

Feedback: Fact and Fiction

One of the most commonly asked questions in professional audio is:
"What microphone can I use that doesn't cause feedback?"
The simple answer to this question is that no such microphone exists.

Feedback results from a combination of many factors, including loudspeaker placement, microphone placement, the frequency response of both devices, and room acoustics.

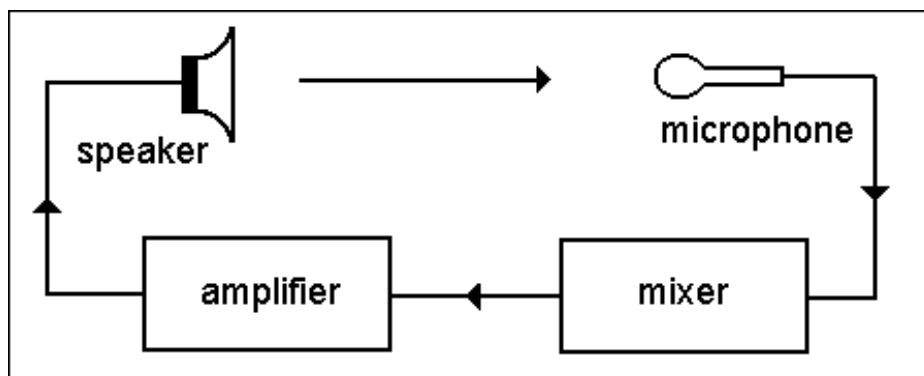
What is feedback?

Feedback is characterised by a sustained, ringing tone, which can vary from a low rumble to a piercing screech. Echoes and reverberation caused by room acoustics, as well as ground buzz and other extraneous noises are not the same thing as feedback, and cannot be cured in the same manner.

What causes feedback?

Feedback occurs whenever the sound entering a microphone is reproduced by a loudspeaker, picked up by the microphone, and re-amplified again and again. The familiar howl of feedback is an oscillation that is triggered by sound entering the microphone.

The easiest way to create feedback is to point a microphone directly into a loudspeaker. (We don't recommend you try this!). Placing the microphone too close to the loudspeaker, too far from the sound source, or simply turning the microphone up too loud exacerbates feedback problems. Other contributing factors are too many open microphones, poor room acoustics, and uneven frequency response in either the microphones or loudspeakers.



What can I do about feedback?

1. The single easiest way to reduce feedback is to move the microphone closer to the desired sound source.
2. Additionally, using a directional microphone (cardioid, supercardioid, etc.) will typically increase the amount of gain before feedback.
3. Reducing the number of open microphones active on a console or with an automatic mixer will also improve the situation.
4. Try to keep microphones and loudspeakers as far away from each other as possible.
5. Lastly, and usually the rarest solution addressed, is to acoustically treat the room. That is, trying to eliminate hard, reflective surfaces such as glass, marble, and wood.

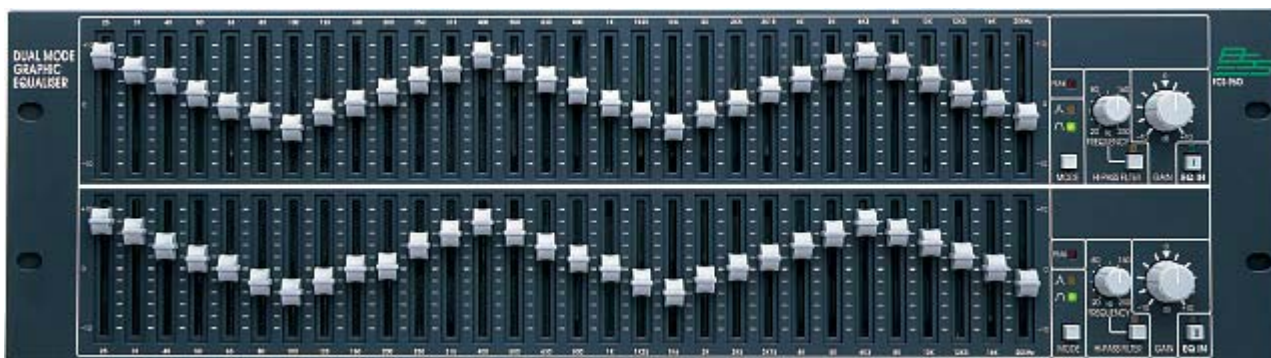
When all of the above solutions have been exhausted, the next step is to look towards equalisers and automatic feedback reducers.

Equalisers

A common technique used by sound engineers is "ringing out" a sound system by using a graphic equaliser to reduce the level of the frequencies that feedback first.

1. After the techniques described in the above section have been applied, slowly bring up the system level until you begin to hear feedback. Now go to the equaliser and pull down the offending frequency roughly 3dB.
2. If the feedback is a "hoot" or "howl" try cutting in the 250 to 500 Hz range. A "singing" tone may be around 1 kHz. "Whistles" and "screeches" tend to be above 2 kHz. Very rarely does feedback occur below 80 Hz or above 8 kHz. It takes practice to develop an ear for equalising a sound system, so be patient.
3. After locating the first feedback frequency, begin turning up the system again until the next frequency begins ringing.
4. Repeat the above steps until the desired level is reached, but do not over equalise. Keep in mind the equalisers can only provide a maximum level increase of 3 to 9 dB.

Parametric equalisers, though more confusing to the novice user, allow for more precise control of feedback frequencies. A graphic EQ allows the user to cut fixed frequencies with a fixed filter width. A parametric EQ allows the user to isolate specific frequencies and adjust the width and depth of the filter.



Automatic Feedback Reducers

Automatic feedback reducers will accomplish the same results as above. They find and cut the frequencies that are feeding back automatically. The same precautions listed above apply to feedback reducers as well as equalisers.

Automatic feedback reducers are very helpful in wireless microphone applications. Remember that microphone placement is crucial to eliminating feedback, and the temptation to wander away from the ideal microphone position when using a wireless is great. If the performer gets too close to a loudspeaker, feedback will result. A good feedback reducer will be able to catch and eliminate the feedback faster than a human operator.



Proper implementation of the above techniques will go a long way towards eliminating feedback in your sound system. Do not rely solely on equalisers or feedback reducers, and remember that feedback results from more than just the microphone!