

Not As Simple As They Look?

Identifying and solving microphone problems

by Bruce Bartlett

Besides sound quality, there really isn't much to think about when it comes to microphones, right? Well, guess again!

Like all elements of a sound system, microphones present their own unique set of special problems. Fortunately, a lot of these problems are relatively simple to solve. It's just a matter of identification and appropriate action.

For example, most mic handles include a set-screw near the connector, with many models using this screw to ground the mic handle. If the handle seems to be picking up hum when touched, check that the set-screw is fully secured (turn clockwise until tight).

Inside the XLR connector on a mic cable is a ground lug, offering the option of tying it to pin 1 or leaving it floating. If this ground lug is connected to pin 1, the connector shell is grounded. Then, if the shell touches a grounded metal surface, a ground loop can occur, causing hum. So, a better approach is to float the shell.

Lighting cables and AC power cables radiate strong hum fields, which mic cables can pick up. Keep mic cables well separated from lighting and power cables. If the cables must cross, do so at right angles to reduce the coupling between them. In addition, vertically separate the cables.

If your situation produces severe hum pickup when using dynamic mic models, try ones that include hum-bucking coils. (The Shure Beta 58 is probably the most popular example in this regard.)

Also, twisted-pair mic cable can reduce pickup of magnetically induced hum. The more shield coverage, the less pickup of electrostatically induced hum. Braided shield generally offers the best coverage; double-spiral wrapped is next best, and spiral-wrapped is worst.

And, routinely check mic cables to make sure the shielding is connected at both ends. For outdoor work, tape over cracks between connectors to keep out dust and rain.

SHOCKING BUT TRUE

At times, electric-guitar players can receive an electric shock when they



Keep a set of "tweakers" handy to tighten down that mic screw.

Audio Basics

simultaneously touch their guitar and a microphone. This is caused when the guitar amp is plugged into an electrical outlet on stage, and the mixing console (to which the mic is grounded) is plugged into a separate outlet across the room.

These two power points may be at widely different ground voltages, so a current can flow between the grounded mic housing and the grounded guitar strings. This occurrence is especially dangerous when the guitar amp and the console are on different phases of the AC mains.

It helps to power all instrument amps and audio gear from the same AC distribution outlets. That is, run a heavy extension cord from a stage outlet back to the mixing console (or vice versa). Plug all the power-cord ground pins into grounded outlets. That way, you prevent shocks and hum at the same time.

Also, put a foam windscreen on each vocal mic to insulate the guitarist from shocks. As a bonus, a foam windscreen suppresses breath pops better than a metal grille screen. If you're picking up the electric guitar direct, try a transformer-isolated direct box and set the ground-lift switch to the position with the least hum.

Using a neon tester or voltmeter, measure the voltage between the electric-guitar strings and the metal grille of the microphones. If there is a voltage, flip the polarity switch on the amp or reverse its AC plug in the outlet.

FUN WITH CLIP-ONS

Nearly all mic companies offer miniature condenser models. These tiny units can offer the sound quality of larger studio mics, but in a compact package. If they're clipped to musical instruments, stage clutter is reduced by eliminating boom stands. Plus, the performer can move more freely around the stage.

Because a miniature clip-on mic is very close to its instrument, it picks up a high sound level. So you can often use an omni mic without feedback. Omni mics generally have a wider, smoother response than their unidirectional counterparts, and pick up less mechanical vibration.

Try mini mics on a drum set as described earlier. Tape an omni mic near the bottom edge of a guitar sound hole, and roll off some bass for a natural tone quality. Tape one to a flute between the lip plate and finger holes, about 2 inches from the lip plate and 2 inches above the flute. It sounds much more natural than a pickup.

For a grand piano, tape two mini mics to the underside of the raised lid, over the bass and treble strings. If necessary, close the lid for more isolation. You can also reduce clutter when using regular-sized mics by mounting them in holders that clip to drum rims and mic stands.

SQUASH THE SQUEAL

Stage monitor speakers are the main cause of feedback, so it's not the first time you've heard this: keep monitor levels down. Loud monitors leak into vocal mics, creating feedback in addition to coloring sound. Musicians always want the monitors louder, so start with them as quiet as possible, and then when you're forced to increase levels, they probably won't be too loud.

One-third-octave (or even narrower) graphic equalizers can also be deployed to fight feedback. Connect the equalizer between the console's monitor output and the monitor power-amplifier input. With the equalizer controls centered, set up a normal



PHOTO COURTESY OF APPLIED MICROPHONE TECHNOLOGY

There are numerous clip-on options to get rid of mic stands on stage.

monitor mix. Now slowly turn up the mixer's master monitor volume control to bring up the volume in the monitor speakers. The system will start to feed back at a certain frequency.

Try to find this frequency on the equalizer by pushing down each control knob/fader in turn. The control that stops the feedback is the correct one. Lower this frequency only down to the point where the feedback stops. Then turn up the monitor volume until the system feeds back again (usually at a different frequency). Lower the control for that frequency until feedback stops. (Rinse, repeat!)

Do this procedure several times, turning up the overall volume as feedback is suppressed, so that three to five frequency ranges are cut. The monitor speakers should now be able to be played louder without feedback than before the equalization process.

There are "feedback fighters" that perform this function automatically. In each device, a microprocessor quickly senses feedback and determines its frequency, then assigns a narrow notch filter to that frequency and eliminates the feedback. Typically, several filters are assigned. (*For more about feedback elimination, see Designer Notebook, beginning on page 62 of this issue.*)

Finally, many sound people have come to love in-ear personal monitoring systems because they don't leak into stage mics. And, the resulting house sound can be louder and more natural.

WHERE'S THAT WIRE?

Wireless microphones and systems certainly present their fair share of problems. Sometimes sound drops out, or bursts of static are produced. Both usually indicate that the transmit-



PHOTO COURTESY OF PROCO

Use twisted-pair cable to reduce pickup of magnetically induced hum.



PHOTO COURTESY OF SENNHEISER

Another handy clip-on application: drums.

ter signal is weak at the receiver.

The first question: is the receiver located at the mix position? If so, it might be too far from the transmitter. Put the receiver on stage so it is fed a strong signal, and also, try to keep a line-of-sight between the transmitter and receiver. In addition, keep the receiver antenna away from metal surfaces, which can reflect radio waves back at the antenna, causing multi-path interference.

Inside most wireless transmitters is a trim pot that adjusts the mic's output level to the mic preamp in the microphone. If the pot is wide open and a singer yells into the mic, the mic capsule will overload the mic preamp and cause distortion. Or, if the pot is turned down and the singer is quiet, you'll hear noise when you bring up the mic's fader on the console.

Starting with the trim pot wide open, have someone sing into the mic as loudly as they will use it. Gradually turn down the pot until the distortion stops.

One last tip: At a Lenny Kravitz concert, the piano player (Ken Crouch) was playing an upright piano. The piano sound was excellent, and I complimented the sound engineer, Tom Edmonds, on his skill. He later told me his secret: the pianist was really playing a Korg M-1 synthesizer mounted inside the upright piano, which was a prop!

The moral of the story is that you just never know everything, and there's something new to be learned every day. Be safe out there, and have fun.

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