

Chapter 6: Fundamentals of Audio

The Importance of Audio

If video is one major part of the television signal, what's another major part? Audio! Even if there is a momentary interruption in the picture, good audio will enable the viewer to follow along with most programs. (In fact, how often have you listened to the television while you were doing something else, perhaps making dinner in another room?) But the reverse is less often the case: If you can't hear the audio, it is usually much more difficult to follow the program.

The Role of Audio in Television

- **Provide precise information**
Example: Main audio sources such as microphones on talent
- **Establish a specific locale or time**
Example: Wild sound mics giving traffic noises to suggest downtown location, or songbirds suggesting early morning
- **Establish a mood or intensify the action**
Example: Recorded music passages which reinforce different video sequences like car chases or candlelight dinners, or which create suspense
- **Create program signatures**
Example: Musical jingles that are used at the beginning and end of a program to establish its identity, such as the Jeopardy theme.
- **Serve as “punctuation points” and/or to connect different parts of your program**
Example: Short bursts of music or sound effects which are used to segue (“seg-way”) between segments, or audio jump cuts that call attention to important pieces of information.

How To Insure Good Audio for Your Program

1. **Choose the right equipment, especially microphones (mics), for the job**
2. **Place the microphone in the right location, generally as close to the sound source as possible**
3. **Make sure that the talent uses the microphones correctly**
4. **Establish the right levels for the audio ahead of time, and maintain these levels throughout the program**

Choosing the Right Microphone

What are the different microphones and which one should I use?

Mic Name:	Pick-up Pattern	Construction & Power	Mounting	Impedance	Frequency Range
Lavaliere: Sony ECM-44 EV C090P	Omni-directional	Condenser battery only phantom only	Clip-on	Low 250 ohms 150 ohms	 40-14,000 Hz 40-15,000 Hz
Hand-held: EV-635A Shure SM58	Depends Omni-dir. Cardioid	Dynamic none none	Hand-held, table or floor stands	Low 150 ohms 310 ohms	 80-13,000 Hz 50-15,000 Hz
Shotgun: Sennheiser	Super-cardioid	Condenser battery/phantom	Hand-held, table or floor stands	Low 130 ohms	 50-15,000 Hz
PZM (Pressure Zone Mic): Crown 30FS	Omni-directional (hemi-spherical)	Condenser phantom only	lies on a large flat surface	Low 240 ohms	 20-15,000 Hz
Wireless: Samson SR-22	Depends on mic	Base unit requires AC power; mic cannot be phantom powered		Depends on mic	Depends on mic
Nady 151-VR	Omni-dir.	Base unit and mic each require batteries	Clip-on	Low	

Pick-Up Pattern:

Different types of microphones are designed to pick up sounds from different directions. Choose a mic that will pick up the sounds you want to hear and not pick up the sounds you don't want to hear.

Omni-Directional: Picks up sound equally well from all directions.

Handheld mic is good for collecting ambient audio, and recording music that is well amplified in a space with good acoustics when separate micing of instruments is not possible. Also used a shared interview mic in locations where the ambient audio isn't too loud.

Lavalier mic is slightly more discriminating than the handheld because of its proximity to the talent. Also less visible and hands-free.

PZM mic has a hemispherical (or half-omni) pick-up pattern, above and all around the mic which should be placed on a large flat surface from which it picks up vibrations. Used in meetings for picking up people seated around a table, and in theatres for micing areas and/or individual instruments such as pianos.

Cardioid: Has a heart-shaped pick-up pattern, which hears very well in the direction the mic is pointing, less well to the sides.

Shure SM-58 handheld mic is a cardioid fmic favored by individual talent (such as singers or field news talent. It can also be shared in an interview, as long as the talent knows how to handle it well.

Uni-Directional: Hears very well in the direction that the mic is pointing and hardly at all anywhere else.

Example: Some hand-held mics (none of ours)

Super-Cardioid or Highly Directional: A mic whose pick-up pattern looks like a cardioid pattern stretched out in one direction.

Sennheiser shotgun mics are examples of these mics, which are used when shooting in an space with a lot of unwanted ambient audio, and/or when the mic cannot be placed near the sound source.

Type of Construction:

Although CCTV has made these choices for you, it is important you to know the difference between dynamic, condenser, and wireless mics.

Dynamic: Versatile, rugged and dependable “work horse” mic that puts out a strong signal which doesn’t need amplification.

Example: Hand-held mics

Condenser: Although expensive and fragile, it is commonly used because of its capacity to respond to, or "pick up", a wide range of frequencies. However, condenser mics put out a relatively weak signal that requires amplification by an external voltage supply. Some mics have their own battery compartments; others can be **PHANTOM POWERED** by a low voltage signal generated by the audio mixer and transmitted through the XLR cable.

Examples: Lavalier and Shotgun mics

Ribbon: Large, less mobile, and extremely delicate. While the sound quality is very good, the ribbon can be destroyed by one blast of sound. They are not used much in Access settings.

Ceramic & Crystal: On the other end of the scale, these mics lack fidelity and ruggedness and fall short of even the most modest professional requirements.

Wireless: Consists of a regular mic and a minature transmitter which sends a radio frequency to a nearby receiver. Covetted for their “cordless” mobility, wireless mics can be susceptible to interference from other sources of radio waves. The range and positioning sometimes causes "dead spots" in the transmission pattern, as well. Wireless transmitters need either a battery or AC power source to operate.

Mic Mounting and Placement

Since many mics might be acoustically suitable for picking up the sound you want, microphone placement is probably the most important issue in getting the sound you want. And usually, you should try to place the mic as close as possible to the desired sound source.

That is one reason why CCTV discourages you from using the camera-mounted mics that come with the camcorders, since the sound sources these are closest to (the camcorder's zoom lens and the cameraperson) are generally not the sounds you're interested in capturing.

At the same time, some microphones require that your talent know how to use them properly. Handheld mics fall into this category. If you are not going to prepare your talent for using these microphones properly, you might be better off using a hands-free lavalier mic.

Roll-off Switches and Windscreens:

Found on most shotguns and some cardioid mics, roll-off switches are used to cut out low frequency sounds such as traffic noise, air conditioning hum, and fluorescent light buzzes. On our Sennheiser shotgun mic, position I offers the least roll-off, and position III the most. Although a roll-off switch helps cut-down on unwanted sound, it affects all sounds in that lower band, effectively reducing the mic's tonal range and causing it to sound less natural. Thus, it should be used only as needed.

Windscreens are foam caps which cover the mic elements and are used to cut down on rumbling vibrations when sound hits the mic. Outdoors, they are used to reduce wind noise; indoors, they are used to reduce "popping" consonants (p, d, b, etc.).

Mic Aesthetics

Since many different mics might do the acoustic job you want, your selection of a mic might also be driven by aesthetic considerations. For example, in a dramatic presentation where the actors are required to move freely about the set, you might decide to use a Boom, Giraffe, or Fishpole device to suspend the mics above and out of the way of the actors. CCTV has several boom poles available if you've got someone to hold and maneuver them. If mic mobility is not necessary, you could alternatively hang mics off the lighting grid.)

Impedance:

Impedance measures resistance to the signal flow, whatever that means. The important thing to understand is that all of your audio equipment must be matched in terms of low or high impedance. Impedance Matchers or Transformers can be used to change a signal from Low Impedance (Lo Z) to High Impedance (Hi Z), or vice-versa.

Low Impedance: Equipment rated below 600 Ohms. Low Impedance gear is required for television use, because it permits the use of cable runs exceeding 20 feet.

High Impedance: Equipment rated above 1000 Ohms, often over 10,000 Ohms. High Impedance gear is acceptable for non-professional audio recording, but it will not provide adequate frequency response when the signal has to travel more than 15-20 feet.

<u>Microphone</u>	<u>Pluses</u>	<u>Minuses</u>
Lavaliere	<ul style="list-style-type: none">• Very wide frequency range, means excellent acoustical fidelity for wide range of audio sources• Hands-free operation• Aesthetically unobtrusive	<ul style="list-style-type: none">• Very fragile cord requires delicate handling• Omni-directional pattern may pick-up unwanted sounds• Condenser construction requires battery power• Talent will walk away with mic still attached if you are not careful
Handheld	<ul style="list-style-type: none">• Best microphone for music• Talent sometimes prefers holding the mic as a prop or security blanket• Can be passed between several people• Dynamic construction means no battery needed	<ul style="list-style-type: none">• Talent needs to be trained in how to handle the mic properly
Shotgun	<ul style="list-style-type: none">• Best microphone for picking up distant sounds	<ul style="list-style-type: none">• Must be held by someone else or mounted separately• Requires battery
PZM	<ul style="list-style-type: none">• Used mostly for convenience sake, to pick up many speakers with just one mic	<ul style="list-style-type: none">• Must be placed on large flat surface to work• If laid on a table, will pick up paper shuffling noise• Requires phantom power
Wireless	<ul style="list-style-type: none">• Cord-free operation gives talent maximum mobility	<ul style="list-style-type: none">• Because it sends its signals through the air, it is subject to radio interference• Also subject to "dead spots"

Tips for Using Lavalier (Lav) Mics:

1. Make sure that the batteries have good strength with the battery tester, are installed in the lav in the correct direction, and that the mic cable is connected to the sound mixer or recorder.
2. To prolong battery life, install them into the microphones right before shooting and remove them immediately after.
3. Test audio levels by talking as you will during the shoot, i.e. in sentences using your normal speaking voice. Never test the mics by tapping them or blowing into them!
4. Make sure that the talent is wearing the lav, not sitting on it (which is fairly common). The mic head should be clipped to the talent's clothing about 6" from their mouth, either in the center or to the side in the direction in which they will be speaking during much of the shoot.
5. If the talent will cooperate, the lav cable should be run up underneath their blouse or jacket, and then clipped to the outside. It should not rub against the clothing, as the mic will pick up any rubbing sounds. For a neat look, loop the mic cable through the tie clip.
6. When working outdoors, always attach a foam windscreen to the lav, to diminish the roar of the wind that the mic will pick up.
7. Make sure that the talent does not try to get up and walk away with the lav still attached.

Tips for Using Handheld Mics:

1. Test audio levels by talking as you will during the shoot, i.e. in sentences using your normal speaking voice. Never test the mics by tapping them or blowing into them!
2. When working in a quiet environment with an omni-directional mic (such as the Electro-Voice 635A), hold the mic at chest level, and speak to the camera across the top of the mic (not into it). If the background noise is loud, use a windscreen and hold the mic about six inches from your mouth; speak across the top of the mic, not into it.
3. When working with a cardioid or uni-directional mic (such as the Shure SM58), you do want to hold the mic at an angle and speak or sing directly into the top of it.
4. Hold the mic relatively still, as movement creates vibrations, which creates noise. If you are sharing a mic, move your arm from the elbow not the wrist.
5. When sharing a microphone, either hold it halfway between you two, or hold it to your mouth when speaking and to the other person's mouth when they are speaking. If interviewing someone young or shorter than yourself, bend down to their level.
6. Make sure that the talent has enough microphone cable to accommodate their movement, and that the cable is not underfoot.
7. When walking with the mic, don't pull the cable with mic. Pull the cable with your free hand while holding the mic in the other.

8. Tie a loose knot where two cables come together, so that they are much less likely to be pulled apart, and so that the pressure falls on the knot instead of at the junction where they come together.
9. Wrap audio cables around the base of the floor stand, to prevent the stand from being pulled over, to minimize the tripping hazard, and to keep the pressure away from where the mic and cable connect.

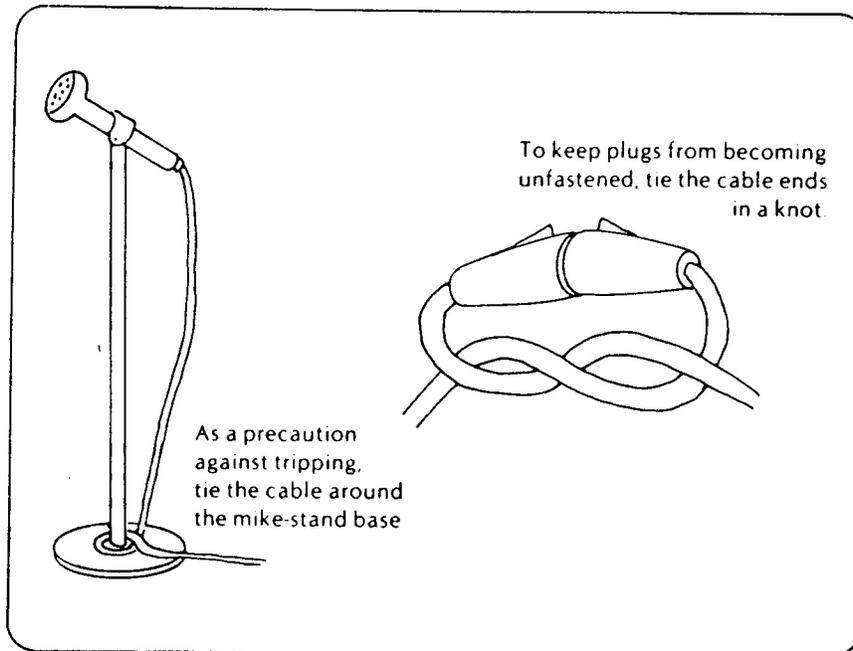


Figure 9-16
Cable handling.

Audio Cables and Connectors

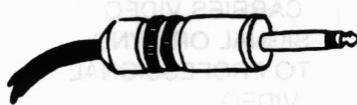
The two most important things to understand about cables and connectors are:

1. Though they may be the least expensive piece of equipment to replace, **cables and connectors are no less important than the most expensive camera or VTR. Treat them with loving care, because your program signal is only going to be as good as the cable that has to carry it.**
2. Audio equipment is not nearly as uniform as video equipment. **There are many kinds of audio jacks and plugs, and it is essential that you know what kind of jacks your equipment has, so that you bring the correct cables and adaptors to hook it all together.**

There are two types of audio cables, which roughly correspond to Impedance:

Balanced Lines: Have three conductors, consisting of two wires and a braided shield, which terminate in a 3-pin XLR plug. These cables are used with Low Impedance gear.

Unbalanced Lines: Have only two conductors, consisting of one wire and a braided shield, terminating in a 2-pin plug which could be an RCA, MINI, or 1/4". These cables are used mostly with High Impedance gear.

AUDIO PLUGS	JACKS	NAME	COMMON USAGE
		RCA OR PHONO	CARRIES AUDIO FROM VCR TO MONITOR
		MINI OR 1/8"	CARRIES AUDIO FROM VCR TO HEADPHONES AND FROM MICROPHONES TO VCR
		XLR OR CANNON	CARRIES AUDIO FROM MICROPHONE TO VCR/ CARRIES AUDIO FROM MIXER TO VCR
		1/4" PHONE	CARRIES AUDIO FROM MICROPHONE TO VCR

Note: All of these plugs and jacks are unbalanced, Hi-Z (high impedance) kinds of audio gear, except for the XLR which are balanced Low-Z.