

MICROPHONES VS. PICKUPS

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People often confuse microphones with pickups, and vice versa. We'll sort out the differences here.

Both a microphone and a pickup are *transducers*: they convert energy from one form into another. A mic converts acoustical energy (sound) into an electrical signal, while a pickup converts mechanical energy (string vibrations or body vibrations) into an electrical signal. That's where the similarities end.

Pickups don't feed back easily, but they tend to sound "electric" or "quacky". Microphones can be made to feed back, but they tend to sound "acoustic" or "natural". The best pickups provide a fairly natural sound as well.

Sonic differences

Microphones pick up sound from a broad area, especially if the mic has an omnidirectional (all-around) pickup pattern. So a mic placed close to an instrument captures the sound of the strings, body, and resonant cavity inside the instrument. That's why a mic tends to provide a natural acoustic sound.

Two types of pickup are magnetic and piezoelectric. A magnetic pickup (sound hole pickup) has several coils of wire wrapped around magnets. When a steel guitar string vibrates next to the pickup, a current is induced in the coils, making a signal. A piezoelectric pickup is basically a crystal that generates an electrical signal when it is bent by vibrations of the instrument's body.

Magnetic pickups which mount under guitar strings respond to the string vibrations in a tiny area, which is directly above where the pickup is mounted. The location of the pickup affects the balance between the strings' fundamental frequencies and harmonics, and which harmonics are emphasized.

For example, a pickup mounted near the bridge tends to sound bright because the higher harmonics in the strings occur near the bridge. The same pickup

mounted closer to the neck tends to sound warm and full because the strings' fundamentals are emphasized there.

If you use the same magnetic pickup on different models of guitars, the pickup tends to make them sound about the same. A magnetic pickup is not sensitive to the body vibrations, so it misses a lot of the character of the instruments.

A piezo pickup which mounts under the saddle of a guitar tends to provide a more natural sound than a magnetic pickup mounted under the strings. That's because the piezo pickup captures more of the body vibrations.

A few piezo pickups mount to the top of the instrument with putty. Some pickup systems have two or three piezo elements that capture vibrations from different parts of the instrument.

A number of manufacturers offer a hybrid pickup/mic system which mixes the signals of the two devices. The pickup provides volume while the mic provides some "air".

Impedance differences

Another difference between mics and pickups is their *impedance* – their resistance to alternating current. Most microphones are low-impedance, while pickups are high-impedance.

The advantage of low impedance is that it lets you run long mic cables from the stage to the mixer without picking up hum or losing high frequencies. Mic cables or guitar cords that carry high-impedance signals can pick up hum and lose high-frequency clarity if the cable is more than about 10 or 15 feet long.

That's why you need a **direct box** when you use a magnetic pickup with a sound system's mixer. The direct box converts the high-impedance signal from the pickup to a low-impedance signal, which can be sent through a long cable to a mixer without hum or high-frequency loss.

When you use a piezo pickup, you need a **preamp** to convert the pickup's extremely high impedance to low impedance. That preamp is in a separate chassis, or it is built into some guitars.

A low-impedance microphone can be plugged directly into a mic cable hundreds of feet long without hum interference or loss of clarity. Unlike a pickup, a microphone does not need to be used with a separate preamp device, because preamps are built into every mixer and instrument amp.

Feedback differences

An advantage of a pickup is that it can be turned up very loud in a P.A. system

without feedback. If the volume is high enough, though, the instrument itself picks up sound from the loudspeakers and vibrates, causing feedback. Microphones do feed back more easily than pickups because mics pick up sound from the loudspeakers as well as from the instrument.

Still, a clip-on mic can get quite loud before feedback occurs. It is mounted very close to its instrument, so it picks up a loud sound that doesn't need to be amplified much.

If you play in a loud band with drums, you may need a pickup to generate enough volume to compete with the other instruments. Otherwise, a good mic will provide a truer representation of your instrument's timbre.

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