Troubleshooting Electrical and Electronic Systems

See if you recognize this: You’re working on a production. The schedule is tight (as usual). Just as you think you’ve got this one nailed, you get a tap on the shoulder followed by the news that something is broken or simply won’t work. Your planned dinner break quickly becomes an unobtainable goal as you set about the task of exorcising the demons that have invaded your lighting, sound, or other electrical system. The scenario is common, but the approach a given person will take to get out of the bind is quite individual. Some people are natural born troubleshooters. They know by instinct where to go and which screw to turn to make things right again. The other 99.7% of us need to work a problem through to get to its root cause. I have found the following tips to be useful, allowing me to efficiently track down system problems. I hope that they will serve your needs as well.

First, clarify the problem

Before jumping into a situation with tools in hand, be sure that you know what the problem actually is. If the trouble was reported by someone else, you will need to question that person in order to get enough information to understand where to begin your task. When you are the victim of a failure, be sure to step back and look for other symptoms or failures before attacking the problem directly in front of you. Gaining this perspective will help to form an effective plan of action.

Has the problematic item ever worked?

This is a very important question to ask yourself. It makes a distinction between performing a repair and adding new functionality to a system. The two scenarios are quite different. In the case of the repair, you can assume that the equipment has worked and that something is simply broken. You must track down the defective or mis-adjusted item and remedy the problem. If the equipment is not known to have ever worked, it must be tested before installing it in the system. This situation arises when you are adding a new piece of equipment to an installation. The new equipment is unproven until you can demonstrate its functionality. It is only when you are convinced that the new gear is functional that you should connect it to the rest of the system. Once installed, check again to insure that it still operates properly in its final working environment. As a master craftsman taught me years ago, “You’re not done until ALL the screws are put in.”. The approach for commissioning an entirely new installation is a whole different world. The process and concepts for that may be the subjects of a future article.

Look for the obvious

Okay, you’ve heard this over and over. We all have our war stories of being called in for an "emergency" only to find the

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control console unplugged from the wall. Many years ago, the Sears Roebuck company included an item in the troubleshooting section of its television manuals that told users to "unplug the set from the wall, turn the plug over and insert it the other way." (This was back in the days before polarized power plugs.) Sears knew that if it told users to look to see that the set was plugged in, no one would ever check. (Well of course I plugged it in!) But if customers were directed to do something technical sounding, they might discover that the set was, in fact, not plugged in. The point is that we all make mistakes; sometimes stupid ones. If you check for the obvious, you could save yourself a lot of time and embarrassment.

**Divide and conquer**

This old war tactic is valid for troubleshooting as well. If you have a complex system, you will often need to isolate problem areas by disconnecting unrelated equipment. For example, when attempting to isolate a problem with a lighting console, it's a good idea to disconnect the peripheral devices such as printers, remote focus units, extra keyboards, graphics tablets, etc. By doing this, you lessen the number of variables which can effect your efforts. As you break a system down to its simplest components by removing the non-essential parts, you gain confidence in the remaining items. You may also discover that some of the components you disconnect are interacting and causing the problem you are trying to solve. Your task then becomes one of discovering which part effects others when it's added to the system.

**Change only one thing at a time**

Sometimes, it's tempting to replace all the parts that might be causing a problem all at once. This strategy seldom results in a solution and will not help you pin point the source of the problem. As a general rule, change one component of the system and then look for different behavior. If the problem remains exactly the same, you changed the wrong part. If the problem is corrected, you get your dinner break. If the problem remains, but now has different characteristics, you may have replaced part of the problem. Sometimes, multiple problems perturb one another. The result is a confusing set of symptoms. Try to associate each different symptom with a specific part of the system and then address each symptom separately. Keep a record of your efforts as you progress. This will not only prevent you from repeating yourself, but will be useful information to recount if you need to involve someone else in the repair process. Change a component only once. Although this sounds odd, I have seen people replace the same circuit board five or six times without changing the nature of the problem. It's really unlikely that a replacement part will have exactly the same failure characteristics as the one it replaced. If you have changed a part and the problem remains unchanged, move on to something else. It's true that a replacement part may be defective, but replacing the same part should be considered a last resort solution.

**Have the right tool for the job**

There's no substitute for a good tool. Even so, your kit doesn't need to make Norm Abrams and Tim Allen envious. Having the right set of tools for the systems you are working on is all that's necessary. If you think about the kind of work and troubleshooting you are likely to be doing, you can develop a kit that's right for you.

**Maintain focus and set priorities**

While going through the motions of any sort of troubleshooting, I try to keep two other concepts in mind. These help to keep your sanity and get things back on line as efficiently as possible. Whenever you are trying to locate the source of a technical problem, always stay focused on the goal of solving the problem. It is all too easy to get diverted by minor or
unrelated problems. Before taking any action it's good to confirm in your mind that what you are doing will help to move you closer to solving the problem at hand. In the rushed atmosphere that accompanies most productions, you will be presented with multiple technical challenges at the same time. When this happens, be sure to firmly establish your priorities. Making sure the production sound system is fully operational is probably more important than having pleasant music in the lobby. If you are the only person available to address such problems, knowing which one to attack first is key. You can only work one issue at a time so chose carefully and follow through on one problem before moving on to another.

**Calling for help**

If the previous guidelines don't get things working, you may need to phone for help from a dealer, service company, or manufacturer. Before placing the call, take the time to gather up some basic information so you have the best chance of resolving your issue quickly. In addition to having the "hard fact" information, you should consider how you will communicate your question or problem to a customer support person. Unfortunately, mind reading isn't a talent easily learned so it's up to you, the customer, to fill in the support person on your particular situation and needs. If you are able to communicate your needs, someone will take care of you and give you the support you require. Here is a list of some of the basic information you should have available when calling for support and some tips to help insure that you get the service and information you need.

- **Product name, model number, and/or configuration** This is pretty obvious, but it is surprising how many people call for help with nothing more than the name of the product manufacturer. Have the name, model number, and configuration (if applicable) for the product you are calling about. If you don't know this information or can't find it, you may ask the customer support person you speak with to guide you to a marking or some other physical trait to help identify your equipment.
- **Product serial number** While this is not always necessary, it may be in some cases. Keep in mind that some products have an electronic serial number in addition to the physical one written on the back panel. An electronic serial number is generally found in a software setup menu within the product. Software version number If you're dealing with a software product such as a lighting control console, this is really important. The software version number is generally found in a setup screen. It may also be shown in a more obvious top-level screen. Product features often change from one version to the next, so knowing what you have can make a big difference in getting accurate answers to your questions.

**Be sure you get the right person on the phone**

If you have a technical question, be sure you speak to someone who can answer technical questions. All too often, you tell your story and ask your question only to hear, "Let me transfer you to someone else." If you confirm that the person can help you up front, you will save yourself from having to repeat everything to a different person. A question like "Can you help me in configuring an XYZ controller?" could save lots of phone time.

**Know what you want to get from the conversation**

The support person needs to understand what your question is. Though this sounds completely obvious, it is amazing how easily we all mis-communicate our needs. An example might be, "I have a dimmer that won't turn on and I need help." Without further information, the support person could address this problem in one of two ways. Either he might attempt to guide you to the technical source of the problem or, instead, might advise you on the process of sending the dimmer in for repairs. To ensure that you will be offered a solution that meets your needs, you need to make those needs known up front. You could say, "I have a Joe's Brand model 1000 dimmer that won't work and I need you to help me find the source of the problem over the phone."
Have a concise description of the actual failure, problem, or question

A good accounting of the facts will get the information you need quickly. A recounting of randomly ordered events can cause confusion for the support person who is trying to help you.

Get the phone and the equipment in the same room

If you call for help on how to operate a piece of equipment, be able to work with the equipment while on the phone with a support person. This is particularly important when attempting to navigate through menu-oriented displays. It's difficult and frustrating to "work blind" or to relay instructions down the hall to another person who's in front of the equipment. It's worth the time and effort to get a phone to the equipment or to move the equipment to a phone. With a little preparation, you should be able to address a problem logically and get superior support from any company you deal with. Hopefully, these guidelines will help in speeding the process. Meanwhile, go have dinner before something else breaks.

Milton Davis is a Technical Support provider and Product Developer at Strand Lighting. He is a member of ESTA's Control Protocols Working Group and has 15 years experience in entertainment field service and product design. In addition, has been able to eat at nearly all regular meal breaks.