Have you ever been frustrated trying to get the desired sound for your station? Have you ever said: "I'll know it's right when I hear it" but were at a loss to achieve that sound?

Sometimes it's difficult to get the on-air sound you want. This article hopes to provide a general guideline to managing the sound of your station to get the results you want. This guideline won't focus on any specific model of audio processor considering the variety of processing in use, both old and new. Neither will this article tell you how your station should sound. Instead, this proposes a systematic approach that you can use for getting the desired results.

Tuning a station's audio processing requires a demanding combination of artistic judgment and technical experience. The basic approach is finding your preferred sound incrementally, usually by adjusting past the optimum tuning point, and then retreating, or "backing it off". In other words, the idea is that you won't know that you've arrived until you went too far. Chances are unlikely that the first pass of adjustments will meet your objective. So, employ a progressive approach to the task. Take small steps toward the goal, rather than attempting one huge leap since the latter is too complex to manage and almost certain to fail.

1. Subjectivity:

1.1. If the General Manager, Program Director and Engineer have divergent preferences, define who will be the ultimate judge. This is an opportunity for positive interdepartmental teamwork. Unfortunately, it's also an opportunity for sharp division. Secure the best outcome by uniting all players toward a common objective. Encourage use of audience research, if your station or group has the resources to do it. Research is much more reliable than depending on the preferences of one (or a few) individuals.

2. Define the desired result to the extent possible, considering:

2.1. There is one "right" answer—the processing that maximizes your target audience. However, in practice it's almost never possible to define precisely what that processing is, even with audience research. Almost all processing is therefore adjusted partly by gut feel, relying on the preferences and experience of those responsible for the station's sound, and, preferably, by adding research to the variables used to make the decision. At one end of the scale is minimal processing for an on-air sound that is most faithful to the original recording. On the other end of the scale is aggressive processing that may sound quite different from the original source. Is your target audience 40-54 listening on a home audiophile system, or 20-something and listening in the car, or perhaps women in their 30's listening in the office? Each of these cases has appropriate types of audio processing. Moreover, the most appropriate processing for your audience may change for different day parts.

2.2. Good judgment must be the rule. By comparison, it's much easier to tune the RF section of a transmitter since there's an objective meter indication when tuning is ideal. There is no meter indication of when processing is "in tune"; you must rely on your artistic judgment. Deciding on- and defining the ideal point on the scale is perhaps the most difficult task in meeting your objective.

2.3. Legal limitations restrict peak modulation. Peak modulation and perceived loudness are not alike! A minimally processed Classical format can have similar modulation peaks as an aggressively processed Hot Urban format though the latter will sound much louder on the dial. Increasing loudness by simply cranking the modulation invites legal penalties; more effective (and less costly) alternatives exist.

2.4. Align your processing objectives to complement the overall audience, format and business plan. If increased Time Spent Listening is a priority for your station's ratings, aggressive processing for dial dominance is not appropriate. But CHR and Urban formats can often benefit from a highly processed sound that increases the energy level of the presentation. Compression and equalization can do this; there's no reason to make the sound overtly distorted and grungy by excessive clipping.

3. System considerations.

3.1. Source equipment audio quality (e.g., noisy analog tape, data-reduced audio sources, etc.). No audio processor can repair source audio that is noisy, distorted, excessively bit-rate reduced, or suffers other maladies. In fact, aggressive audio processing greatly exaggerates any defects in the source material seen by the processor. If the unprocessed audio is faulty so follows your on-air product.

3.2. More audio processing components installed in your system does not guarantee better-sounding audio. It does however; guarantee greater difficulty in managing the audio processing to achieve the desired result. Adding components increases risk of failure and often, degrades the audio. Changes made to the first component cause downstream components to react in sometimes-unpredictable ways. In general, it's wise to minimize components in the audio chain.

3.3. Peak overshoot is the enemy of perceived loudness. Every percent of overshoot broadcast is about 0.1dB of loudness sacrificed. Therefore, every component in the system following and including the broadcast audio processor must have the lowest possible overshoot!

3.4. Not all audio processors are created equal. Probably the best measure of an audio processor's performance is how effectively it can reduce the peak-to-average ratio without introducing unpleasant artifacts. In other words, how well it can increase perceived loudness without pumping the audio, sucking up noise, creating weird frequency balances, or adding objectionable graininess or intermodulation distortion due to excessive clipping.

3.5. Configuration, or order of the components in the system. Components in the system must be arranged to deliver the best peak control possible (i.e., minimum overshoot) to the transmitter. A common problem is locating the main audio processor prior to an overshooting Studio to Transmitter Link; if the audio with overshoot is applied directly to the transmitter, you must reduce modulation (and loudness) to remain legal. Two common solutions are to relocate the main audio processor after the STL, or to fix the overshoot problem in the STL itself. While some newer exciters have built-in overshoot limiters, use these only as a last resort if you can't eliminate overshoot by other means. Moreover, composite clipping is not appropriate as a cure for overshooting STLs because it adds audible non-linear distortion and can interfere with SCAs and the stereo pilot tone.

3.6. Receivers differ. What sounds great on a $3000 receiver will not sound the same on a $100 boom box. Act upon the broadcasting system as a whole: from the studios to the audience, through the lens of the processing components-STL-transmitter-receiver.

3.7. Listen in varied environments: in your car (or pickup truck!), in the office on table radios, with personal "Walkman" style radios… whatever is typical to your audience. In addition, if your target audience typically listens at low volume, it's wise to do the same. It is irrelevant to evaluate audio processing with a pair of $2000 loudspeakers if your target demographic is 12- 18 year-olds! It's prudent to have a high-quality monitoring system as a reference, however keep things in context of the target audience.

4. Where and when to start tweaking, and what to tweak.

4.1. Where to start? It doesn't matter whether you're walking in "cold" or correcting an ongoing problem. If you have an analog processor, start with one of the suggested settings listed in the operating manual. If you have a digital processor, try one or more of the manufacturer's recommended presets as a starting point. Some digital processors have the added advantage of a single control that scales many parameters to your preference, making the task of adjustment much easier than tweaking individual parameters, and less time-consuming.

4.2. What to tweak. Make an effort to understand the operation of your audio processor(s). Study the operating manual(s). Understand the effect of each adjustment; what it will do and won't do for your sound. Adjusting the Automatic Gain Controls probably shouldn't be your first choice to correct a clipping or distortion problem. Furthermore, manufacturers implement traditional controls in different ways: AGC drive may not perform the same on different products. If you are uncertain about the description of the *Throbulator* control, you may wish to carefully sweep that control through its range while monitoring its effect. Be careful if you do so, as some controls can yield significant changes, and make sure to return it to its original position! If you're still uncertain, call the manufacturer's technical support.

4.3. Document everything before you change anything, and *document each change along the way*. At some point, you'll need to back up to a previous setting. "I like the way it sounded last Thursday." For analog processors, create a chart tabulating the control parameters, and the date of each change. If you have a digital audio processor, save each change to a preset. That way you can revert to precisely the way it sounded last Thursday.

4.4. Use an incremental approach to adjusting the audio processing. Taking a single huge leap is seldom (if ever) effective. Make small changes to perhaps only one or two parameters per adjustment session, followed by listening. Making large changes to many parameters in one session is difficult to manage: if the results aren't satisfactory, which parameter should be modified? What went wrong? The downside to making small adjustments is that differences can be too subtle to notice. Considering your on-air presentation, this approach is less precarious.

4.5. Listen. Allow plenty of time to judge the effects of your changes. Sometimes the consequences will not be immediately evident. What sounds fine on a few songs may sound wretched on another. What sounds great on your $10,000 monitoring system may sound wimpy on a car radio. So, listen to many selections, from many sources and program types. Listening over time will also give your ears an opportunity to rest, and time for you to formulate an opinion.

4.6. Where and when to stop. Ask yourself "how will I know when I'm done?" If the present on-air sound is far from your goal, it's relatively easy to judge changes to the audio processing. However, as the processed sound approaches the goal, subjective differences from the ideal become smaller, and increasingly subtle.

5. Troubleshooting: what to do if your station's sound is unsatisfactory

5.1. First, determine where the problem *begins*. If the program output of the audio console sounds fine, does it sound okay at the output of the processor? At the output of the STL? If the audio sounds bad at the STL output feeding your final audio processor, it's unlikely that any amount of knob twisting of the latter will compensate for the former.

5.2. Next, determine if the problem is due to a component failure, or due to misadjustment. That same STL problem may be the result of simply being overdriven. If the problem seems to originate from the processor, the best way to determine if it's functioning properly is to restore all settings to the manufacturer's recommended positions (or recall a factory preset). You'll have a good idea of the nature of the problem at this point.

5.3. If the on-air sound is unsatisfactory, but it doesn't sound broken, what then? It will depend upon your specific system. If the system has numerous processors, bypass them one by one and compare the overall sound both ways.

Define your on-air audio goal as much as possible. Break the adjustment process down to manageable steps, both in the number of system components, and in the parameters changed in an adjustment session. Expect to over-adjust and be prepared to revert to some previously documented setting.

Finally, don't get caught in a processing war that turns into an ego war between two engineers or programmers. The worst thing you can do is to forget the interests of your audience in the heat of the battle. Processing wars can be fun for aggressive personalities, but the audience is the loser. Never forget that they have other entertainment options including CDs, and if you deliver obviously distorted, squashed, and pumped audio, they may respond by tuning out.