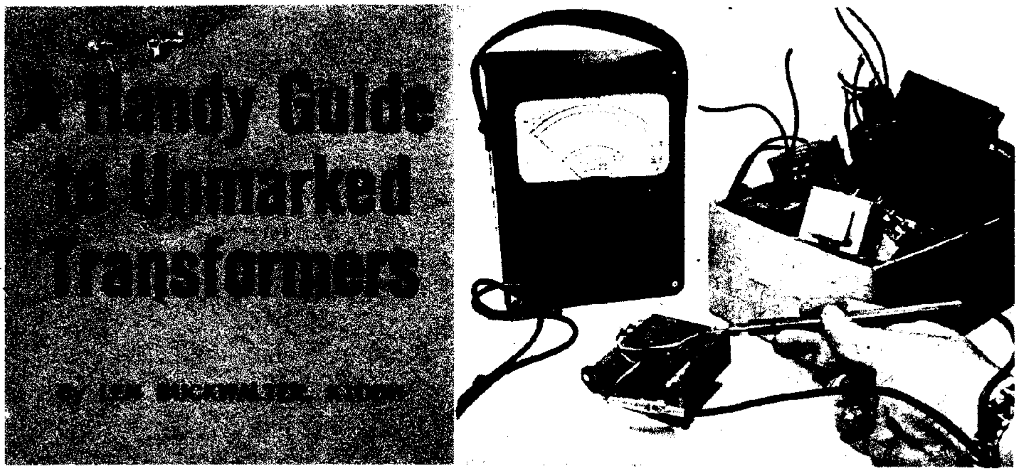

These servicing and identification shortcuts will clear up the puzzlers.

NEED to replace a burnt-out transformer that has no identifiable type number? Or maybe you have a junk box full of goodies you figure are no good for the same reason. Well, here's how to find the facts. The job is done with color codes, an ohmmeter or with low-voltage AC to determine turns ratio.

Color codes are the simplest method. Coding used by nearly all manufacturers for power transformers is shown in Fig. 1, for audio output transformers in Fig. 2. Only problem is that color usually fades from the insulation (if it's cotton) after a few years. If there's no hue, don't cry. Try nicking the insulation with a razor blade. This should expose a bit of telltale color.

If you're checking an IF transformer use the diagram in Fig. 3. Older IF types also have color-coded wires leads; newer ones have unmarked lugs, identified by their position with respect to a color dot.

Check Combinations. When an aging transformer can't be identified, tackle the problem by first finding continuity between as many lead combinations as possible. (Use the ohmmeter's R×100 scale.) Wherever two or more leads show continuity, twist them together (but don't let bare ends touch).

If you measure a power transformer, like the one in Fig. 1, you'll find that windings fall into three groups: low resistance for fila-

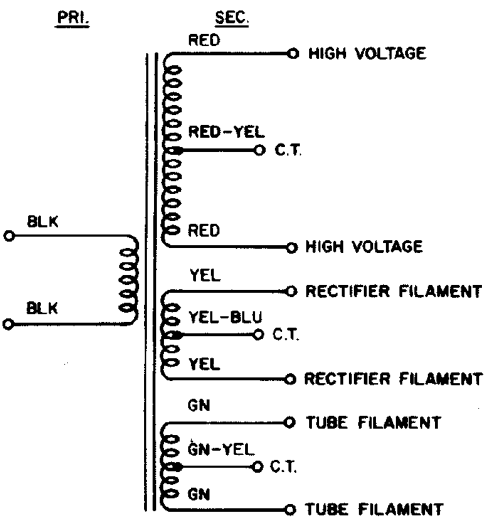

FIG. 1—POWER TRANSFORMER COLOR CODE

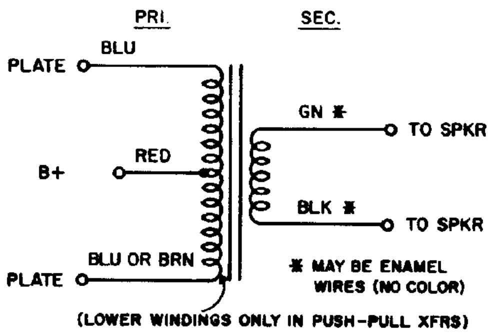

FIG. 2—AUDIO TRANSFORMER CODE

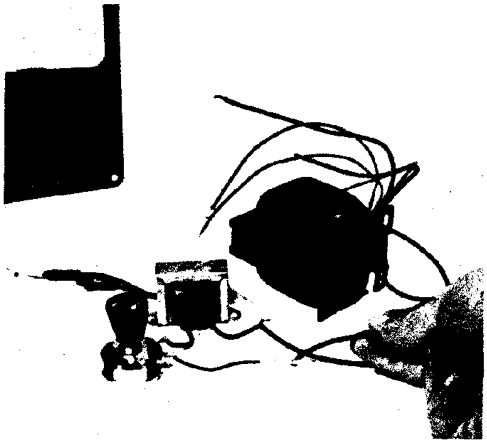

Fig. 4—This test setup, described in the text, is used to test voltage and impedance ratings.

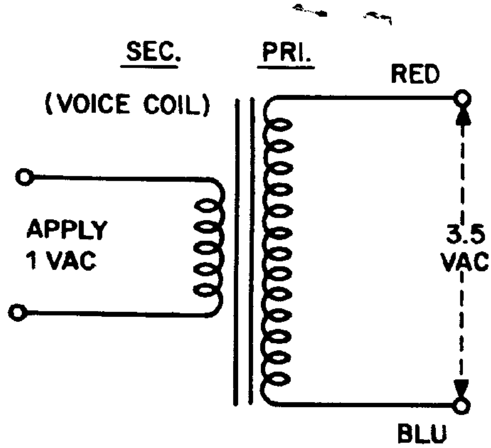

Fig. 5—Impedance ratio may be calculated as the square of the turns ratio (3.5:1 in test above).

ments, mid-range for 117-V primary, high resistance for high-voltage (B+) secondary.

Here's an example of resistance values measured in a small power transformer rated at 125-V high voltage and 6.3-V filament: high voltage (red to red/yellow in Fig. 1) —260 ohms; 117-V primary (black to black)—60 ohms; 6.3-V filament (green to green)—0.2 ohm. In measuring a second transformer, about twice as large, the same resistance groupings were encountered. Only now the resistances were lower, suggesting heavier wire and a higher power rating. The ohmmeter readings: 230-V high voltage—300 ohms; 117-V primary—7 ohms; 6.3-V filament—0.1 ohm.

Some windings may contain a high-voltage center tap, needed for some full-wave power supplies. The meter finds it by showing equal resistance between each red and red/yellow pair. Center taps for filament windings are also found this way.

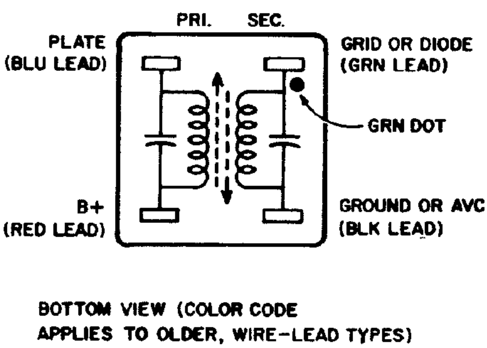

FIG. 3—IF TRANSFORMERS

The same resistance checks can be performed on audio transformers. Now resistance of the primary winding generally will measure much higher than the secondary (or voice coil) side. For example, a common table-radio output transformer (single-end tube circuit) measures about 200 ohms across the primary (red to blue) and 0.2 ohm for the voice coil (enamel wires). You'll encounter lower resistances in tiny transistor output transformers. A typical push-pull model measures 6 ohms from each end of the primary to the center tap; voice coil resistance is 0.5 ohm.

Voltage Checks. An experienced technician might determine voltages of a power transformer by plugging the primary leads into 117 VAC and measuring AC across pairs that show continuity. If you elect to do this, be cautious. Keep clear of bare wires to avoid shock. With this method the voltages usually read somewhat higher than normal since the windings are unloaded.

By using the setup shown in Fig. 4 you can apply safer voltages and also perform the impedance measurements described later. You'll need a 6.3-V filament transformer with a 5,000-ohm wirewound potentiometer wired in series with one 6.3-V lead. This pot and the other 6.3-V lead are connected to the power transformer primary (black to

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black). With the filament transformer plugged in, turn the pot so you read 1 VAC at the power transformer primary. After this adjustment, shift the meter to the secondary and measure the voltage. The reading quickly provides secondary voltage with an easy mental calculation: move the decimal two places to the right. For example, we measured 2.4 VAC at a secondary so the winding's actual value is about 240 V.

This system does not work for precise measurement of filament voltages since 1 V on the primary barely produces a reading at the filament secondary. But you can use it to isolate, and temporarily tape up, dangerous high-voltage secondaries. Then it's safe to plug the primary into 117 VAC and check actual filament voltages with a meter.

Power Ratings. Without the manufacturer's specs, you'll have to use some crude (but surprisingly effective) guesswork on how much power you can draw from the transformer. Begin by checking the transformer section in an electronic parts catalog. Find the transformers that most closely resemble yours in terms of voltage ratings and number of windings. After you've narrowed it down to a few model numbers, compare physical dimensions and, if possible, the weight. The ampere values in the catalogs for a similar-size transformer will probably be very close to your unknown unit.

Then there's the brute-force method, based on the heat given off by the operating transformer. After running it in a circuit, cautiously touch the case with your fingers. If you can say "Anaheim, Azusa and Cucamonga" before removing your hand, chances are the transformer is within its rating. If it sizzles or fumes, you're not even close.

Impedance. Direct measurement of an audio transformer's impedance requires elaborate equipment. But here's a method that tells the impedance of one winding if you known the other, based on the fact that the impedance ratio in an ideal transformer equals the square of its turns ratio. You can determine the turns ratio with the test setup of Fig. 4. The pot, however, should be a 1,000-ohm wirewound.

Let's say you have a small transistor audio

[*Continued on page* 119]

output transformer and measure less than 1 ohm across one winding. This almost always is the voice coil, or secondary winding. With your test set-up, apply exactly 1 VAC to that winding, using the pot and a meter for adjustment. Shift the meter leads and measure the voltage at the primary, or other winding. We'll assume it measures 3.5 VAC, as shown in Fig. 5. Multiply this voltage by itself: 3.5×3.5, or 12.25. Now multiply this by the impedance marked on the secondary or speaker side. If it's still in a circuit use the speaker impedance. If it is 10 ohms, you would get 10×12.25, or 122.5 ohms as the impedance of the primary.

It's often possible to operate the same transformer at a different impedance. If you want to use a 4-ohm speaker, just substitute 4 for 10 in the problem above to determine the effective (reflected) impedance of the primary with the new speaker. Output transformers for tube equipment have primary impedances running from about 1,000 to about 8,000 ohms, but the method is the same.