

Manhattan School of Music
Suggested Audio Equipment and Techniques
for Music Distance Learning

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This document serves to introduce you to basic audio practices and techniques when doing Distance Learning classes using videoconferencing devices. At the Manhattan School of Music, we have put forth extensive efforts in attaining high fidelity audio quality using this technology, and this document will outline how to adopt similar practices in your sessions with us and other institutions. If you have any additional questions concerning what equipment to purchase or how to setup your system, please contact James Sizemore at 917-493-4505

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Videoconferencing Equipment

NETWORKING

1. Video/Audio Codec

- Used to compress audio and video data to small sizes so it can be easily transferred over the Internet or ISDN lines.

2. Network

- A high speed internet connection (greater than 384kbps) or Video ISDN connection is needed to transfer data between locations
- MSM is also Internet2 compatible

AUDIO

1. Microphones and Stands

- A handheld dynamic microphone can be used for simple talkback communication.
- For musical instruments a condenser mic is suggested.

2. Mixer

- A small mixer is needed to increase the mic level signal, provide phantom power to the condenser microphone, and mix together the microphone signals.

VIDEO

1. Camera

- A DV camera is needed to record local video images.

2. TV Monitor

- A TV monitor is needed to view the video being sent and to hear the music being performed from the other side.

CABLES

1. Audio

- XLR mic cables needed for each mic
- RCA cables needed to send audio to Codec, and to TV speakers

3. Video

- S-Video cables needed for camera and TV



Click on a link for more information and purchase Options

Microphone Options

Speaking Microphones

- Dynamic Mics: [Shure SM58](#) – Handheld microphone used for talking \$100

OR

Room Mic – PZM microphone – Condenser Microphone that can be placed on a table in the center of the room. [Audio Technica AT849](#) \$350

Microphones for Music

- Condenser Mics: [Audio-Technica AT825 Stereo Mic](#) Stereo Mic – for Musical instruments. \$369 (Easier to use)

OR

Condenser Mics: [Studio Projects C4*](#) – Pair of Microphones for Musical Instruments \$359 (More versatile)

Mixer Options

- [Mackie 1202-VLZ Pro](#) - \$300

Or

[Soundcraft COMPACT 10](#) - \$179

Microphone Stands \$36 each

*if purchasing the SP C4, you will also want a [stereo microphone bar](#) \$25.

Microphone Cabling – [Proco XLR cables](#) \$20 per cable**. ~\$120 total

**Cost of cabling depends on microphone selection, distance from mic to mixer, and type of *codec* being used (ie. Polycom)

You will most likely need 3 to 4 15' to 25' [XLR cables](#) for your microphones to your mixer and 2 15' to 25' [XLR to ¼" cables](#) between the mixer and videoconferencing *codec** (ie. Polycom, Tandberg, etc.).

*NOTE: Please check your Videoconferencing *codec*'s input connections before purchasing cables

Headphones – The [Sennhesier Eh 150](#) for \$39.99 or [Sennheiser HD 280 Pro](#) for \$99 are 2 affordable options

Optional - Using additional speakers instead of the speakers built into your TV, are also an option and suggested. The [M-Audio BX5](#) for \$299 are an affordable option and work well for this application.

TOTAL COST ESTIMATE \$850 - \$1300

This represents an entry level package to basic audio production. If you are interested in a more high fidelity set of audio tools, we would be happy to give you more recommendations. Please contact James Sizemore at 917-493-4505.

Basic Principles in Audio Engineering For Distance Learning Music Applications

For High Fidelity Music applications, it is useful to incorporate more professional audio equipment and practices. This document will give you a basic introduction to practices in audio engineering.

I. Microphone choices:

Dynamic : These microphones use a small magnet wrapped with a coil of wire (remember electromagnetism?) to transform acoustic sound waveforms into an electrical audio signal. This is the type of microphone most people think of when they think of a mic. They are very rugged and good for recording very loud sounds, but are not quite sensitive enough for recording many musical instruments



Shure SM58



Audix CD11

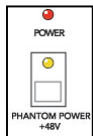


Shure SM57



Sennheiser MD421

Condenser: These microphones use a small electrically charged plate to pick up sound waves. Because they need to be electrically charged, they require *phantom power*, which is a 48 volt electrical signal sent down the microphone cable, provided to the mic by a switch on many pro-audio devices such as *mixers* and *pre-amps*. These microphones are much more sensitive, and help to pick up the finer nuances of a musical instrument.



Studio Electronics SE1A



Rode NT5



A Pair of Neumann KM184



Audio-Technica AT849

II. Microphone Technique:

Speaking Mic: When using a dynamic microphone, position the microphone about 12” from the person's mouth (placing it too closely will make it sound “boomy”, with too many bass frequencies). Aim the microphone pointing slightly upward towards the

speaker's mouth. This microphone can be very useful for a single person speaking, which is why it is commonly used on podiums at a lecture.

Room Mic: Often if there is an entire room of students who wish to talk during a videoconference, a room mic can be used to capture the sound of everything in the room (if you received a "mic pod" with your video conferencing system, this is the kind of mic you probably have). This microphone, called a *PZM*, picks up sound from all directions, which means it is an *omnidirectional* microphone, whereas the dynamic mics listed above only pick up sound directly in front of it, which are known as *cardioid* microphones. These mics are usually placed on a table or other flat surface in the middle of the room. The Audio-Technica AT849 shown above is an excellent example of a room mic.

Instrument Mics: There are many ways to mic an instrument depending on the instrument and the sound one is looking for. A more in depth resource for information on micing your particular instrument can be found at <http://www.shure.com/ProAudio/TechLibrary/EducationalArticles/index.htm>

When trying to record a larger ensemble, such as a choir, or even a large instrument, such as a piano, it is sometimes useful to use 2 microphones instead of 1. This more closely resembles the way that humans hear sound using 2 ears, and will create a more enriching musical recording or transmission. Some microphones, such as the Rode NT5 shown above are *stereo mics* and are basically 2 microphones built into 1! This mic can be used to create a better stereo sound of the instrument you are trying to record/transmit. One can also purchase a pair of microphones, such as the Neumann KM184 shown above, and simply place them with a spacing similar to that of the ears on a human head.

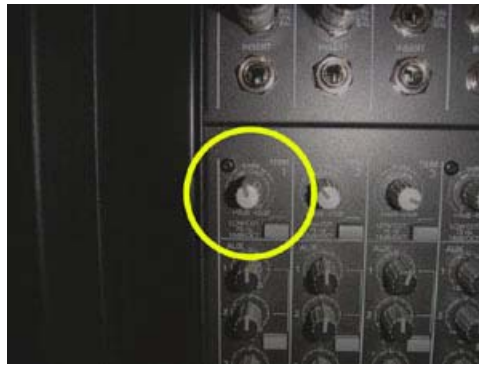
Keep in mind, the final measurement is always the sound itself. If you are unsure of how something will sound, put on your headphones, listen carefully, and judge for yourself!

III. Pre-Amps and Gain Structure

When speaking into a mic, the *diaphragm* of the mic converts the sound pressure into an electrical signal. As you can imagine, this is a very weak signal, which is why we have pre-amplifiers. This low level signal is known as *mic level*, but for pro audio applications we must raise it up to *line level*. This process is known as increasing the *gain* of a signal.

You will most likely be using a mixer to increase the level of your signal from *mic level* to *line level*. Plug the 3 prong XLR cable into the mic, then plug the XLR cable into the mixing board. Right below the plug or on the top of each mixing channel, you will see a small knob that should be labeled as TRIM or GAIN.

TRIM KNOB

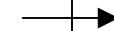


This is the knob you will use to raise the level of your microphone. On the bottom of the mixing strip, you will have an additional fader or knob that can be used to adjust the level while mixing, if you so desire. Most of the time, however, you should leave this knob at *unity* or 0. When it is set to unity, the mixing board will not be amplifying or attenuating the level of the signal. This helps to create high fidelity audio.

Set this knob to U or O



Fader
Example
Unity

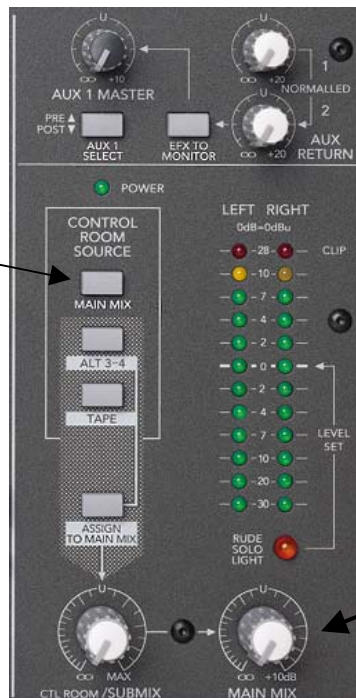


If you are using a stereo microphone, be sure to turn the pan knobs above your Gain control hard left and hard right, as seen below, for each side. Otherwise it will still be in mono!



Now, look at the Master control levels section of your mixer. This is an example from a Mackie 1202 VLZ pro, but your controls will look similar, depending on your mixer.

Push this button to send the signal to the mixer's Main Output



Use these meters to control your overall level. Make sure the red light doesn't go off, and try to keep an average level around 0

This level controls the overall level going into your Polycom, Tandberg, or other Videoconferencing encoder.

IV. Audio Monitoring

It is also suggested that you purchase a pair of headphones so you can listen to the audio feed coming from your microphones and out of your mixer. You can use these headphones to create a good mix using your different mics. Simply plug the headphones into the output on your Mixer labeled “Phones”.

**** Important note**** Please realize that the Videoconferencing *codec* is processing and *compressing* the audio in various ways to allow the audio to pass through the internet (very much like an mp3). Due to this *data compression* the audio you are hearing might sound different than what your partners are hearing on the other side of the connection.

You will also need to purchase a set of speakers to plug into the audio output of your Videoconferencing *codec*. Although Pro-Audio professional monitors are not necessary, the more money you spend on your speakers, the better your audio quality will be.

V. Wiring up your Mics and Mixer

Here is a basic set of instructions for wiring up your mixer and microphone.

1st, plug the XLR cable into the microphone, and then plug the other end of the XLR cable into the mixer’s microphone input.



Into Microphone



Into mixer



Mixer Mic Input

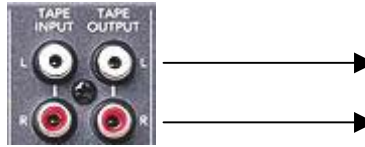
At this point, if you are using a *condenser* microphone, you should turn on *48V Phantom Power*. This might be a switch next to the mic input, as shown above, or it might be a switch on the back of your mixer

Now you will need to connect your mixer to your *codec*, such as a Polycom or Tandberg unit. If your *codec* has an XLR input, you can connect the Main Right and Main Left outputs to *codec*'s Main Left and Right input.

If your *codec* has ¼” inputs, you will need an “*XLR to ¼” TRS Adapter*”, like the one shown below. Make sure the connector has a little ring on the end!



If your *codec* has an RCA input, similar to what you might see on your DVD player, you will want to use your mixer's RCA Tape Output.



Sound Checks

Using these techniques and equipment, you are now well prepared to engage in Videoconferencing with the knowledge that you will be able to maintain a high fidelity audio signal. When preparing for a videoconferencing distance learning event, it is Manhattan School of Music's policy to have a sound check. It is at this time that audio operators on either end of the connection setup their mics and create a "mix" on their mixers. This is a useful time to decide on good locations to place microphones, which microphones to use, and where to set your levels on your mixer. Whenever in a sound check, let your ears be the final judge!

Thank you for your attention to this document. We at The Manhattan School of Music will greatly look forward to collaboration with your institution, and by following the guidelines outlined here, we can be sure they will be successful.