

The General Tester

Additional Operating Hints

A FEW weeks ago "Pentode" described the construction of a useful general-purpose tester for testing valves, batteries, etc., under operating conditions. A little doubt seems to exist regarding what the amateur is to expect when he places his valves in the tester and the adapter in the valve socket. The full description was overlooked at the time, but it is hoped the following will fill in the omission:—

The purpose of the tester, when considering valves, is to check over the filament supply and see what is happening in the plate lead. A milliammeter is a current-operated instrument, and as only voltage fluctuations occur, or should occur, in the grid circuit of each valve, no advantage would be gained by the insertion of this instrument in the grid lead.

Current flows through the valve from filament to plate, and it is this current that we desire to test. Now, a general-purpose 201 A type of valve should draw no more than 5 m.a. when used in any but the final stage of a receiver, and if excess of this is being taken by a high-frequency or first audio valve, the receiver is putting far too much of a drain on the B batteries with no better results. In fact, the results will be far worse in many cases when excessive current is flowing. The primary of most audio transformers is wound with extremely fine wire, not heavy enough to stand a constant load of more than 3 or 4 milliamperes. Therefore, if the detector or first audio frequency valves are taking more current than that specified, grave risk is being run of the transformer primaries being burnt out.

The natural question that will be asked is, what remedy is there if excessive current is found to be passing? The answer is: Adjust the grid bias of that particular valve. In general,

with 90 volts B battery a bias of 4½ volts will be found correct. This decrease in current will also greatly prolong the life of the B batteries.

When testing the last audio stage no general indication can be given as to the correct amount of current taken without first knowing the type and size of the power valve used. Small power valves draw 8 to 10 m.a., while larger ones may take as much as 25 m.a. to operate them successfully.

There is one test, however, that can be relied upon to indicate whether the last valve is overloading. When music is being received with the last valve under test, no appreciable movement should be noticed by the milliammeter needle, even on the loudest passages. If the needle jumps from side to side of the scale, distortion is taking place and adjustments should immediately be made to try to remedy this. Commence with the grid bias and gradually increase, noting the effect on the needle each time. If distortion appears, and it is quite easy to see it, to increase with an increase of grid bias, either lower the bias or raise the B voltage. This latter method will enable the valve to handle far more volume. If no distortion was present the needle would remain quite steady, and, neglecting the ear as a judge, make all adjustments according to the milliammeter needle. If this shakes violently, adjust either the B or C voltage, or both. If this does not effect a cure, then a larger power valve is indicated.

This same test should apply to all the valves in the receiver, and in no case should the instrument needle quiver appreciably while music is being received.

IN a properly-charged accumulator the negative plates should be light grey in colour, and the positive plates chocolate colour.

IT should be an invariable practice directly a joint has been soldered to wipe it carefully with a clean duster so that all surplus flux is removed.

Matching Impedance

A CORRESPONDENT in "Questions and Answers" has asked, "How can you calculate the impedance of a coil, given the gauge of the wire and the diameter of the coil?" Actually, the question cannot be answered, but the following discussion from Drake's Radio Encyclopedia throws a great deal of light on this problem.

"Any electrical device which produces or delivers power, such as a valve, will put forth the greatest effort and will deliver the greatest possible power when the impedance of whatever unit forms the external load is at least equal to the internal impedance of the source of power, the valve in this case.

"In the earlier days of radio reception, little, if any, attention was paid to this subject of matching impedances. The results were manifested in poor performance.

The principal concern in this matter of matching impedance is to obtain a balance between the plate impedance of a valve and the impedance of whatever unit is connected as a load in the external plate circuit. The plate of a valve may be connected to any form of coupler such as an audio frequency transformer, and audio frequency impedance or an audio frequency resistance coupler. The plate of the valve may also be connected to a loudspeaker, to a pair of headphones, or to a coupling transformer for a loudspeaker. In any of these cases, the impedance of the plate circuit in the valve measured in ohms, should be equalled or exceeded by the impedance of the coupling device or speaker.

"To attain this object is not quite so easy as it sounds, because the impedance of the winding in any transformer, in any loudspeaker, or in any other unit, containing inductance or capacity changes with every change of frequency. The higher the frequency the higher becomes the impedance of a transformer, a choke or a speaker in which inductance is the chief factor in its impedance.

"The impedance in the valve is composed principally of the resistance between plate and filament. In tables of valve characteristics it is the plate resistance which is usually specified and for the work of matching impedances sufficient accuracy will be obtained by matching the impedance of the load with the plate resistance of the valve, both being measured in ohms. In the following paragraphs the plate resistance will be spoken of as representing the plate impedance.

"The impedance of the external load changes greatly with change of the frequency being handled, but there is comparatively little change of the valve resistance with change of frequency.

Therefore, it is impossible to match the load impedance with the plate resistance at all frequencies. The parts of the audio frequency range which are used the most run between 100 cycles and 3000 cycles. The impedance match may be made at a medium frequency, say around 1000 to 1200 cycles, and the results at lower and higher frequencies left to care for themselves. This is the most economical method because it allows the use of small inductance in the external load, but it is not the most satisfactory.

"Better all round results will be made by matching the impedance and resistance at much lower frequencies. This will call for a larger inductance in whatever unit follows the valve. At higher frequencies the impedance in the load, will then be two, three, or four times the resistance of the valve, but this is an advantage rather than a disadvantage.

"The plate resistance of a valve is changed by changes in the plate voltage or "B" battery voltage. For example, a certain amplifying valve has a plate resistance of 5500 ohms with 135 volts on the plate, while with only 90 volts on the plate the resistance rises to 8800 ohms. It is generally quite easy to learn from information published by valve manufacturers the resistance of their various valves with different plate voltages."

The UX222

IN our issue dated February 8, 1929 (Vol. II., 30), appeared the statement that the control grid of the screen grid UX222 was connected to the top of the valve. A diagram indicated that the ORDINARY GRID connection went to the TOP. The text was thus not in keeping with the diagram, and has puzzled correspondents. The text, however, was faulty and should read thus: "The terminal at the TOP of the valve is the GRID, so that the prongs at the bottom will connect filaments to filaments, plate to plate, but GRID to GRID CONTROL."

A NEGLECTED soldering iron which has become "scaly" can easily be cleaned by heating the iron until it is red hot and then plunging it into cold water.

WHEN a water-pipe earth is used, and a clip is placed round this to carry the contact, it will often be found that a few sharp blows on a nail so as to form projecting points, will cut through any small film that may have formed, and so ensure better contact.

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