

An Introduction To Pro Tools & Digital Audio For Music Educators

The Midwest Clinic - 2013

Presented By:
Jenny Amaya



Certified Instructor

What is the Purpose of This Session?

To provide you with the information and confidence that you need in order to create a simple, professional recording of your school ensembles and/or student performances.

This Session is for You If:

- You have little or no experience working with Digital Audio or Digital Audio Workstations
- You are thinking about putting together a Digital Audio Workstation, but you do not know where to begin.
- **You have no idea what the important components of a Digital Audio Workstation are, or what the best specs are for each of those components.**

This Session is Also for You If:

- You launch a program like Pro Tools and try to start a new session to make a simple recording, but you stop and have a panic attack when it asks you to make decisions about:
 - Audio File Types
 - Sample Rates
 - Bit Depths
 - **I/O Settings**

In This Session, I Will...

- Explain the five standard components that every Digital Audio Workstation (DAW) should have, with the basic “specs” necessary to complete simple recordings.
- Demystify audio file types, sample rates, bit depths, and I/O settings.
 - You will understand the basic audio fundamentals that will help you work successfully with any digital audio workstation.
- **Give you the tools to be confident when using Pro Tools for simple audio recording tasks.**

Why Pro Tools?

- It is the industry standard.
 - Professional projects sequenced in other applications ultimately end up in Pro Tools.
 - Why not start in Pro Tools, do *everything* in Pro Tools, and avoid having to learn additional software applications?
- It is easy to use!
 - It is just as easy to learn and use as any other professional sequencing application.
- It is available for Mac and PC.
 - PCs are not only affordable for you and your students, but they are extremely reliable when running Pro Tools.
- It is a great recording and music creation tool.
 - It does everything every other sequencing application can do + it is the best when it comes to working with audio.
- It integrates directly with Sibelius.
 - There is no other sequencing application that integrates directly with a professional notation program without the hassle of file conversions.

Let's Start by Defining Five Important DAW Components:

Important DAW Component #1: Your Computer (and Its Software)



Four Important Computer Components:

1. **Operating System:** Your operating system should always be as current as possible (but not *too* current)...
 - What operating system is working flawlessly with your software?
 - Check software requirements & don't update your OS too quickly.
 - Pro Tools 11 for Mac – Mac OS 10.8.4 (Mountain Lion) = "Safe" (currently)
 - Pro Tools 11 for PC – Windows 7 or 8 (not 8.1) = "Safe" (currently)
 - Pro Tools 11 (and all new DAW software) is strictly for 64-bit operating systems – you can no longer use 32-bit plug-ins, etc.
2. **Processor:** This is the speed of your computer (measured in GHz). It is best to have a dual- or multi-core processor when working with audio. Do not buy the cheapest retail PC computer on the market – they come with the worst processors. Buy the best quality processor you can afford. (And choose a speed between 2.x-3.x GHz.)

Four Important Computer Components:

3. **Hard Drive:** The place where you will store all of your sessions and audio. It is best to have at least two hard drives (one system drive, and one drive to record and save your audio to). A good hard drive size is approximately 500GB. In general, the bigger, the better; however too large a drive can have a slower access time.
4. **RAM:** This is the "working memory" in your computer. The more, the better. You need at least 4GB; however, 8GB+ is highly recommended.

Choosing Your Pro Tools Software



- Pro Tools Express
 - For Beginners
 - Limited Software Features
 - Included with the purchase of any Mbox or Fast Track audio interface purchase.



- Pro Tools 11
 - A Professional "Host-Based" Pro Tools System
 - Freedom to Choose Your Hardware Interface



- Pro Tools 11 HD (& HD|Native)
 - Advanced Pro Tools Systems

Important DAW Component #2: Your Audio Interface



Choosing an Audio Interface For Your Pro Tools System:

- If you are just getting started, *keep it simple*:
 - 2 Inputs / 2 Outputs (preferably 2 XLR inputs)
 - USB connection to your computer
- You cannot go wrong with an Avid interface if you are running Pro Tools:
 - Fast Track (Solo/Duo)
 - Mbox Series (Mbox/Mbox Pro)
- Pro Tools works with most 3rd-party interfaces.
- Pro Tools runs through Core Audio on Mac...You do not actually need a hardware interface on Mac, although it is recommended for advanced/professional recording and monitoring.



Important DAW Component #3: Your Monitor Speakers & Headphones

- For a good pair of affordable home studio monitors, research Powered (or “Active”) Near-Field Monitors
- *Many* option/brands to choose from!



...and don't forget a comfortable pair of headphones!
(You need headphones in order to monitor while you record.)



Important DAW Component #4: Microphone(s)

- XLR connections give you professional-quality
- It is always best to buy two so that you have a stereo pair.
- Shure SM57 = The mic everyone owns.



Important DAW Component #5: USB MIDI Keyboard

- Again, many options/brands for you!
- 25-88 Keys; Weighted/Semi-Weighted/Touch-Sensitive; Control Knobs; Onboard Sounds; etc.



5 Important DAW Components:

1. Computer & Software
2. Audio Interface
3. Monitor Speakers
4. Microphone(s)
5. USB MIDI Keyboard



Connecting Your System

- Your USB MIDI Keyboard connects directly to your computer via USB (it is simple)
 - Load updated drivers first!
- Your Audio Interface connects directly to your computer via USB or Firewire (it is simple)
 - Load updated drivers first!

Connecting Your System (cont'd)...

- Your microphone connects to your audio interface as an “Input”
- Note: Take note of the Input # that you plug your mic into – you will assign that number as the input on your track in Pro Tools!

Connecting Your System (cont'd)...

- Your Monitor Speakers connect to your audio interface’s “Main Outputs” or “Monitor Outs”
- Your Headphones connect to your audio interface’s “Headphones” jack

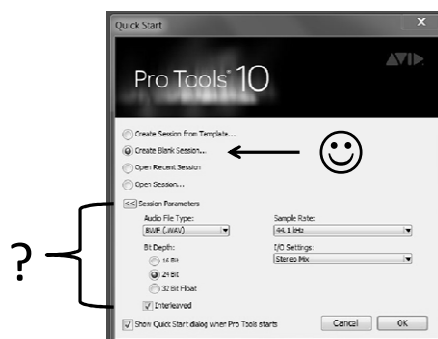
Don't Forget Your iLok!

- Pro Tools 11 requires a 2nd Generation iLok.
 - Your iLok must be authorized to run your Pro Tools software. (www.ilok.com)
 - Your iLok must be plugged in to your computer, or Pro Tools will not launch.



Launch Pro Tools

Create a New Session
Using the Pro Tools Quick Start...



Understanding Pro Tools “Session Parameters”

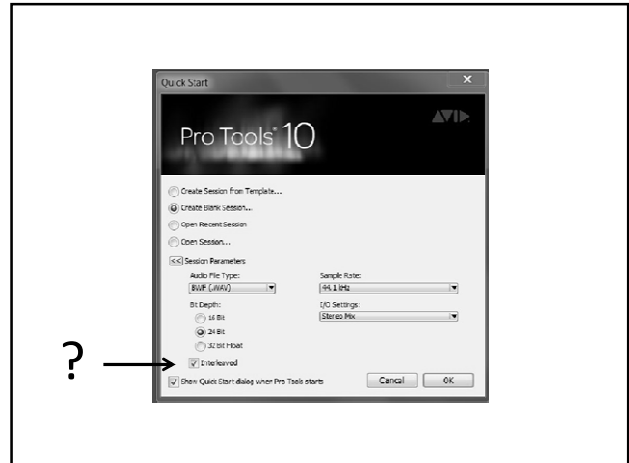
Audio File Type
Sample Rate
Bit Depth
I/O Settings

Audio File Types

- WAV: Audio file format defined by Microsoft. The default file type in Pro Tools systems. A common professional audio file format.
- AIFF: Audio file format co-developed by Apple. Also a common professional audio file format.

The Default Choice is Up To You!

**Pro Tools 11 Allows Multiple File Types w/in a Single Session, But Only One Default File Type.*



Interleaved Stereo

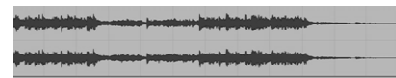
- **Interleaved Stereo:** The data making up the left and right channels are mixed together into one contiguous block of data.
 - If you are new to audio, you will be most comfortable working in this format, so **check this option under session parameters!**
 - With this option checked, any stereo audio you record into Pro Tools will appear as one single file in your session's audio files folder.

Dual Mono / Split Stereo

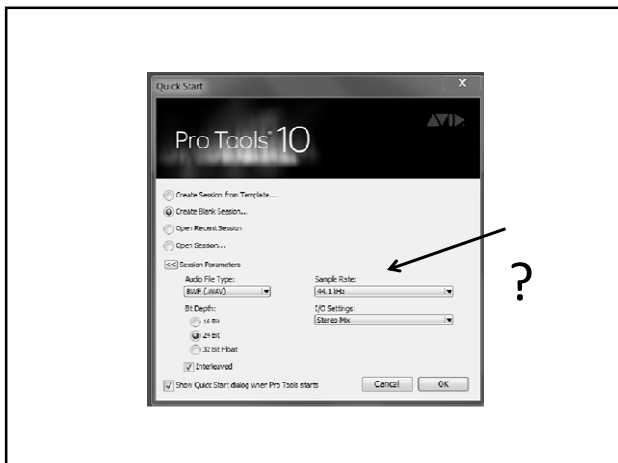
- **Dual Mono / Split Stereo:** A digital stereo recording where the data making up the left and right channels are split into two blocks of data, identified with the suffix .L and .R



You will always view stereo audio in your Pro Tools Playlist as Split Stereo:



**Even if you check the "Interleaved" box in Session Parameters, you can end up with split stereo files in your session's audio files folder, but only if you import split stereo files into your session. (The two types can co-exist in one session.)*

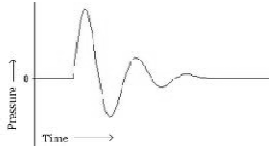


Sample Rates

This requires a little lesson, beginning with some basics...

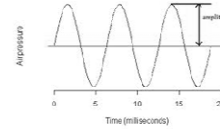
SOUND

- Sound is a Wave of Positive & Negative Pressure Traveling Through The Air
- A “Waveform” is a Graphical Representation of Sound (Plotting Pressure with Time):



Pressure = Amplitude

- In audio, we refer to the degree of change in sound pressure as **Amplitude**.



- Visually, it is the distance above or below the center line (or “zero crossing”) on the waveform graph.
 - The greater the distance from the center line, the more intense the pressure, and the louder the sound.

Amplitude = “Loudness”

We equate Amplitude to **Loudness**.



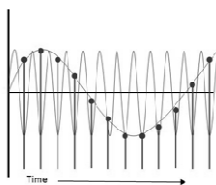
Amplitude is measured in **dB** (decibels)

Sampling

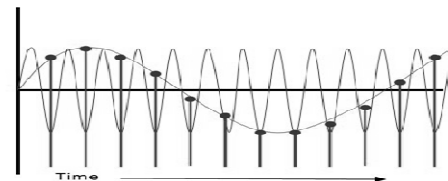
SAMPLING IS THE PROCESS OF RECORDING THE AMPLITUDE OF A WAVEFORM AT PERIODIC INTERVALS...

The Sampling Process...

- A **sample** is a digitally-recorded piece of audio.
- When we record a sample, an **A/D Converter** measures the amplitude of a waveform at periodic intervals.
- These intervals are known as the **sample rate**...



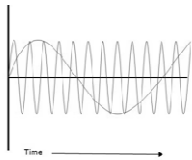
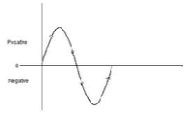
Note: your A/D Converter (and its partner, the D/A Converter) are housed inside your audio interface!



- The **Sample Rate** is literally the number of “snapshots” taken of an analog waveform per second.
- The sample rate helps the digital system redraw the “shape” of the waveform.
- In the above example, we can accurately reproduce the red waveform; however, our sample rate is too low to capture the faster-moving blue waveform.

Waveforms & Pitch...

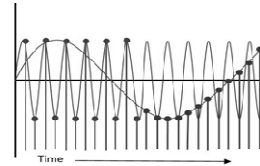
- An **oscillation** is a full **cycle** of the wave:
- The number of **oscillations** per second determines the **frequency** (or “**pitch**”) of the sound.



- The more oscillations per second, the higher the pitch.
- Frequencies are measured in Hz (hertz) or kHz (kilohertz).
- If a sound wave has a frequency of 100 Hz, then 100 oscillations are passing by within one second's time.

In Short:

A recording made at a higher **sample rate** will be able to capture and store a wider range of frequencies than a recording made at a lower sample rate.



With a faster sample rate, we can capture all audible frequencies more accurately.

Why Do We Record at least at 44.1kHz (sample rate)?

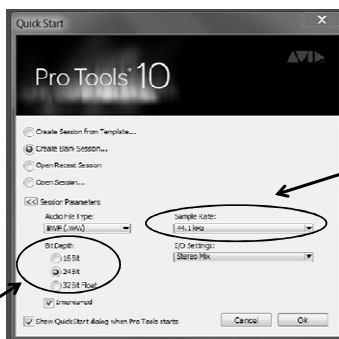
- Nyquist's Theorem: To accurately capture a frequency, we need to sample it at double the rate of the frequency.
- The average human can hear up to 20kHz.
- So...we need to record with a setting of *at least* 40kHz to accurately sample all of the frequencies up to 20kHz that humans can hear.

THIS IS WHY “CD QUALITY” IS 44.1kHz!

What About Higher Sample Rates?

- Most entry-level audio interfaces will only allow you to record at 44.1kHz and 48kHz
- Sample rate conversion works best if cut in half (from 88.2 to 44.1, for example); otherwise, you are better off recording at 44.1kHz if your final destination is CD
 - If your final destination is video, record at 48kHz
- It is very difficult to hear the difference in a higher sample rate recording. (Many debates exist!)

You will be absolutely fine and your recordings will sound professional if you record at 44.1kHz!

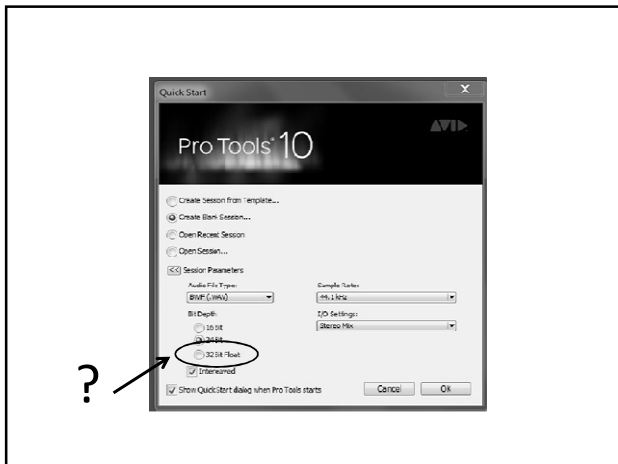
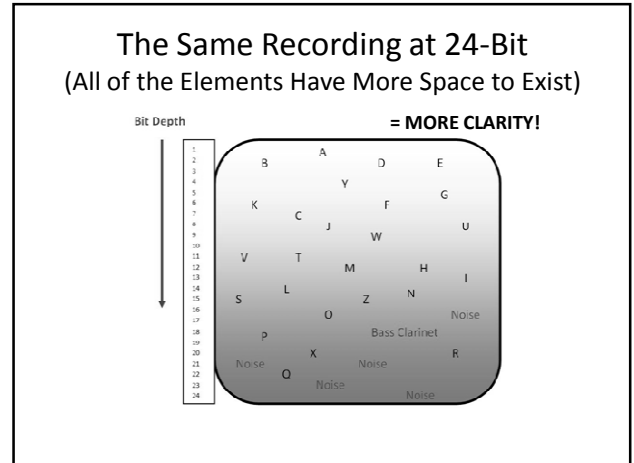
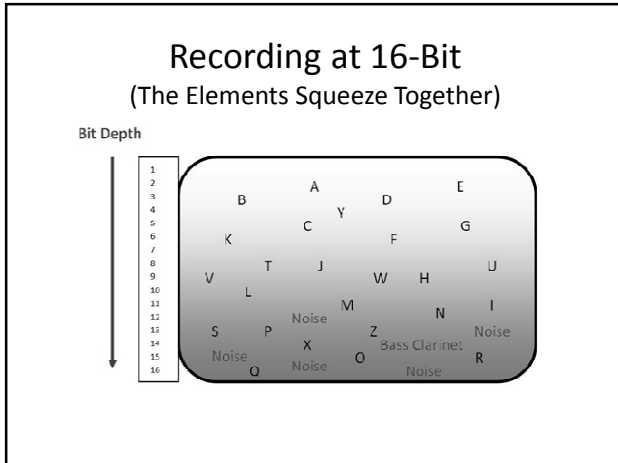


Bit Depth

- The *clarity* of the snapshot.
- The *resolution* of the snapshot.

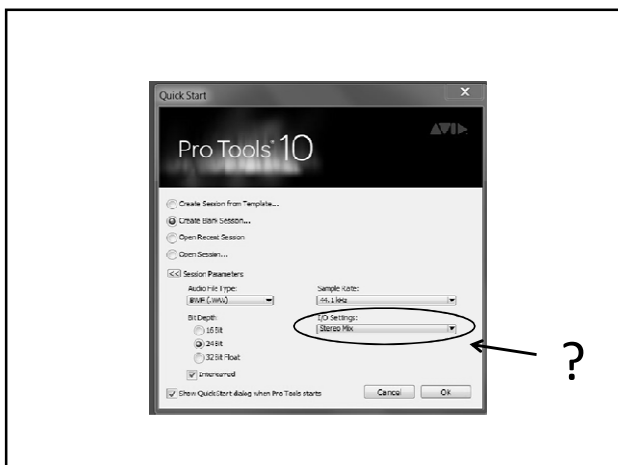
More Bits = Greater Resolution = Higher Quality of Sound

- More bits help capture quieter data more accurately...
 - Think of capturing a low bass clarinet playing quietly within an ensemble in a large room...



What is 32-Bit Float?

- Choosing 32-bit Float does not mean that you are recording at 32-bit.
 - Interfaces cannot record at 32-bit.
- 32-bit Float records at 24-bit but applies 8 more bits to your audio within the session (in the “mix bus”), to allow for more headroom for processing.
- **Before your audio leaves Pro Tools, it is scaled back down to 24-bit.**



I/O Settings

Let's Keep This Simple:

If you have an interface that only has two main outputs, you will always choose “Stereo Mix” as your I/O Setting.

Tip for Beginners:
Make sure you choose Stereo Mix!
Do not leave this parameter set to “Last Used”!

Smart & Simple Session Parameters



Now Let's Create A Session And Record Some Audio...

- Add a Mono or Stereo Audio Track (1 vs. 2 mics)
- Assign the Input(s) to the Track
- Record-Arm the Track
- Adjust the Input Gain (on the interface)
 - Input averages at -6dB
- Adjust for latency (if necessary)...

Adjusting for Latency...

Setup > Playback Engine > H/W Buffer Size
(Set the "low end" buffer size here.)

RECORD LOW
MIX HIGH

Record.

Edit.

Two Ways to Get Your Audio Out of Pro Tools:

1. EXPORT THE CLIP

- For a one-track recording, this is the simplest way
- When you export, Pro Tools applies "Dither" for you
- Exporting is very quick – it is not a real time process

2. BOUNCE TO DISK

- Requires a Master Fader w/ Dither Plug-In
- Your file bounces out in real time while you listen

Let's Look at Exporting the Clip

- Rename the Clip
- Select the Clip
- Clip List Menu
- Export Clips as Files

Before Bouncing to Disk, Let's Take a Look at Dither...

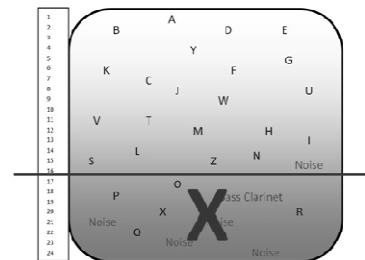
DITHER

- Any time your audio converts from a high bit depth to a low bit depth, you must apply dither to maintain the best quality of sound.
- When we convert from 24-bit to 16-bit, we "truncate" (cut out) 8 bits of data:

01101000 11010101 ~~10101011~~

- ...But we worked *really hard* to record those extra bits, remember...?

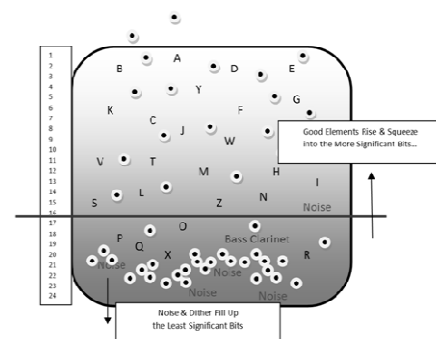
Our 24-Bit Recording (All of the Elements Have Space to Exist)



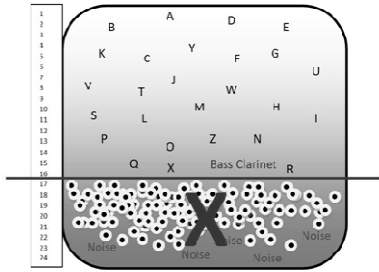
And Now We're Going to Cut Some of it out?

What is Dither & How Does it Help?

- **Dither** is a "good," "pleasant" noise.
- **Dither** resides way down in the "least significant bits," along with other noise.
- If we add **Dither** into our mix, it will begin to "fill the pool," squeezing the good elements up and away from the least significant bits.
- **Dither** will push the good stuff up into the bits that we are keeping when we truncate...



Truncate After Applying Dither...



...and you've got a great mix left over!

When & How to Apply Dither in Pro Tools

- Pro Tools automatically applies dither for every process *except* bouncing to disk.
 - Create a **stereo master fader** track.
 - Insert the **dither plug-in** on the track.
 - Then bounce to disk & Pro Tools will “Dither Down”... 😊

Bouncing To Disk

- After you have created a stereo master fader track & inserted the Dither plug-in...
- Make a timeline selection
- File > Bounce To > Disk
- Check/Adjust the settings & save.

The End.

THANK YOU!

This Session Was Brought To You By:
AVID & Romeo Music

Your Presenter Today Was:

Jenny Amaya

Prof. of Music Industry Studies, Cal Poly Pomona
Owner, The Commercial Music Lab
Avid Certified Trainer
Certified Pro Tools Expert – Music
Certified Pro Tools Operator – Post Production
Sibelius Master Instructor
Sibelius Author, Lynda.Com

jenny@commercialmusiclab.com

Email Me or See Me at the Romeo Music Booth!