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Simple tester checks Christmas-tree lights

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 Why is it that you always test 48 bulbs before you find the bad one in a 50-light string? The simple circuit in **Figure 1** allows you to divide and conquer, greatly reducing the time it takes to find the bad bulb. The circuit uses a pair of NE2 neon bulbs with current-limiting resistors. You can use a pair of Radio Shack 272-1100 bulb-resistor sets. It's convenient to house the tester in a clear piece of plastic tubing, with the probe tip emerging from one end and a light-duty power cord emerging from the other end. You place the bulbs in the tube such that one is close to the probe tip and the other is near the power cord, so it's easy to remember which bulb lit last. The probe tip connects to the common point between the neon bulbs. It consists of thin spring wire with all but

the last ¼ in. insulated. You use the bare tip to make contact with the crimp connectors in the base of the bulbs.

Series-string Christmas-tree lights come in two types. The first type is the continuous-series string (**Figure 2a**). In this configuration, one wire from the plug goes from bulb to bulb until it reaches the last bulb. A return wire bypasses all the bulbs and returns to the plug. The second type is the alternating-series string (**Figure 2b**). In this connection, one wire from the plug goes to the first bulb, and the other wire from the plug goes to the second bulb. The connections then alternate through the string. To troubleshoot a defective continuous-series string:

- Plug in both the tester and the bulb set.
- Insert the tip of the tester's probe into the wire hole in the base of the first bulb. One of the neon bulbs should light; remember which one.
- Move halfway down the set and insert the probe again. If the same neon bulb lights, then the problem is in the second half of the set. If the other neon bulb lights, then the problem is in the first half of the set. Either way, you are testing 25 of the 50 bulbs without breaking into a sweat.

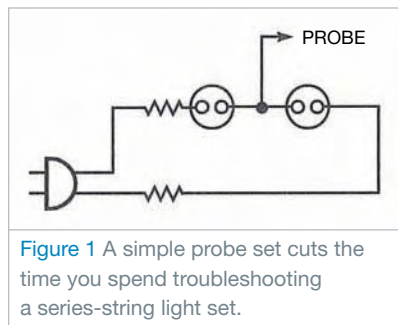
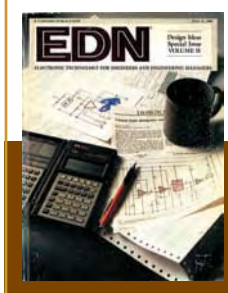


Figure 1 A simple probe set cuts the time you spend troubleshooting a series-string light set.



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• If the original neon bulb lights, move halfway down the remaining part of the set and try again. If the other neon bulb lights, you must move back halfway to the last bulb you tested and try again. This process should allow you to find a bad bulb in a set of 50 in only seven steps. You know you have the bad bulb when inserting the probe tip into one side of the bulb lights one neon bulb and placing the tip in the other side lights the other neon bulb.

To troubleshoot a defective set with many bad bulbs, use the same process as above. At some point, you will reach the dead spot between two or more bad bulbs. When you reach this point, neither neon lamp will light. Back up, just as if the other neon bulb had lit. You know you have a bad bulb if the probe lights when you plug it into one side and nothing lights when you plug it into the other side. Replace this bulb and start over.

To troubleshoot an alternating-series string, you must work in pairs. Test the first bulb, and one neon bulb lights. Test the second bulb, and the other neon bulb lights. Now move down the set an even number of lights and test the next pair of lights. When you pass the bad bulb, the same neon lamp lights for both series-string bulbs. **EDN**

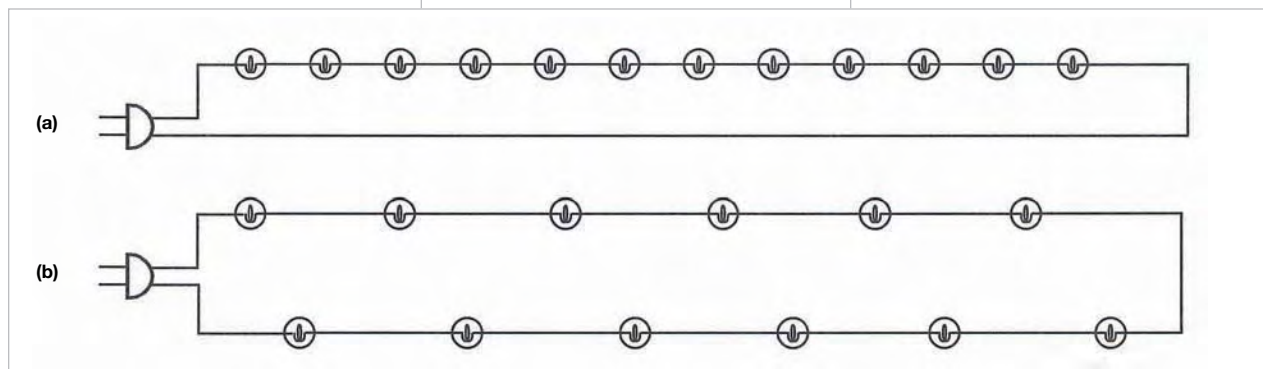


Figure 2 Series-string light sets come in two flavors: a continuous-series string (a) and an alternating-series string (b).