Technical Articles

Basics of Troubleshooting Sound Systems

by Al Keltz

Divide and Conquer

Murphy's Audio Law #10: ***"The probability of having sound system failure is inversely proportional to the amount of time remaining until the performance."***

We've all experienced it: there were problems with load in or set-up, time is short, the system is set-up with only a few minutes to spare and of course, something works improperly or not at all. Although the first instinct might be to take a "shotgun" approach and start checking plugs, connections, cables, etc. in a random fashion (i.e. "panic"), a tried-and-true troubleshooting method will almost always find the problem with less effort and in a shorter amount of time.

The most basic troubleshooting technique (after "is it plugged in?") is the "Divide and Conquer" method. This involves identifying the good parts of the system as well as figuring out which parts have failed. Not only can these working sections be eliminated as the cause of the problem, but they can also be used to test other parts of the system.

For example, a mic channel at a mixer is dead while others are operating properly. The good news here is that you can use one of the working channels to isolate the problem.

First, unplug an input connector from a working channel on the console and plug it into the dead channel. If the bad channel on the console now works, the problem must exist before the console, back toward the mic.
If it's still dead, the problem has to be after that channel's input (bad channel, dirty insert jack, wrong assignment, etc.) Either way, about half of the system is eliminated.

Let's assume the first condition above - the console is OK. The remaining part of the system can be divided in half again by doing same thing at the stage end of the snake. That is, after switching the cables back to where they were on the console, plug a cable from a known working mic into the offending channel on the stage box. If the channel stays dead, the problem has to be in the snake. But if the channel comes to life, the snake is eliminated and the problem must be between the stage box and the mic (the cable and/or the mic itself). In

this case, substituting either the mic cable or the mic will identify the problem.

The same technique can be used after the the console too.
One amp not responding? Take the input cable from another amp that is working (AND handling the same frequency range if its a bi-amp or tri-amp situation - DON'T TAKE A BASS FREQUENCY line and plug it in to the offending amp that's feeding horns). If it starts working, put things back and move back toward the console - maybe to the crossover. Try reversing the left and right signals starting at the console and moving toward the amps. When the problem switches from one side to the other, you've found the problem point in the line.
As said before, the tendency, especially under pressure, is to start substituting cables or wiggling connections in a random manner. Although you might just get lucky and hit on the defective component, it's very easy to put yourself into an endless circle, trying this and that, without really getting a handle on where the problem lies. This is especially true if a section has more than one defective component.

Practice an organized troubleshooting method and you'll "Divide and Conquer" your problem every time.

A New Generation

A tool that can be invaluable for system troubleshooting and setup is a portable generator/monitor unit. This "black box" can be used to generate or listen to signals, from mic level to amp drive level, at any point in the sound system. Our support people here at Whirlwind had spoken to quite a few people over the years who had built homemade units or were "going to build one someday". Our design team, also real world sound engineers, had often talked about building one of these handy tools as well. This prompted Whirlwind to design and produce its **Qbox**.

This type of tester usually consists of two sections, a signal generator and a monitor.

The **generator** section is designed to produce audio signals at various levels. By injecting the appropriate level at various places in a system, proper set up or functioning can be verified at every point from the power amps back to the mics. The Qbox produces mic (-50dB), instrument (-20dB) or line (+4dB) signals with a built in 400 Hz tone generator or internal condenser mic.)
For example, a person can inject a mic signal at the stage box and identify where or if it arrives at the board - unassisted and without uttering a single "check". Or you can inject a

mic signal into the console and confirm its path and proper routing through to the output, even before the mics are unpacked. Have a problem with a dead power amp channel? Start at the input of the power amp and inject line level signal. If the amp works, continue to inject at each point going back toward the console (amp rack input, cable from crossover output, crossover input, etc.). When the channel quits, you have identified the bad component quickly and in an organized manner.

The **monitor** section of this type of tool consists of a circuit that can be used to listen to any mic or line signal in the system. You can use this feature to troubleshoot a system as it allows you to verify the presence of signal and/or confirm its level at any point. (The Qbox features a built in speaker/headphone section - the position of the volume control indicates the approximate level of the signal. LEDs also light when phantom or intercom power is detected).

There are other uses for the monitor function besides use in set-up and troubleshooting:

- The unit can be set on stage or clipped on a belt and used as a squawk box to give directions to the crew before the system gets powered up.
- Use one as a console or line monitor during remote broadcasts or anytime a small powered monitor speaker needs to be set up quickly.
- Connect two units together with their mic and headphone sections active at the same time for a quick and easy hands free 2-way intercom.

Whether you build it yourself or opt for a commercially produced unit, a good portable generator/monitor can be one of your best friends when setting up or shaking out a problem system.