

Sound in surveillance

Adding audio to your IP video solution

Table of contents

| | |
|-----------------------|---|
| 1. First things first | 4 |
| 2. Sound advice | 4 |
| 3. Get closer | 5 |
| 4. Back and forth | 6 |
| 5. Get to it | 7 |

Introduction

Using audio can extend your video surveillance system's capabilities and provide considerable operational benefits.

Adding sound could mean increased possibilities for improving detection, creating better situational awareness and obtaining valuable forensics information.

1. First things first

Many Axis cameras have built-in microphones, so getting started with audio is just a matter of enabling sound recording in the cameras or in your video management software.

It is important to know that recording sound in public areas is often more regulated than video surveillance. Laws differ regionally and between countries. Make sure you know what you are allowed to record before you plan to add sound to your surveillance system.

If your environment strictly prohibits audio recording, the built-in microphone in some Axis cameras can be disabled in hardware by plugging an unconnected plug into the auxiliary microphone jack.

2. Sound advice

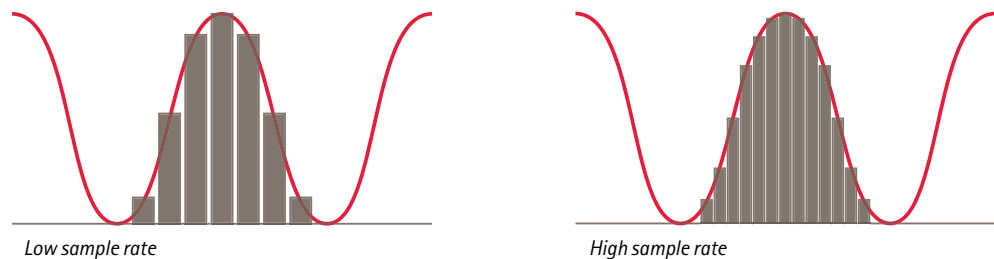
Let's look at some basic facts about the nature of sound!

Sound is compression waves in the air caused by mechanical vibrations, for example, in a loudspeaker or a human's vocal chords. The compression waves spread through the air in a manner similar to rings on water. The human ear picks up these vibrations and interprets them as sound.

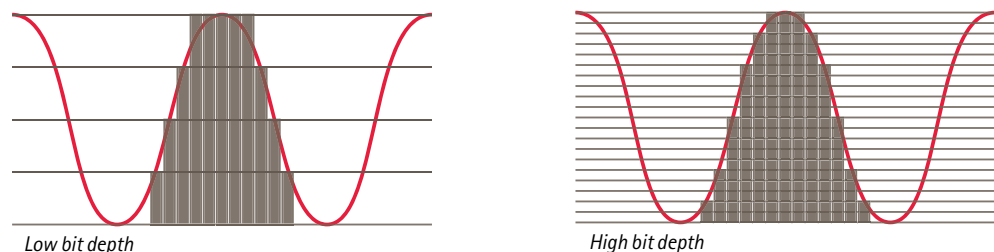
The frequency of the vibrations will determine the perceived pitch of the sound. Low frequencies come across as bass tones, and higher frequencies as treble, or high tones. The human ear can hear any frequency between 20 hertz, or vibrations per second, and 20 kilohertz. As a human grows older, the upper limit drops slightly. The human voice normally ranges from 150 hertz to 5 kilohertz.

Recording sound starts with a microphone. A thin membrane in the microphone reacts to the incoming pressure variations and starts to vibrate at the same frequencies. This vibration produces a varying electric voltage that can be amplified and transferred by wire. If this voltage variation is fed to a loudspeaker, the vibrations will be retransferred to the air, causing the sound to be reproduced.

When recorded, the electric signal is sampled several thousand times per second. You need at least double the sample rate compared to the frequency you want to record, so for any sound up to 11 kilohertz you will need to sample at least 22,000 times per second.



The bit depth controls the resolution of each sample. With a higher bit depth, the signal level in each sample can be stored with greater precision.

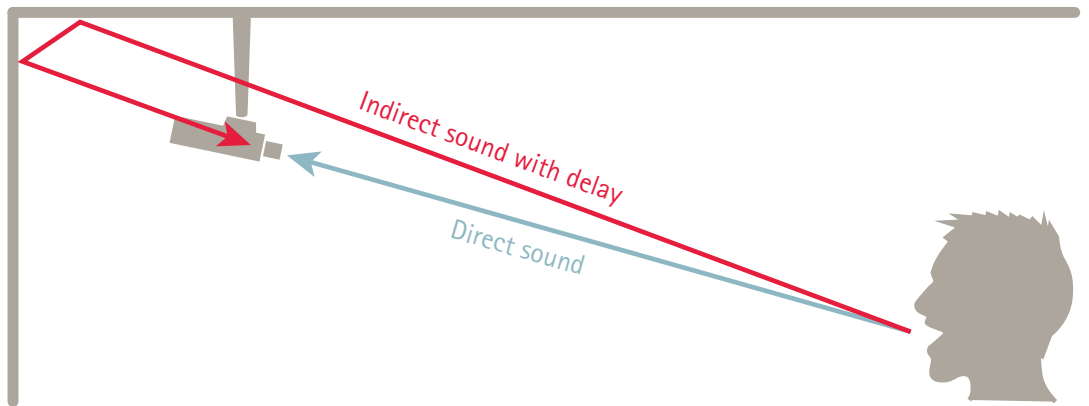


If you multiply the sample rate with the bit depth you get the bit rate – the actual data bandwidth required to convey or store the sound digitally. Encoding the digital data will compress it, thereby decreasing the bit rate. Several encoders are available for this purpose, such as G.711 or the Advanced Audio Codec.

3. Get closer

On several Axis camera models, you can connect an external microphone for even higher-quality recording, or to achieve optimal microphone placement.

A camera is often mounted in the corner of the room near the ceiling. This placement is not very ideal for a microphone, since the hard surfaces of the ceiling and walls will create reverberations and distortion in the sound being recorded. If possible, place the microphone away from large, flat surfaces like walls.



Sound propagating through the air will attenuate. This means that as distance increases, the intensity of the sound will gradually diminish. Doubling the distance will lead to a fourfold decrease in sound intensity.

Moving the microphone away from noise sources in your scene – that is, closer to what you really want to record – will have a big impact on the quality of your recorded sound.



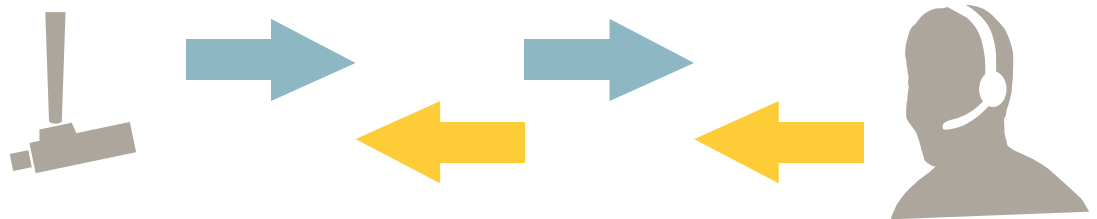
4. Back and forth

Sound transmission capabilities are often expressed in terms of simplex, half-duplex and full-duplex transmission.

Simplex means sound can be transmitted only one-way, usually from the camera to the operator. Common scenarios include an operator listening in on a scene, or recording of interrogation or courtroom sessions.



Half duplex means sound can flow in both directions, though only one stream of sound can be active at a time. Think of a walkie-talkie-style communications radio; you either transmit or listen, but you can't do both at once. This setup could be useful when an operator needs to communicate directly with persons in the scene.



Full duplex means audio can be sent and received simultaneously, similar to a telephone conversation. This could introduce feedback problems, if the microphone and loudspeaker on either side of the link are positioned too close together.



Using a camera with built-in sound, you can easily set up gatekeeper functionality. Visitors can present themselves before the camera and state their business. Video and sound are monitored by an operator who can talk to the visitor through a loudspeaker connected to the camera. Once the visitor has been cleared for entry, the operator can open the door remotely using the camera's output port.

5. Get to it

As you can see, adding sound to your video surveillance doesn't have to be difficult at all. You may already have the capability in your cameras, and Axis has a range of accessories and solutions for optimizing audio performance.

The accessory microphones in the AXIS T83 series deliver crystal-clear audio and the freedom to get closer to your sound sources.

And even if your current camera deployment lacks sound capabilities, the AXIS P8221 Network I/O Audio Module will give you full-duplex, IP-based audio with phantom power and a built-in speaker amplifier.

About Axis Communications

As the market leader in network video, Axis is leading the way to a safer, smarter, more secure world — driving the shift from analog to digital video surveillance. Offering network video solutions for professional installations, Axis' products and solutions are based on an innovative, open technology platform.

Axis has more than 1,400 dedicated employees in 40 locations around the world and cooperates with partners covering 179 countries. Founded in 1984, Axis is a Sweden-based IT company listed on NASDAQ OMX Stockholm under the ticker AXIS. For more information about Axis, please visit our website www.axis.com.