Mixing and Mastering Audio Recordings for Beginners

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This handout is available from www.tomrudolph.com/handouts.htm

Reference sources:
- o Jack Klotz, Recording Engineer consultant jsklotz@comcast.net
- o Rick Schmunk, Pro Tools Graphics schmunk@usc.edu
  (from *Mobile Recording* Presentation at IAJE 2008 used by permission)
- o Erik Hawkins, Music Production blog
  http://erikhawkins.berkleemusicblogs.com/

A. For Best Results, Make Good Quality Recordings

TIP #1: Refer to Tom Rudolph's 2008 MidWest Conference Presentation:
Making High-Quality Recordings of Your Ensembles Using a Computer
http://www.tomrudolph.com/presentations/DigAudioMidWest07New.pdf

Top 5 Ways to Make a Better Midwest Clinic Recording
http://www.midwestclinic.com/recording_101/

1. Choose an appropriate space.
   - Use a large room or hall with a high ceiling.
   - Choose a room that has minimal background noise.
2. Use the proper equipment.
   - Use condenser microphones if possible.
   - Record to CD if possible (or use a high quality digital recorder)
3. Place the microphones for a better blend.
   - Use two microphones on a bar on one stand, or two stands about 4 feet apart.
   - Set the microphones about 15 feet high and 12-15 feet in front of the ensemble.
   - Plug the Left microphone (when facing the ensemble) into the Left of the recorder.
4. Set the recording levels carefully.
   - Check levels using the loudest passage of the piece. Set the levels just under the loudest level on the meter. If using a mixer, set input level first, then mix, then main, then recorder levels. (This is very important! Distorting in the Digital Domain cannot be tolerated)
5. Don't adjust any levels during the recording.

B. Purchase Appropriate Software and Hardware

TIP #2: If you have the money, send the master recording to a professional to mix and master. Expect to pay $500 or more for this service.

1. Purchase Software that can be used for Mastering (select one)
    a. Stereo editing software designed for mixing and mastering
        i.   Sound Forge 9 for Windows
             (lite version SoundForge Audio Studio)
        ii. Bias Peak Pro 6 for Mac (lite version Peak LE)
    b. Use computer-based software (DAW) including Pro Tools, Logic, Cubase, Sonar, and other similar titles for mixing and mastering.

2. Purchase a variety of quality monitors to listen to your mix.
    http://erikhawkins.berkleemusicblogs.com/2008/02/29/setting-up-multiple-monitors-for-better-mixing/

    Include a pro set of headphones – Sony MDR7509HD

    Evaluation Process:
    a. Take several CDs of various genres of music to a store that stocks several models of speakers
    b. Playback each CD while switching between models of speakers
    c. Choose whichever monitors give the truest reproduction of the genre(s) on which you're most likely to spend the most time working
    d. Quality main monitors cost in the $500 range per speaker ($1,000)
        i.   Mackie HR824 or Event Studio Precision 8
    e. Consider additional mini monitors
        i.   Edirol MA-7A or M-Audio StudioPro3
    f. Monitor control (switching from one set of speakers to another)
        i.   PreSonus Monitor Station
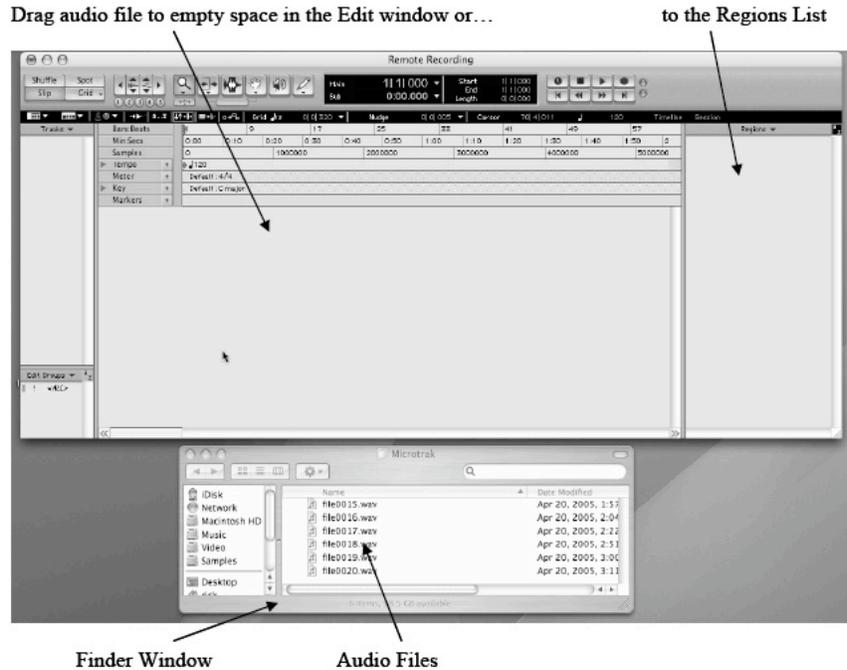   ii. Samson C-Control ($99.95)

C. Multitrack Recording (multiple tracks)
1. Set individual volumes (blending
2. EQ various tracks – such as the bass – use a multiband EQ
    a. Not more or less than plus or minus10db
    http://erikhawkins.berkleemusicblogs.com/2008/03/31/using-eq-effectively/
3. Add a Compressor (if necessary)
    http://erikhawkins.berkleemusicblogs.com/2007/12/06/compression-for-dummies/
4. Add Reverb (If necessary. If you can record in a hall or church with good acoustics, your final version will not need artificial reverb)
    http://erikhawkins.berkleemusicblogs.com/2007/11/02/let%E2%80%99s-talk-reverb/
5. Tweak Results (compare to other recordings)
    http://erikhawkins.berkleemusicblogs.com/2008/04/15/copycat-cool/

TIP #3: Stereo recording does not require mixing, so it saves a lot of time. However, only the entire recording can be edited, not the individual instruments or tracks.

D. Stereo Tracks – Mastering

1. If recording in multitrack, bounce the tracks to a stereo track. Then import it into the software you choose to use for mastering.
2. If recording in stereo on a dedicated recording device, import the file into Pro Tools.

Drag audio file to empty space in the Edit window or...   to the Regions List

Finder Window   Audio Files

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E. Making Edits

1. Clean up the start points and end points of recording
2. Trim off the noise
3. Create a cross-fade (so it does not pop in)

Example: *Region and Fade Dialog box*

Region with selection touching the region boundary
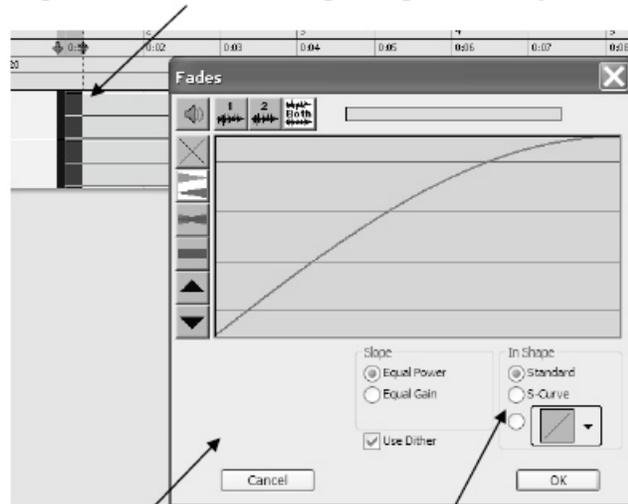
F. Applying EQ (Equalization)

http://erikhawkins.berkleemusicblogs.com/2008/03/31/using-eq-effectively/

1. Listen and analyze the recording and decide what general areas need to be addressed.
2. On the parametric EQ, find/choose a band that generally matches an area that needs work.

Fades dialog box   Fade Shape

3. Turn the boost/cut control to maximum boost level
4. Next, slowly sweep the center frequency up and down until the frequency related problem "sticks out."
5. Decide if you want to boost or cut this selected area. Note that effective engineers more often choose to reduce the level of a frequency area rather than boost it.
6. Sweep the Q/contour setting to determine how a wide a range that needs to be adjusted.
7. Adjust boost/cut control to the appropriate level - should not exceed plus or minus 10 dB.
8. Repeat with other frequency bands as necessary.

Example: *Track Insert with Parametric EQ Plug-in*

Frequency Bands   Center Frequency Control   Gain Control

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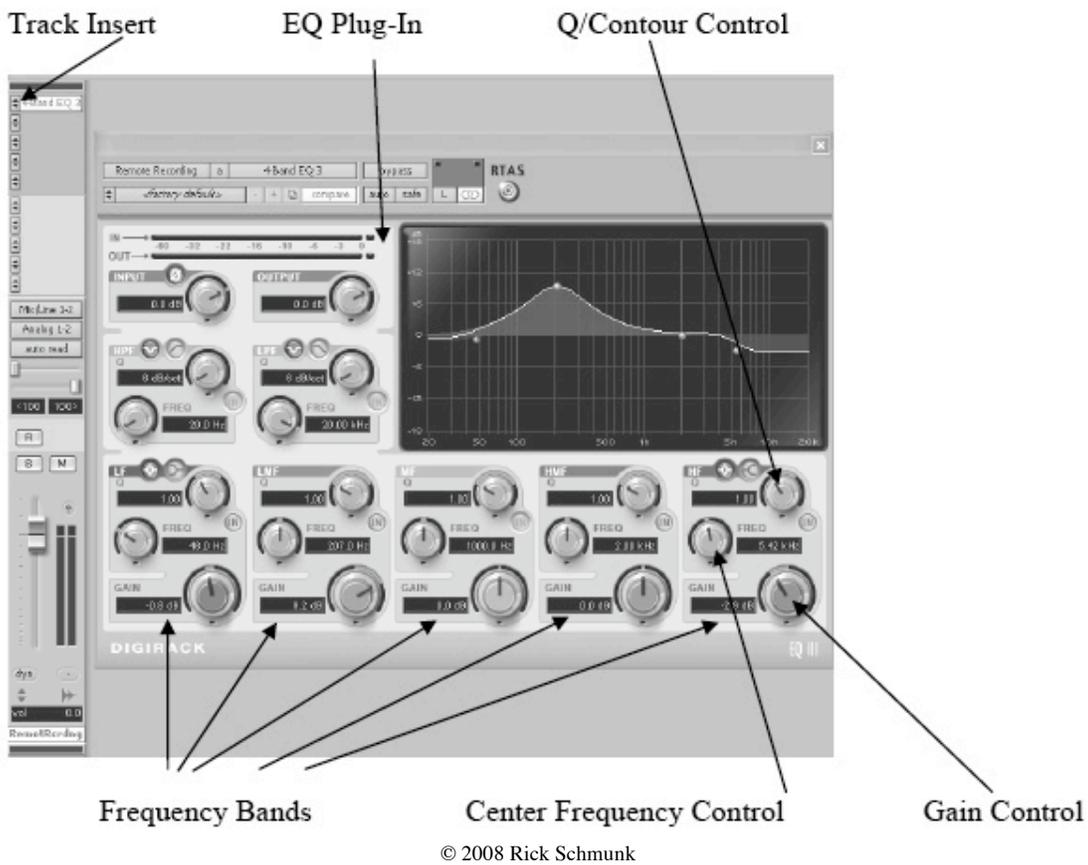
TIP #4: Pro Tools shortcut to copy plug-ins: Select the insert; Shift+Command+C then Shift+Command+v to paste.

G. Compression

http://erikhawkins.berkleemusicblogs.com/2007/12/06/compression-for-dummies/

Compression is used for a variety of reasons. For a stereo recording, use compression to smooth out the highest peaks so the overall levels can be brought up. Compression can protect the headroom of the recording by reducing the dynamic range to protect against

distortion. Also, you can use a compressor to manipulate the envelope of the sound (attack, sustain, etc). For example, when recording a bass direct, bassists often complain there is not enough sustain. So, you can reduce the attack slightly to make the sound more natural – only the attack is compressed.

> **TIP #5**: There is a quick option for maximizing the levels of your recording that is called Normalizing. Most recording engineers (including Jack, my mentor) are not fond of it. Instead, use compression for adjusting volumes unless you are in a big hurry and then normalizing is an option.
> If you feel a need to Normalize, don't exceed 70% of maximum gain level. This will leave room for the gain changes that are caused by signal processing such as EQ and compression.
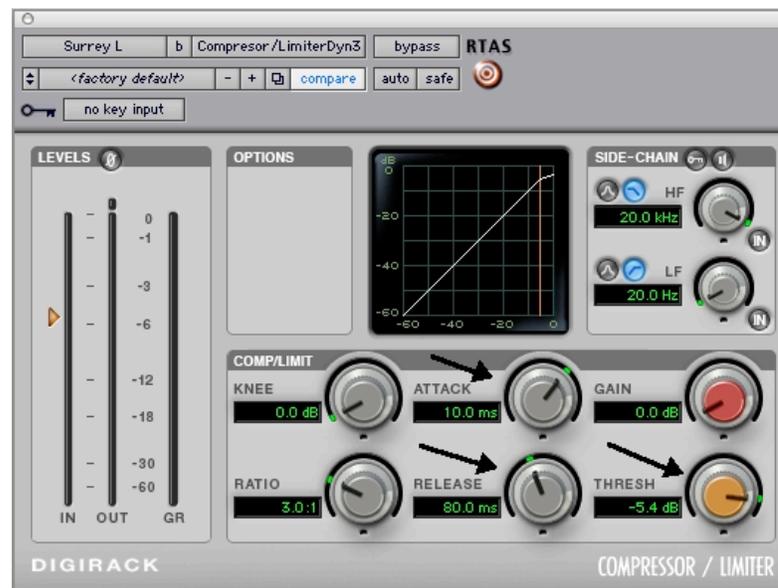
1. Create an insert to the Compression plug-in:
    a. Plug-in > Dynamics > Compressor/Limiter
2. There is no one set process. You will tweak the various options to obtain the desired result.
    a. Start with **Threshold** (working clockwise from bottom right). The threshold sets the volume level at which compression begins. Start with a range of around 3:00 o'clock. Turning the knob to the right, raises the threshold causing gain reduction to occur only to louder parts of the signal
    b. **Ratio** determines the amount of gain reduction that will occur once the threshold is crossed. Higher ratios produced by turning the knob to the right will cause more dramatic volume reduction to those parts of the signal that are above the threshold.
    c. **Attack** is the top middle button and controls how quickly or slowly the compressor starts reducing gain once volume goes above the threshold. Turning the knob all the way to the left will make compression kick in instantaneously after the threshold is crossed.
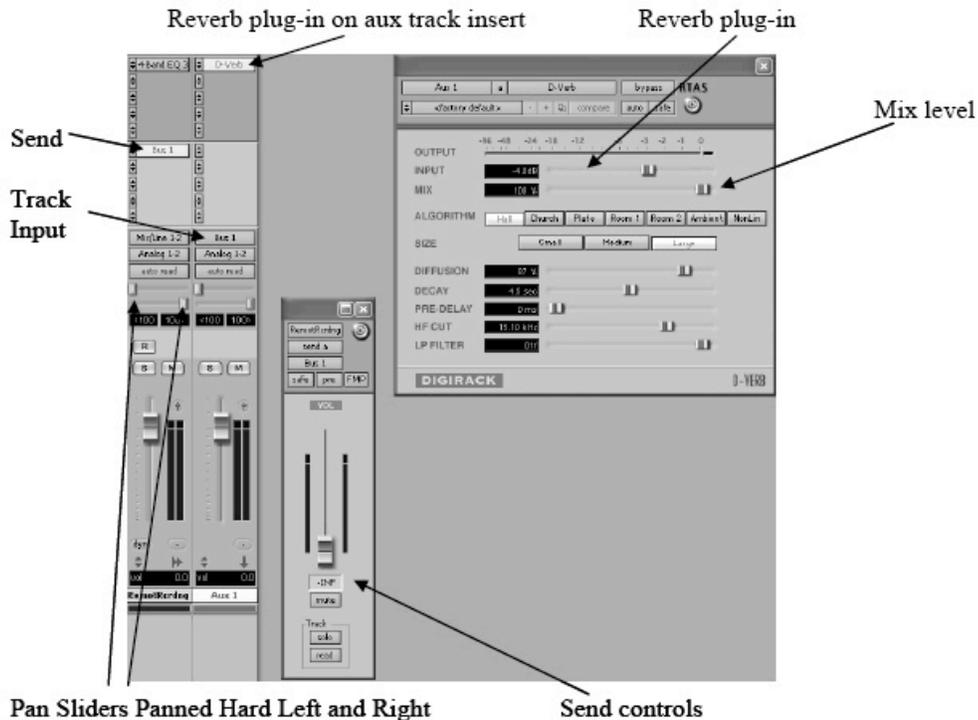
TIP #6: For example when using with drummers, the kick drum needs to be tighter. Create a slower attack (allow the transient to pass through), gain will be reduced only on the rink of the sound.

    d. **Release**: controls how quickly or slowly gain will return to normal once the gain goes back below the threshold. Turning the knob to the right slows the release time. Release must match the nature of the sound being processed. Unmatched release times will result in an audible "pumping" sound as the compressor kicks in and out.

    e. **Knee** – rounds out the curve of the compressor – as you widen the knee by turning the knob to the right, it makes the compressor kick in more smoothly.

H. Add Reverb (if necessary)

1. Create a stereo aux input track
2. Set that track's input to a pair of available busses (not used for any other purpose). Busses 1 & 2 are used for this example.
3. Place a stereo reverb plug-in on an insert of that aux input track.
2. Create a stereo send on any tracks that need reverb.
4. The send should be assigned to the same busses as the aux input track is set to receive.
5. Set the Reverb plug-in mix parameter to 100%
6. Raise the level on the sends as desired.
7. Use the auxiliary track fader to raise or lower the overall reverb level.
8. Tweak (compare to other recordings)
   http://erikhawkins.berkleemusicblogs.com/2008/04/15/copycat-cool/

Example: *Reverb Setup*

Reverb plug-in on aux track insert

Reverb plug-in

Mix level

Send

Track
Input

Pan Sliders Panned Hard Left and Right

Send controls

I. Bounce to Disk

1. First, create a master fader track. The master fader has many benefits but, is primarily used to adjust the overall level of the session. Track levels default to unity gain and can be lowered if any clipping is heard or if levels show red on the master fader channel's meter.
2. Note: if you are converting files from one bit depth (e.g., 24-bit) to another (e.g., 16-bit for CDs), you will need to add a Dithering plug-in on the master fader. Adding dither reduces noise that is a byproduct of the digital audio conversion process.
3. Remember, the bounce process in Pro Tools happens in real time and takes into account current track solo and mute settings. In addition, if a selection is made in the session timeline, Pro Tools will only bounce the selection. So, before continuing to the bounce command, solo and mute buttons should be disabled and dither a selection of the desired length should be made or any selection should be cleared.

Example: *Master Fader Track with Dither Plug-in*

Master Fader Insert   Dither Plug-in
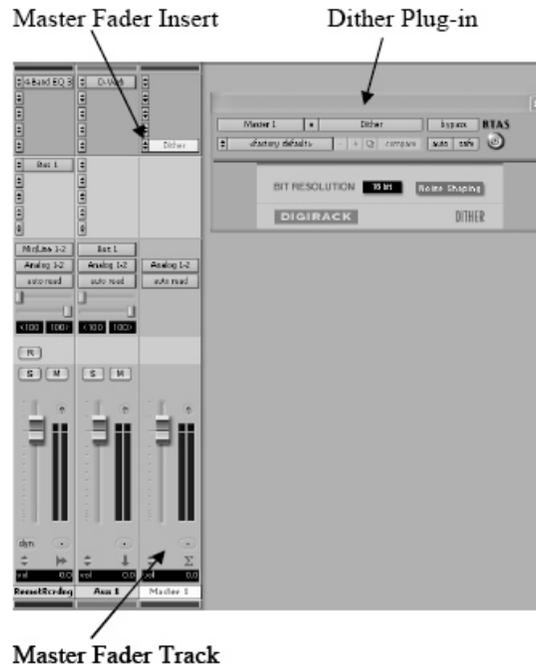
Master Fader Track

4. Make any slight adjustments to the Master track to avoid any clipping (distortion that might occur). You might also consider placing a compressor – set with a relatively high threshold and low ratio (1.5:1 or lower) on your master fader to help protect against clipping.

> **TIP #7:** See Erik Hawkins post: The Master Fader is not for Monitor Control.
> http://erikhawkins.berkleemusicblogs.com/2008/02/03/the-master-fader-is-not-for-monitor-control/

5. Choose File > Bounce To > Disk
6. Make the settings for a standard CD (there are other options)
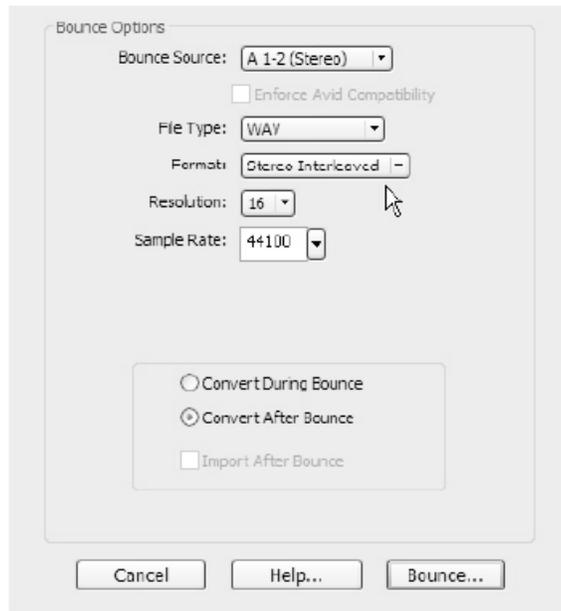
J. Creating the Master CD (burning)
1. Basic:
   a. iTunes (Mac/Win) or Windows Media Player (Win)
2. Advanced:
   a. Mac: Roxio Toast 9 Titanium
      http://www.sweetwater.com/store/detail/Toast9
   b. Windows: Sony CD Architect
      http://www.sweetwater.com/store/detail/CDArchitect/
3. Listen on many different speaker systems – computer, home stereo, and car stereo.
4. Compare it to another recording that has been professionally recorded.
5. If necessary, repeat the mastering process

K. Reference
1. Book: *Recording in the Digital World* by Rudolph and Leonard.
2. Take a Berklee online courses on Desktop Music Production,
   Pro Tools, and many more:
   http://www.berkleemusic.com/school/courses/music_production
3. Take a TI:ME course on Digital Audio http://www.ti-me.org/sites.html
4. Read and Subscribe to Erik Hawkin's blog:
   http://erikhawkins.berkleemusicblogs.com/
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