

What is Troubleshooting?

Techniques for Electrical Circuits

Improving your methodology when troubleshooting electrical control equipment can speed your problem solving times. Methodical choices, rather than random guesses, can help you quickly return equipment to service, and can enhance your reputation as a troubleshooter as well.

One method of troubleshooting can be found on a popular game show that has been airing in households for years. On “The Price is Right”, one of the games, “Hi-Lo”, challenged the contestants to guess the price of a product while the host Bob Barker would give them guidance, indicating higher or lower. The most successful contestants accomplished this by “boxing-in” the number and quickly eliminating whole ranges of numbers to quickly narrow in on a price.

Another variation of this type of troubleshooting can be found in a guessing game using ordinary playing cards. You start by telling someone that you can guess which card they are holding by asking them up to seven yes/no questions. Wait, you might think, with 52 cards in the deck, how could a person be certain that they could guess your card within seven guesses?

Let’s look at an example where the person is holding the 3 of Clubs:

1. First, ask whether the card is red. They will answer no. What has been accomplished with this question? You’ll see that the number of cards left for consideration has been reduced from 52 to 26, and we now know that the card is black!
2. The next question we’ll ask is the suit. Is the card a Spade? Again, they’ll answer no. But we can deduce that the suit is a Club, and in two questions we’ve eliminated 75% of the possibilities!
3. Next we’ll ask if they hold a face card. They will answer no, so we know that the card is something between 2 and 9, inclusive.
4. Continue this “divide-and-conquer” technique by asking if the card has a number greater than 5. The answer will be no, but we know that the card is a 2, 3, or 4 (or possibly 5 if they interpreted your question strictly as “greater than but not equal to 5”).
5. Is the card greater than 3? No. So it’s either a 2 or a 3, and we have two questions left to ask.
6. Is it a 2? No. Now we know that it’s a 3.
7. Is it a 3 of Clubs? Yes.

Even though it took us all seven questions to determine the card, we were able to systematically narrow down on the only logical choice that was left.

A similar technique can be applied to troubleshooting an electrical circuit. Our questions are often asked with a volt-meter. By using an electrical schematic, we can plant one lead on the Neutral and systematically walk the other lead through the circuit to narrow down on the problem.

It is important to realize that troubleshooting is a methodical act. Don’t make random guesses, but rather seek to eliminate all the options that aren’t part of the solution. By doing so, you will increase your ability to quickly focus in on a solution and return your equipment to service.

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