HOBBY CORNER

How to determine the voltage and current rating of unmarked transformers.

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HAVE YOU EVER REACHED INTO YOUR "junkbox" and found a power transformer with the tag missing? You probably have a marking system something like mine. When transformers are new or when I salvage them from old equipment, I identify the leads with tags, or write on the transformer with a waterproof marker. But tags come off, and some markers are more "waterproof" than others.

Whether because of missing tags or markings, or because the transformer was borrowed from someone who neglected to mark it, I usually end up with unmarked transformers. You have probably discovered that slapping 120 VAC on just any old leads can cause real fireworks. Don't do that, but don't throw the transformers out either. You can figure out which lead is which by applying a little logic.

The great majority of power transformers are low-voltage types for solid-state power supplies. We'll concentrate on these in this article, but you can use the same principles to identify high-voltage transformers as well.

First, you may find some numbers printed on the transformer. Unfortunately, these are seldom manufacturers' identification numbers. More often than not, they are "house numbers" placed there for the benefit of the bulk purchaser who was putting them into equipment. You might get lucky and match your numbers to those listed in a catalog, but the chances are slim and I wouldn't waste any time trying.

Second, you could check the *color* of the insulation on the lead wires (if any). If there are colors and you can decide what they are, you may be able to match them up with the old color code given in most electronics data books and handbooks. However, I have found the wrong colors are used so frequently that I don't trust them any more.

My approach is to disregard numbers, colors, and even wire size, and proceed right to the identification process. Here's how I do it, step by step:

The first task is to mark each lead with a temporary number since it is easy to lose track of which leads you just tried. I use a small piece of masking tape with a number written on it.

Second, you should find out which leads are connected to each other through the same windings. You can use an ohmmeter or just a battery and flashlight bulb to check this. Touch the leads in various combinations until each lead has been identified as being connected to at least one other lead. Of course, since there are no "one-lead windings," if you find such a situation, this tells you that there is a burned or broken winding in there.

Make sure to write down what leads are connected to each other as you go along. Unless you make notes, it is hard to keep track of more than four leads. For example, you might find something like this: leads 1 and 6; 2 and 3; and 4, 5 and 7. After you have this information, draw out the transformer windings and label the leads according to your findings.

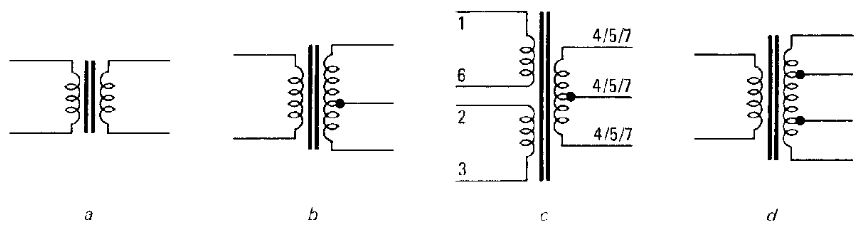

FIG. 1

Some of the more common types are shown in Fig. 1. The transformer shown in Fig. 1-c is labeled for the example given in the above paragraph. Note that at this stage, we don't know which winding is the primary (120 VAC), or which number belongs to each lead of the tapped winding. We can figure that the winding with the center tap is a secondary winding because that is almost always the case.

The next identification step is not really necessary. It may make you feel a little more comfortable but don't worry about omitting it. This optional step is to measure the resistance of the windings you have identified. With an ohmmeter as found in the typical VOM, you won't learn much because the lowest meter scale is far too large, but perhaps a hunch will help.

A primary winding usually shows a DC resistance in tens of ohms—say, 15 or 20 ohms and maybe up to 90 or 100 ohms. A low-voltage secondary shows a lower resistance—from less than 1 up to several ohms. To add to the confusion, the primary of one transformer can be less than the secondary of another. In spite of the fact that you can *almost* count on the primary having a higher resistance than the secondary, I recommend making one more test before throwing 120 volts on any winding. Incidentally, if your measurements are very different from the ones described here, be careful because you may have some other kind of transformer—an interstage or an audio transformer, etc.

The next identification step makes use of the following fact: The *ratio* of voltages on the various windings of a transformer will be almost the same regardless of the absolute value applied to one winding. Knowing this, I apply a *low* voltage to what I *think* is a secondary winding of the unknown transformer. Usually, I use approximately 3 VAC from one-half of a 6.3-VAC center-tapped transformer. Note that this is *AC* voltage because transformers don't work on DC.

With 3 VAC applied to a probable secondary, measure the output of the other winding or windings. If one or more of these measurements is extremely small—much less than 1 volt—you are using the primary winding or another high-voltage winding. In this case, switch to another pair of wires so that the voltages are large enough to measure. Make a chart of the wire numbers and your measurements. In the case of our sample transformer, the chart would look like the one shown in Table 1.

Now, figuring that the highest voltage is on the primary, let's call leads 2 and 3 the leads to the 120-volt winding and write that data on the chart. (Note that the identification information shown in parenthesis in the chart was added after all measurements were made.) Call 55 volts one-half of 120 volts—at this point,