

# Feedback

## What is it ? What causes it ? How to Avoid It !

### What is it ?

Feedback is the technical term used that describes the squeal or howl that can occur in a sound system.

### What causes it ?

When the sound originating from a speaker gets back (feedback) into the microphone, a closed loop through space occurs. When the energy level (volume) leaving the speakers reaches the location of the microphone and is at the same energy level of the signal (voice) into the microphone, a 1:1 ratio occurs. At this point the squeal or howl will begin and can continue to build up to a very loud high pitched aggravating sound.

This feedback loop (mic to speaker and back to the mic etc.) can go around as fast as 1000 cycles per second (1kHz). This frequency is within the most sensitive range of the human ear.

### How to avoid it !

The level of sound getting back into the microphone must be stopped or reduced. The best way to do this is to build a booth around the location of the microphone. This will isolate the microphone from the speakers. Any sound proofing in the booth will further decrease the possibility of feed back. This is the best possible solution, however it is not practical for most PA systems where the announcer and speaker must be in the same room.

The other solution is to move the microphone and speaker further apart. This will reduce the sound level from the speakers into the microphone (the 1:1 ratio will be reduced). Always try and place the speakers ahead of the microphone, so that the sound is going away from the microphone. If this cannot be done then there is no other simple solution except to reduce the sound level (volume) from the speakers to a safe level. This level will now become the maximum setting of the volume control before feedback occurs.

The volume before feedback can be so low that the audience will not be able to hear properly. If this is the case, you have no other choice but to request that the announcer operate closer into the microphone (2 to 4" is ideal).

Unidirectional (Cardioid) Microphones have been developed to assist in reducing feedback problems. These microphones are designed to reduce the sensitivity on the sides and rear of the microphone cartridge. This will permit a greater volume level before feedback, however a practical limit will still have to be established. Since this type of microphone is only sensitive directly into the head, it is imperative to stress to the user that he or she must speak directly into the microphone at a distance of 2 to 4". This type of microphone works best if it's back is pointing towards the speaker, and should always be used if the speaker and microphone are in the same room.

### How to determine if a microphone is Unidirectional (Cardioid) or Omnidirectional.

These microphones always have different physical characteristic. If the mesh covering the cartridge is along the top and sides (Figure 1A), the microphone is Unidirectional (Cardioid) and less prone to feed back. If the mesh covers the top portion only (Figure 1B), the microphone is Omnidirectional and more acceptable to feedback (Figure 1B). The technical reasons for these physical differences are very complicated, and are beyond the scope of this note.

When feedback occurs the first human response is to put your hands over the microphone to stop the howl. Do not do this! This response will promote more feedback by temporarily making the Unidirectional (Cardioid) microphone Omnidirectional. The only solution is to turn the volume down to the maximum safe level.



**FIGURE 1A**

(Typical Unidirectional Microphones)



**FIGURE 1B**

(Typical Omnidirectional Microphones)



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