control the converter and to write the digital signal coming from the converter to a hard drive. In this case we are using the latest generation of macbook pros with an internal RAM of 16GB and a 256 internal hard drive (the internal hard drive will not be used for storing the digital files, as it is not of a very high capacity - instead the kit includes a 1tb external hard drive that will be connected to the laptop and used to store the files). This computer is the most expensive part of this kit and cost about \$1500.

Speakers

PreSonus Eris E3.5

New

\$150



The kit also includes a set of reference speakers used to playback the audio from the converter. The audio that you will hear from the speakers in this setup will be the pre-digitization signal, so you are hearing exactly what is recorded on the tape, and you can use the converter to adjust the audio levels. These are Presonus Eris speakers purchased new for about \$150.

Cables

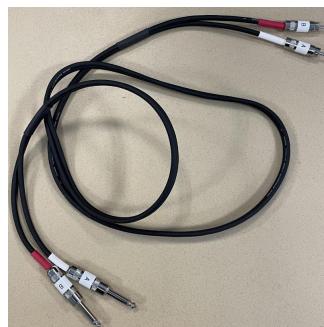
1/4" to 1/4"

Carries pre-digitization audio signal from converter to speakers



RCA to 1/4"

Carries analog audio signal from playback deck to converter



And then of course there are an assortment of data cables, adapters, and power cables that are required to power the equipment, and to move the analog and digital signals from one device to another. Pictured here are two of the main sets of cables used in the kit.

On the top have two XLR to XLR cables (XLR is the name of the long metal connectors at the end of the cables) which carry the pre-digitization sound from the converter to the speakers - so you can monitor the sound as you're digitizing it.

On the bottom you have a set of RCA to XLR cables that carry the analog audio signal from the cassette deck to the converter (RCA are the shorter connectors on one end of these cables, the end that connects to the back of the cassette deck). If you look closely, you can see that the cable connectors are labelled with A, B, C, D, and you will also see these labels on the back of the devices, this is to help connect the correct cable to the correct input or output.

Digitization Software

Focusrite Control

Included with Scarlett converter

Allows control of converter



Audacity

Free and open source

Audio digitization software



VLC Media Player

Free and open source

Playback software



Besides the hardware, a set of software is required to make this process work. The necessary software are those listed in bold. First is Focusrite control which is basically the software that controls the basic settings for the converter, and this can be downloaded for free when you've purchased the device and it has already been installed on this kit's MacBook.

Second is Audacity, which we use as the digitization software. Audacity is a free and open-source digital audio editor and recording application. The latest version has already been installed on the Macbook for this kit and is ready and configured for use with this setup. VLC media player is also a free and open source software and can be used for quality control and playback of the digital files - you can use other software like itunes too if you prefer.

Audio Digitization

File Types

- **Preservation File**
 - As close a representation of the analog audio as possible
 - Uncompressed
 - No editing or noise-reduction
 - Large files
- **Access File**
 - Optimized for listening and use
 - Compressed
 - Smaller files
 - Easier to stream or share online

With any digitization project, it's important to lay out the specifications of the resulting digital files in the beginning. As you will see in the demonstration, once you've digitized the tape, you have to decide on what type of files you'd like to export from the software - what format, what sampling rate, what bit-depth, what bit-rate, and the many other technical parameters that you can specify for a digital file.

In general, the main goal is to recreate the analog signal that is recorded on the audio tape as accurately as possible in a digital file - this means creating an uncompressed preservation master file with no level-boosting, no editing and no restoration. These preservation files are meant to be preserved for the long-term and are generally larger in size and not necessarily meant to be used for sharing and listening. The files that you create for sharing, access, streaming, and use are called access files, they will be in a different format, they will be compressed resulting in smaller size, thus easier to share and stream online, and you can apply any editing or noise reduction that you like since the preservation

master is safe as the most accurate representation of the tape itself.

Audio File Specifications

Preservation files

Preservation Files

Format: BWF (.wav)

Bit depth: 24-bit

Sample rate: 96 kHz

Bit rate mode: Constant

Bit rate: 2304 Kbps per channel



Thankfully in audio preservation world, there is a generally agreed upon set of technical specifications for preservation files (unlike with video files which we will be working with during the next webinar). These specifications can be seen on this slide for the preservation files.

Access Files

Format: M4A (.m4a)

Encoding: AAC

Bit depth: 16-bit

Sample rate: 44.1 kHz

Bit rate mode: Variable



And the specifications for access files can be seen here, although many still prefer to make mp3 files instead of m4a files. The advantage of m4a files is they yield a better quality than mp3 but they are still just as small and compressed. We will look more closely at some of these parameters for preservation and access files during the last step of our kit demonstration today.

Kit Demo

Thank you!



Community Archiving Workshop



AMIA



NATIONAL
ENDOWMENT
FOR THE
HUMANITIES

