HOW TO MAKE YOUR HOME RECORDINGS PROFESSIONAL

by

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Introduction:

One of the big differences between home recording and studio recording is the number of tracks that are used. In home recording, you are often limited to 4 or 8 tracks where professional recording uses 24 to 32 tracks.

The lower number of tracks means that you will often have to pre-mix instruments into a final mix before all of the tracks are recorded. In the studio, we can spread the instruments over more tracks and save all of the final mixing until all of the instruments are recorded. We will shortly find out the reasons that this fact gives professional recording a big advantage in obtaining a professional sound, it all has to do with hearing.

Two Hearing/Mixing Limitations

There are two hearing limitations that interfere with mixing. By *hearing limitation* we mean that the ears don't accurately hear the sound that is there.

Fletcher Munson Effect

The first hearing limitation interferes with all types of mixing. It equally interferes in the professional studio and the home studio. This limitation is called the Fletcher Munson Effect. The Fletcher Munson Effect is simply stated a follows:

Humans do not hear the low frequencies (bass) and the extreme high frequencies (treble) as well at low volumes.

Humans can generally hear sounds that have a frequency between 20 Hz and 20 kHz (20,000 hertz). The lower-frequency sounds (250 Hz and below) are the Bass Frequencies. Instruments like the bass guitar and lower drums (foot and toms) put out the majority of their energy in this range. The higher-frequency sounds (6 kHz and above) are Treble Frequencies.

Instruments such as cymbals put out a majority of their energy in this range. A lot of instruments such as vocals have some energy in this range. The Treble Frequencies, for instance, contain the breath sounds of the voice. The middle-frequency sounds (250 Hz to 6 kHz) are called the Midrange. Instruments such as vocals and guitars have a majority of their energy in this range although all instruments have some energy in this range.

In comparing the difference in hearing between conversation levels and loud music playback levels, human hearing finds it 64 times as hard to hear the bass frequencies at low levels. It is about 16 times as hard to hear the extreme highs. These are compared to the midrange.

Because of this, the level at which you listen to the mix makes a huge difference in how the mix sounds. It becomes very difficult to judge, for instance, how much bass energy is the correct amount of energy for the mix. The end listeners will listen to the final product at different volumes depending on where they are, what they are doing and how they feel.

The most effective way to judge any mix is to listen to it at different volumes. You should endeavor to obtain a mix that sounds the best loud, soft and in-between. Leaving the volume at one setting while working is a guaranteed way to mess up a mix and make something that sounds good one day and sounds bad the next.

You can experience the Fletcher Munson Effect by listening to any recording loud for a minute or so and then real softly. When the mix is played at low volumes, it will be very difficult to pick out the bass line.

Masking

The second hearing limitation affects everyone but effects the home recordist, with a limited number of tracks, much more than the studio engineer with 24 or more tracks. This hearing limitation is called masking. Simply stated, masking is:

When two sounds are at similar frequencies, the one that is slightly louder will make the softer sound unable to be heard.

Because of masking, every instrument in a mix sounds quite different when it soloed (listened to by itself) compared to how it sounds in the mix.

When instruments put out sounds, they put out the tuned frequency and they put out energy at multiples of the tuned frequency. Going to a piano and playing the A above middle-C will cause a sound of the tuned frequency at 440 Hz. But the piano will also put out energy at multiples of 880 Hz, 1320 Hz, 1760 Hz, 2200 Hz, 2640 Hz and so forth. The "multiples" are called harmonics. The energy level of the different harmonics determines the "tone" of the instrument and is the leading factor as to why a piano and a instrument playing the same note sound different.

When an instrument is played with other instruments, some of the harmonics are masked, making the instrument sound different "in the mix" than "by itself."

The studio engineer has a great advantage over a home recordist because he/she can hear all of the instruments when doing the mix. The instrument's tone can be adjusted so that it sounds

the best, when playing with the other instruments. The home recordist has to commit to a mix before all of the instruments are recorded. Getting a mix that sounds good now may not sound as good when the other instruments are added. This is especially true for rock bands where more guitars are added after the original tracks are recorded. The mid-range instrument of the guitar can cause the first guitar recorded to sound dull or even unable to be heard. The new guitars can interfere with the bass line, vocals, synthesizers and almost all instruments that have been originally recorded. Since these original instruments have already been mixed together, adjusting them now is rather difficult if not impossible.

Equalization To The Rescue

An equalizer is a device that will increase, or decrease, the level of signals at a certain range of frequencies. The simplest equalizer has the treble and bass controls often found on stereos. The bass control will increase (or decrease) the energy of any signal present below 250 Hz. The treble control affects the energy above 6 kHz.

When you "adjust the tone" with the treble and bass knobs on your stereo, you are increasing the harmonics of certain instruments and perhaps the tuned frequencies of other instruments.

Equalizing the instrument's sound while mixing is one effective way to overcome the two hearing limitations, especially masking.

Professional and "Home" Equalizers

Professional boards in studios have a lot of different equalization settings. There are often 4 bands, meaning that 4 frequencies can be adjusted at the same time. Since the mid range is the most important range of frequencies, the professional board will often have two different bands to cover these frequencies and also a treble and bass band.

The least-expensive boards and board/recorder units only have a treble and bass control to adjust tone on the individual instruments. This type of unit does not really have enough features to obtain a professional sound at home.

There are many boards and board/recorders that are only slightly more expensive than the cheapest units and have a "sweepable" midrange equalization control on every channel. This control is getting very close to the professional controls found on professional boards. The sweepable midrange frequency control allows you to adjust the center frequency of the frequency range that will be boosted or cut with the other midrange knob. Now you have a control that can assist you obtain a professional-sounding result.

The Home Equalizer Controls

Midrange equalizer controls on professional consoles and better home-recording equipment have at least two knobs.

The first knob is the frequency knob. The frequency knob sets the frequency that will receive the maximum boost (or reduction) of energy and is technically referred to as the "center frequency." The typical home-recording equipment will vary the center frequency between 250 Hz and 5 kHz. The control often appears as seen in figure 1a.

Professional console frequency knobs are well labeled, allowing the studio engineer to exactly set the frequency of the equalization. Home recording equipment usually has little labeling, just showing what the maximum, minimum and middle settings that the knob will yield. Figure 1b shows what the knob would look like if 11 frequencies were labeled.

The second control is the "amount" knob. On professional equalizers the amount of equalization is marked with "dB" settings. One dB represents approximately the smallest change that can be heard and +6 dB represents the signal strength getting twice as high. A 12 dB increase would represent the signal strength at the center frequency getting 4 times as strong.

Home recording equipment usually does not label the amount knobs except with lines that allow the user to get the amount back to a setting used before, as shown in figure 1a. If the amount knob was labeled with "dB" markings, it would look like the control in figure 1b.

The "HF" control (High Frequency Control) on the equalizer allows the energy from 10 kHz and above to be boosted or reduced. The only knob available is the amount knob. The "LF" control (Low Frequency Control) allows the energy from 100 Hz and below to be boosted or reduced. Again the only knob available sets the amount of equalization.

The Home Recordist's Challenge

Because one instrument's sound will mask another instrument's sound, equalization is best applied when you can hear all instruments. Somehow the home recordist has to mix without hearing all of the instruments.

The home recordist needs to develop an "ear" for how instruments need to sound before they are combined with other instruments. You can't just adjust instruments to sound good by themselves and then combine them. Masking will give the mix a mushy, indistinct sound. Often you need to make instruments sound less-natural so that they will distinctly "cut-though" the other instruments.

This is especially true for the bass and for the vocals. Typically the bass guitar has to have accented midrange attack and string sounds to sound good in a mix. The tendency is to boost the fullness of the bass when you listen to it by itself. This will cause the bass to get "lost" in mix of instruments 90% of the time. The vocal usually has to have over-accented presence and be slightly "thin" sounding to sound good with other instruments playing.

When equalizing guitars, the 2.5 kHz range of frequencies are often boosted to give an increased "attack" to the guitar. Often, to sound good in a mix of instruments, the guitar has to have an unnaturally loud attack. If, however, there are several guitars, you should not boost all of them at the same attack frequency. If you boosted 3 guitars at 2.5 kHz, you will insure that one guitar will cover up the sound of another. The correct procedure in this case is to use slightly different frequencies on the different guitars, like 2.5 kHz, 4 kHz and 5 kHz.

Recommended Equalization Settings

Years of trial and error experience will allow the home recordist to know how to use the equalizer to get a clear sound. Most people don't want to wait that long to start getting

professional sounding product.

In order to help, we have compiled the most-often used equalization settings used for different instruments in mixing. We when one step further by converting them to the settings that you would use with home recording gear. These settings appear in figure 2.

Using The Recommended EQ

The equalization settings are based on micing close with good-quality microphones. The equalization for bass was with the instrument recorded directly into the console and with the tone and volume controls on the bass in the fully-up position. The vocal equalization is for a male vocalist about 8 inches away from the microphone.

You can't just take these recommendations as a "bible" and always use the same settings. This is because different instruments and different microphones will sound different. You will find the most variance with guitars; this is because you have tone and volume controls on the guitars and on the amplifier. In addition, different guitars and guitar amplifiers sound quite different. The equalization for the bass will be the most consistent. In any case these settings give you a good "starting point" for using your equalizer.

Demonstration Tape

To further assist you we have made a demonstration tape available. On the demonstration tape you will hear instrument sounds without equalization and with equalization. You can compare the equalized instrument sounds with the sound you are obtaining in the session as a guide for setting your equalizer.

The demonstration tape takes the tune "All Behind" by the group "Traitor Gate" to give the equalization examples. The band is a rock band with 2 rhythm guitars and a lead guitar (as well as drums, bass, vocals and background vocals).

The demonstration tape, *Professional Equalization Demonstration,* is available from the Recording Institute of Detroit, 14611 9 Mile Road, Eastpointe, MI 48021, (810) 779-1388. The cost of the tape is $12 plus $3 shipping/handling.

Settings:

Drums:

+9 dB LF

-12 dB MF at 400

+6 dB HF

Rhythm Guitar 1 (Cleanest)

+3 dB LF

+6 dB MF at 2.5 kHz

Rhythm Guitar 2

+1.5 dB LF

+6 dB MF at 4.0 kHz

+1.5 dB HF

Lead Guitar

+6 dB MF at 5 kHz

+3 dB HF

Lead Vocal

+3 dB MF at 3.5 kHz

+3 dB HF

Background Vocals

+1.5 dB LF

-6 dB MF at 3 kHz

+3 dB HF

Bass Guitar

+2 dB LF

+4 dB MF at 400 Hz

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