AUDIOCLINIC??

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Transformer Impedance

Q. I was recently given what seems to be a fine output transformer, but I don't know its impedance. The wires are divided into two groups, the first of which contains those colored red, blue, and reddish yellow, while the second contains those colored black, brown, orange, and yellow. The first group is evidently the primary, and the second, the secondary, but how will I proceed from here? Al Kerper, Brooklyn, N. Y.

A. My first recommendation would be to locate the model number and the name of the manufacturer of the transformer, and then consult his catalogue for the desired information. If, for any reason, you are unable to follow this course, proceed as follows:

Assume first that you have correctly identified the groups of wires. Red goes to one plate, blue to the other, and reddish yellow to B plus. (proper phasing of the primary leads can be found only by trial & error. If the phase is reversed, the amplifier will oscillate. Black is probably the common on the secondary winding. It is probable that the brown is the 4-ohm tap, orange the 8-ohm tap, and yellow the 16-ohm tap. However, to be certain, measure the resistance of each lead with respect to black, or common, arrange the leads in order of ascending resistance values, and they will be in order of ascending impendance values, although the resistances do not equal the impedances. You will find that the lowest resistance you will come across will be less than one ohm, whereas the impedance represented by this resistance is 4 ohms.

You now have the probable impedances of the secondary and next you must find the impedance of the primary. This is done by connecting a resistor of appropriate value across the secondary, feeding in a signal from an audio oscillator at a given voltage, and then noting the voltage appearing across the primary. The square of the voltage ratio between the signal fed in and the voltage appearing across the primary gives the impedance ratio of the two windings.

Illustration: Start with the 8-ohm tap. Connect an 8-ohm resistor from this tap to common. Connect your audio generator across this resistor and feed the secondary with 1 volt of signal of approximately 400 cps. Measure the voltage appearing between the red and blue leads (primary). Be sure to use a fairly sensitive a.c. voltmeter for this purpose, so as not to load down the primary circuit. Let us assume that you get a reading of 30 volts. Since the ratio of the voltage fed in to that appearing across the primary is 30:1, the turns ratio is also 30:1. The impedance ratio is equal to the *square* of the turns ratio, so we find that the impedance of the primary is 30^2, or 900 times that of the secondary. Since the impedance of the secondary is 8 ohms, the primary impedance must be 7200 ohms. This primary impedance is correct only when the secondary is terminated in an 8-ohm load. Within limits, the transformer can be used to match a range of impedances. The only thing which is really constant is the turns ratio. Do not confuse the impedance of the transformer with that of the internal impedance of the amplifier. This latter is a function of the amount of negative feedback applied. A discussion of internal impedance can be found in an earlier AUDIOCLINIC.

Frequency Response

Q. Is it possible to sweep a high fidelity preamplifier or amplifier and observe the over-all response curve as is done in video alignment? If so, how? Also, how can I determine the frequency response of a loudspeaker? Robert A. Poltzer, Chicago, Ill.

A. Yes, methods for rapidly sweeping the audio spectrum are often employed. The audio generator is made to sweep the spectrum and is, of course, fed into the device to be checked out. The output of the device is connected to a scope for direct display, or to an assembly which moves a pen over a moving drum in accordance with the dips and rises in response. By this means, a permanent graph of the response of the equipment is obtained.

Measuring the response of a loudspeaker is quite complicated because of at least three variables which you will encounter besides that of the speaker itself. Were it not for these, the method would be quite simple. Feed a series of audio-frequency tones into the speaker. Place a microphone near the speaker to pick up these tones. The output of the microphone feeds the measuring device.

The first question which arises is: how flat is the response of the microphone? In order to be sure, you have two courses open to you. One is to use a calibrated microphone, especially designed for this type of work. The second is to send your own microphone to the Bureau of Standards to be calibrated. Then, superimpose the graph of the microphone's response over that of the plotted response of the speaker in order to obtain the speaker's true response.

Another problem is that of the room in which the measurements are made. Any resonances, antiresonances or reflections present within the room will greatly influence the response curve. It is necessary to make these measurements in a room designed especially for such work. Such a room is known as a space room, or anechoic chamber, because of its complete freedom from reverberations. Most of us do not have such rooms available, but we can approximate the conditions found in them very closely by making the measurements out-of-doors. A rooftop is a good spot, but it may be resonant at several frequencies, and the effect of this will to

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| Split Primary | 125 |
pearing across the primary. The square
order to be sure, you have two courses open