VALVE TESTING PANEL, VT/2

Function

The Valve Testing Panel, VT/2, is designed for carrying out mutual conductance and anode to grid insulation tests on small valves.

The panel as it stands is suitable for testing any directly-heated valve with a 4-pin base or indirectly-heated valve with a 5-pin base, including screened grid and H.F. pentode valves with top (anode) terminal or plug, and L.F. pentodes with side (screen) terminal.

Special adaptors are necessary with the panel for testing valves fitted with 7-pin and 9-pin bases and directly-heated L.F. pentodes with 5-pin bases in which the screen is connected to the centre pin. The adaptors can be obtained from the Valve Section of the Research Department. Special provision is being made at those stations concerned to enable current-rated valves to be tested since the VT/2 panel is unsuitable.

All small valves in service should have their **mutual conductance** (S_m) checked on the valve testing panel, preferably once a month but at least once every two months. Any valve found to have a mutual conductance less than that listed in the schedule for its *end of life* conductance should be rejected.

New valves direct from the makers are tested before issue by the Valve Section and the value obtained for S_m under the test conditions appears on the green label attached to the valve. Except to check that they have not been damaged in transit, therefore, such valves need not be further tested before being put into service. In the event, however, of a valve being purchased locally, a mutual conductance test should be carried out, and if the value obtained is less than that listed in the schedule for its *acceptance limit* conductance, it should be returned to the makers for replacement.

Special noiseless valves are put through a special test by the Valve Section. Valves so tested have a small blue label attached in addition to the green label. Should these become noisy in service they should be returned to the Valve Section for examination.

Valves not carrying the blue label, if suspected of being noisy, should have their **anode to grid insulation resistance** checked and should be rejected if this is found to be less than 25 MΩ.

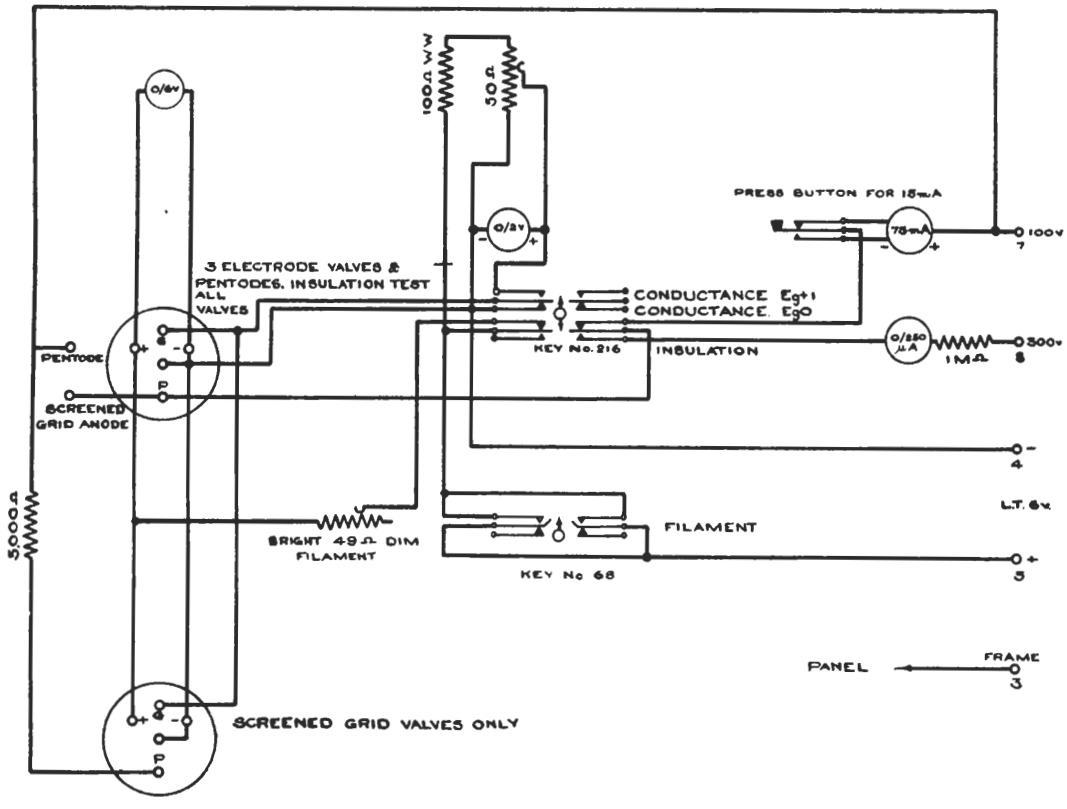
With the valve testing panel, VT/2, mutual conductance is directly measured by applying 100 V to the anode of the valve and by noting the change in anode current which corresponds to a change of grid voltage from zero to one volt positive. The insulation test is carried out by measuring with a microammeter the current resulting when 300 V is applied between anode and grid, or in the case of screened grid and H.F. pentode valves when 300 V is applied between the screen and the control grid, with the grid and cathode connected together and the filament disconnected.

Description

The panel is provided with two standard 5-pin valveholders. The right-hand valveholder is wired for mutual conductance tests on triode and L.F. pentode valves and for insulation tests on *all types* of valves. The holder on the left is wired only for mutual conductance tests on screened grid and H.F. pentode valves, of which the pin designated ' P ' is connected to the screen and requires an H.T. potential less than that applied to the

Description (*Contd*)

anode. There are two terminals in addition to the valveholders. One marked **pentode** is connected directly to +100 V and is provided for the side terminal (screen) connection of L.F. pentodes when inserted in the right-hand holder for the mutual



Drawing A914 Issue 4

conductance test. The other terminal is designated **screened grid anode** and is associated with the left-hand valveholder for the anode connection of screened grid and H.F. pentode valves.

The centre pin and one of the filament pins of both holders are connected directly to −6 V. The other filament pins are connected to +6 V, via a rheostat designated **Dim → Fil. Bright,** a break contact of the 3-position key in its normal and lower off-normal positions, and the make contacts of the filament key. A voltmeter, reading 0−6 V, is provided for use in conjunction with the rheostat to enable the filament voltage to be adjusted to the correct value.

The grid connection to both valveholders is made to the traveller of the change-over

Description (*Contd*)

contacts forming the upper half of the 3-position key. Via the break contact of the key the grid pin is connected (in the normal position of the key) to −6 V, and via the make contact of the key it is connected (in the lower off-normal position of the key) to the slider of a potentiometer connected across the 6 V supply. The range of adjustment is restricted and a voltmeter, reading 0−2 V., is connected between the slider and −6 V. Each panel is calibrated before being sent out and a red line is drawn on the scale of this voltmeter to indicate the deflection corresponding to exactly one volt.

For the purpose of the mutual conductance test the potentiometer is set to give a voltmeter deflection up to the red line, so that when the key is operated from $\mathbf{E_g O}$ to $\mathbf{E_g + 1}$ (normal to lower off-normal position) the grid potential is increased by exactly one volt.

The anode pin of the right-hand valveholder and the terminal provided for the anode connection of screened grid or H.F. pentode valves (which are tested in the left-hand valveholder) are connected to +100 V, in series with a milliammeter via a break contact of the 3-position key in its normal and lower off-normal positions. The milliammeter is a double-range instrument, normally reading 0−75 mA, but having a 0−15 mA scale which is brought into service by operating a press button.

The **pentode** terminal, as previously mentioned, is connected directly to +100 V, and the 'P' pin of the left-hand valveholder, by which connection is made to the screen, is connected to +100 V in series with a 5,000 ohm resistance.

By operation of the key to its upper off-normal position, which is designated **insulation,** the L.T. positive connection is interrupted and the anode connection is transferred from +100 V to +300 V. A microammeter reading 0−250 μA is inserted in the +300 V. lead and a 1 MΩ series resistance is provided in order to protect it.

For the mutual conductance tests, supplies at 100 V. and 6 V. are required, the L.T. providing both the filament and grid voltages. For the insulation test only an H.T. supply at 300 V. is necessary. Where 6 V. and 300 V. supplies are normally available from the station L.T. and H.T. batteries, the supply at 100 V. is obtained from a separate accumulator battery. At other stations the necessary supplies are obtained from a small motor-generator set.

Mutual Conductance Tests

(1) Insert the valve in the appropriate valveholder.
   (*a*) Use *left-hand* holder for *screened grid* and *H.F. pentode* valves; connect anode lead to **screened grid anode** terminal.
   (*b*) Use *right-hand* holder for *triodes* of all types and *L.F. pentodes* with side terminal. In the latter case connect the side terminal (screen) to the **pentode** terminal. (For directly-heated pentodes with 5-pin bases use an adaptor.)

(2) Set filament rheostat to **dim** and switch on the L.T. supply by operating the **filament** key. Adjust the filament voltage accurately to the value given in the schedule for the particular valve. The voltage is read on the instrument with 0−6 V. scale mounted on the extreme left-hand panel.

(3) Adjust the bias potentiometer to obtain a deflection up to the red line on the voltmeter with the 0−2 V. scale. *Serious errors in testing will occur unless this initial adjustment is accurately made.*

Mutual Conductance Test (*Contd*)

(4) Note the anode current reading on the milliammeter. Then depress the right-hand key (to the position designated $\mathbf{E_g+1}$) and again note the milliammeter reading.
In the case of indirectly-heated valves about 30 seconds should be allowed to elapse after the filament voltage has been correctly adjusted before taking anode current readings.
If the anode current indicated is less than 15 mA the push button should be operated and the 0—15 mA scale used. It will be observed that on the 0—75 mA range the meter is calibrated 1 mA per scale division and on the 0—15 mA range it is calibrated 0.2 mA per division.
With valves taking a heavy grid current at $\mathbf{E_g+1}$ the deflection of the meter indicating the grid voltage may be observed to fall slightly below the red line. Provided, however, that the initial adjustment was accurately carried out no attempt should be made to compensate for the fall.

(5) The difference between the two readings gives the mutual conductance in milliamperes change of anode current per volt change of grid voltage.
For example, if a valve shows an anode current of 30 mA at zero grid voltage (key 'normal') and of 33 mA with the grid one volt positive (key depressed), it will have a mutual conductance of 3 mA per volt.

(6) The value obtained should be checked against the value listed in the schedule as *the end of life* conductance for the type, and the particular valve should be rejected if the measured value is less than that given in the schedule.

Insulation Test

All valves should be inserted in the right-hand valveholder; the left-hand valveholder should not be used at all.

The test is made by raising the right-hand key to the position marked **Insulation** and by noting the reading obtained on the microammeter. It will be realised that *the larger the reading the lower will be the insulation resistance and vice versa.* Thus a full-scale deflection is equivalent to an insulation resistance of only 0.2 MΩ, whereas a deflection of only one microampere is equivalent to an insulation resistance of approximately 300 MΩ.

Valves should be rejected if their anode to grid insulation resistance is less than **25 M** Ω. Since this value is indicated under the test conditions by a reading of **11.5** μ**A**, valves should be rejected if the current shown on the microammeter has a value *greater* than this.

When testing the insulation of an indirectly heated valve it is important that the cathode should be quite cold since otherwise an unduly high current reading will be obtained corresponding to a false low value of insulation. It is, therefore, better to test indirectly heated valves for insulation before the heaters have been switched on for any other test because the emission takes some time to die away.