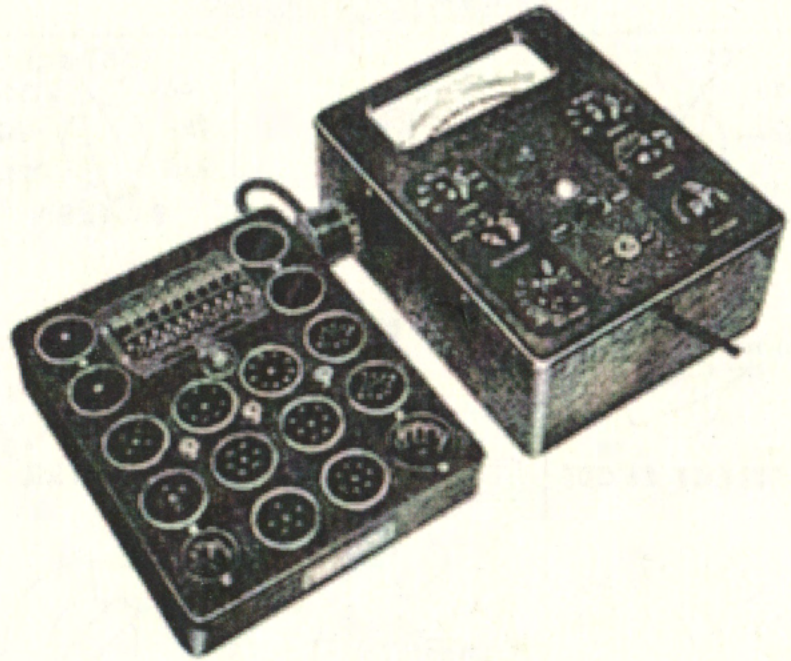
THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.
WINDER HOUSE, DOUGLAS STREET, LONDON, S.W.1
Telephone: VICtoria 3404-9.

2M1047

# INSTRUCTIONS

## FOR USING THE

# "AVO" VALVE TESTER



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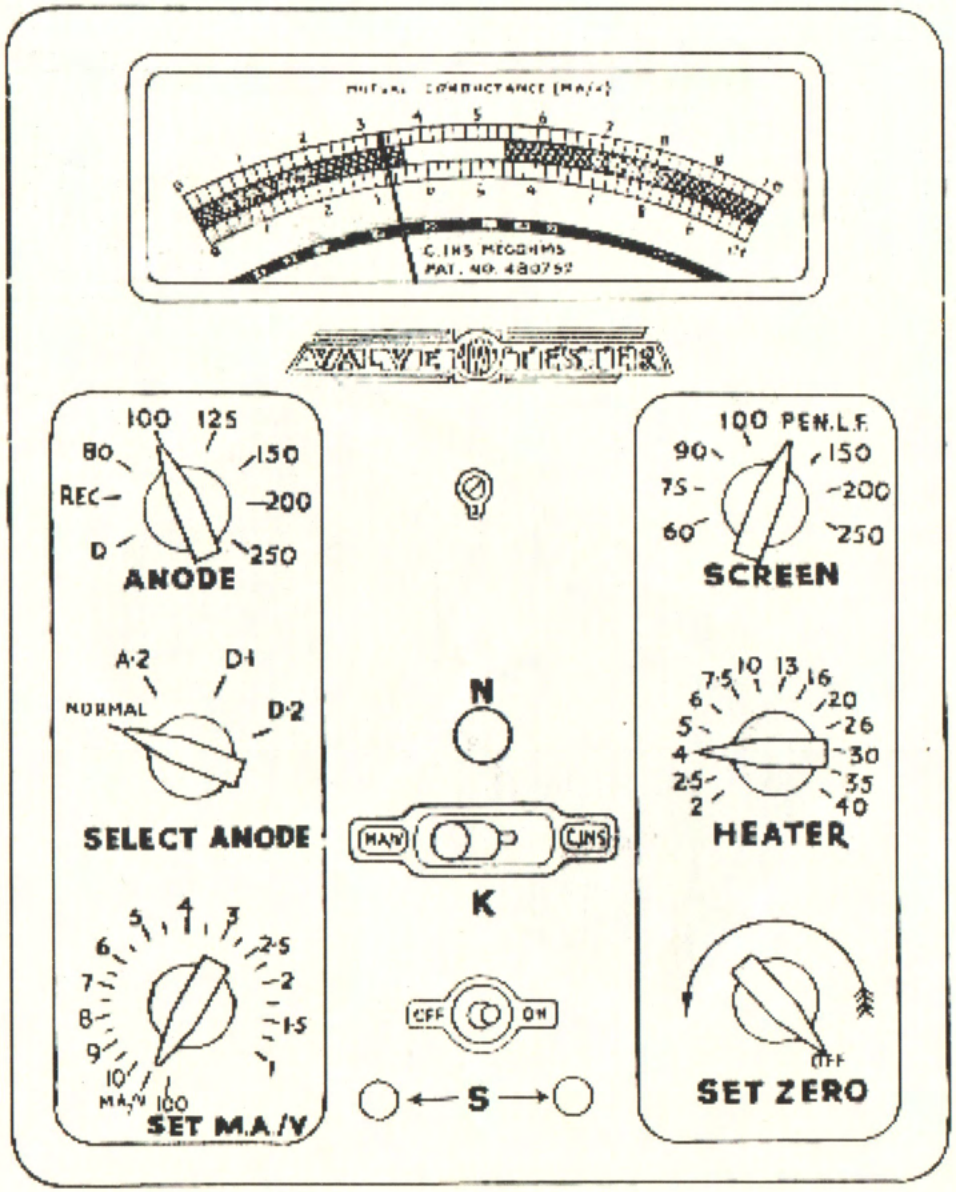
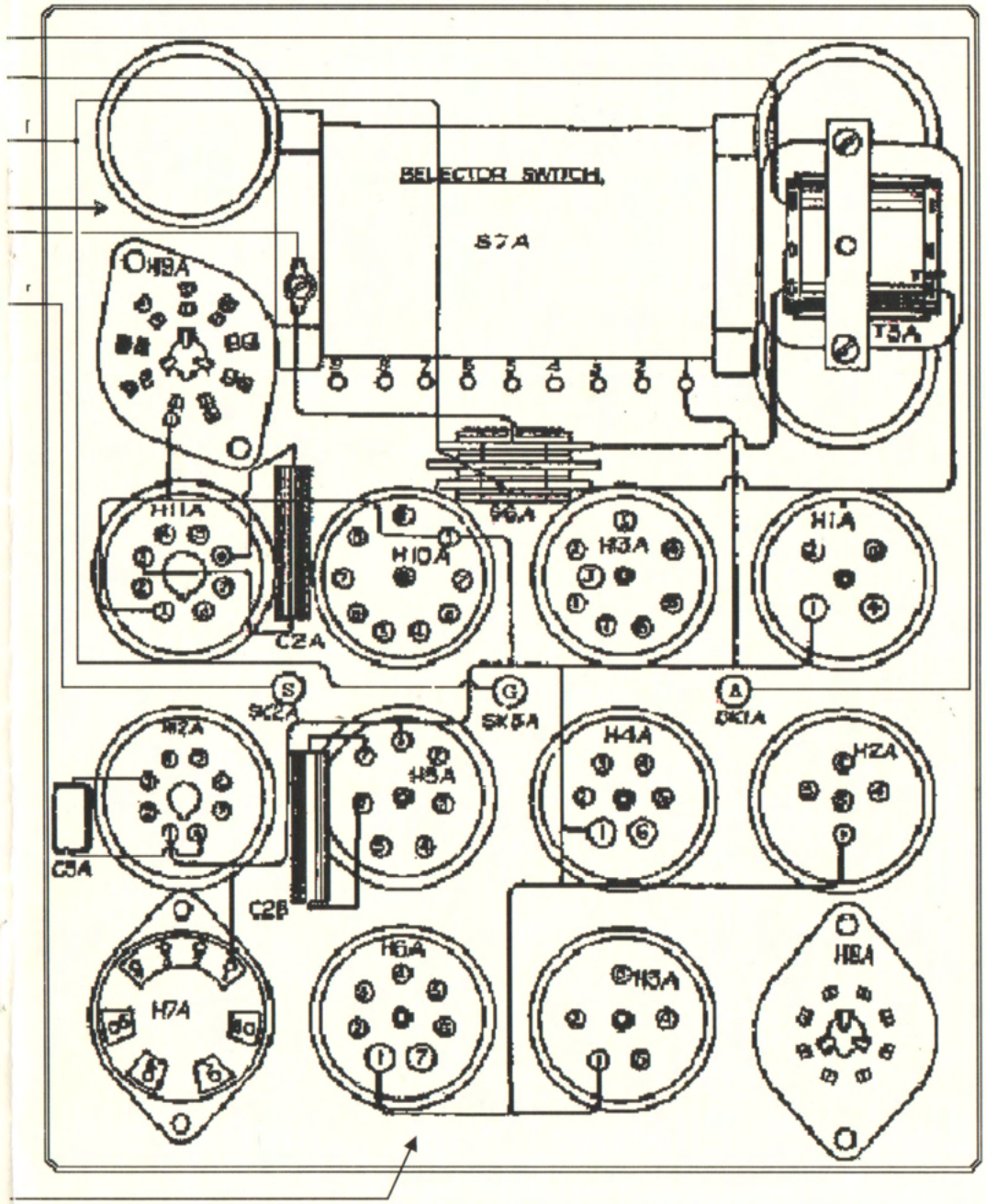
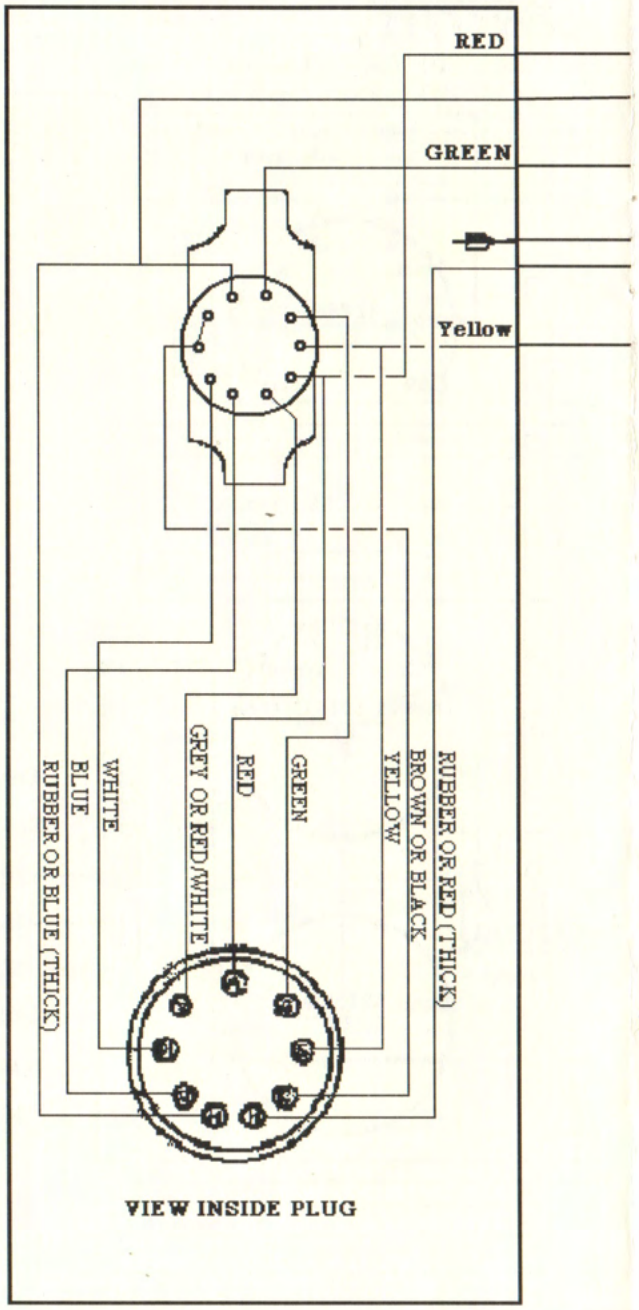

MUTUAL CONDUCTANCE (MA/V)
C. INS MEGOHMS
PAT. NO. 480752
VALVE TESTER
100 125 80 150 REC 200 D 250
ANODE
A·2 D·1 NORMAL D·2
SELECT ANODE
MA/V 100
SET M.A./V
N
MAN C.INS
K
OFF ON
S
100 PEN.L.F. 90 150 75 200 60 250
SCREEN
7·5 10 13 16 6 20 5 26 4 30 2·5 35 2 40
HEATER
OFF
SET ZERO


SELECTOR SWITCH.
S7A
H9A
T5A
H11A
H10A
H3A
H1A
C2A
S
SK2A
G
SK3A
A
SK1A
H2A
H5A
H4A
H2A
C3A
C2B
H7A
H6A
H13A
H8A

## AVO VALVE TESTER VALVE PANEL

## WIRING FROM VALVE PANEL TO PLUG →

## WIRING OF SWITCH CONTACTS 2-9 as No.1




VIEW INSIDE PLUG

# THE "AVO" VALVE TESTER

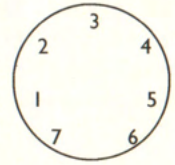
## INSTRUCTIONS FOR USE

The "AVO" valve tester is supplied adjusted to work from 230 V. AC. mains (unless other instructions have been given).

Adjustments for other mains voltages may be easily carried out by removing the small circular disc underneath the meter unit. This will disclose a paxolin plate upon which is mounted a screw driver operated switch, terminals and a floating mains lead. In order to set the instrument for operation on 100-150v or 200-250v A.C. the floating mains lead is set to the 100v terminal for the 100-150v range or to the 200v terminal for the 200-250v. range, and the nearest make-up number is set upon the switch. For example, for operation on 220v. AC. supply, the floating lead would he set to 200 and the switch set to 20. **For accurate results it is essential that the mains voltage tapping be correctly set.**

### Valve Holder Panel.

This panel has one of each type of valve holder in common use at present , and one spare place for future development. The function of the rotary switch is to connect the electrodes of the valve under test to the instrument, and therefore each of the nine rotatable rollers represents a pin number, and reading from left to right they conform to the standard numbering adopted by all the valve manufacturers, with the exception of the 7-pin continental base. There appears to be no rigid universal pin numbering of this base and the diagram along side shows the numbering, which we have adopted, the base being viewed from the underneath of the panel.




The numbers engraved on the rollers are arbitrary and have no reference to actual pin numbers, their inclusion being necessary to enable a simple indexing system be used. In other words, each roller represents a valve pin, and each number on a roller represents an electrode connection to the instrument. Consequently, any roller, and therefore valve-pin, can be connected to any electrode connection in the instrument.

Every valve listed in the data book supplied with the instrument has, in the column next to the type number, a figure containing nine digits, each of which represents a roller. If the rollers are rotated until this figure shows in the window the panel is then set up to receive this particular valve. All rollers not connected to valve pins are set to "0 " or earth. It should he noted that as the extreme left-hand roller is Pin No. 1, and the next roller is Pin No. 2, and so on, a four - pin valve must have at least five noughts at the end of its set up figures. Immediately under each number engraved on the roller is marked the corresponding electrode sign . This enables the operator to set up the number for a valve that is not listed in the data book from the pin connection the maker's catalogue. For instance , if we look at the pin connections of an octal frequency changer valve, they will be given as follows.

| | | |
|---|---|---|
| 1. Shielding. | 2. Heater. | 3. Anode (Hexode.) |
| 4. Screen Grids (G.2, G.4.) | 5. Oscillator and Mixer Grids | 6. Oscillator Anode. |
| 7. Heater. | 8. Cathode. | Top Cap-control Grid. |

From this data, we can set up the nine rollers as follows, reading from left to right :—

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | 2 | 7 | 5 | 4 | 6 | 3 | 1 | 0 |
| E | H- | A2 | S | G | A | H+ | C | E |

Thus we get the number 0 2 7 5 4 6 3 1 0 which is the number that would be shown in the data book. It will be noted that, as there are only eight electrode connections, the ninth roller is set to "0" or earth. The third roller, corresponding to valve pin No. 3, and therefore hexode anode, is set to A.2 and the sixth roller, represent valve pin No. 6, the oscillator triode anode , is set to "A" or normal anode. This enables the two halves of the valve to be tested by setting the anode selector to normal and A.2 respectively. By following this procedure, any valve base arrangement can be set up, it being merely necessary to find the pin connections from the manufacturer's leaflet. The other columns in the data book are almost self-explanatory. They show respectively the top cap connection, the heater volts (H.V.), the anode volts (A.V.) the screen volts (S.V.), and lastly, the correct mutual conductance for the valve, or in the case of rectifiers, the emission figure that should be obtained. In the case of pentodes having a side terminal the letter S in the column marked T.C. refers to the side terminal connection which is connected to screen volts. The connection to the top cap or side terminal of a valve is made by one of the two leads provided having a plug at one end and a spade tag or grid clip at the other end. The plug is inserted into the appropriate socket on the valve holder panel marked A (anode,) S (screen,) or G (grid.)

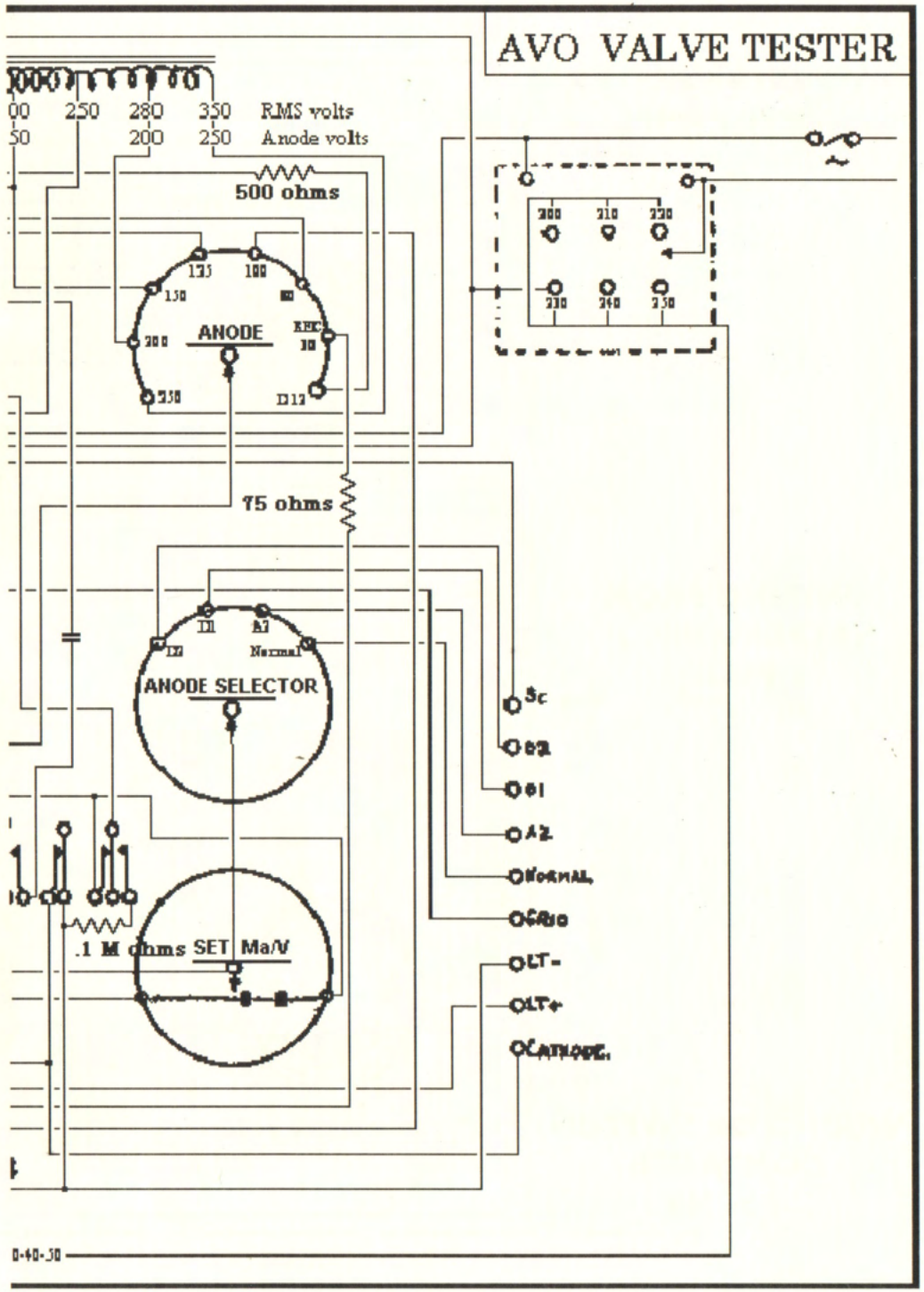
## TESTING A VALVE.

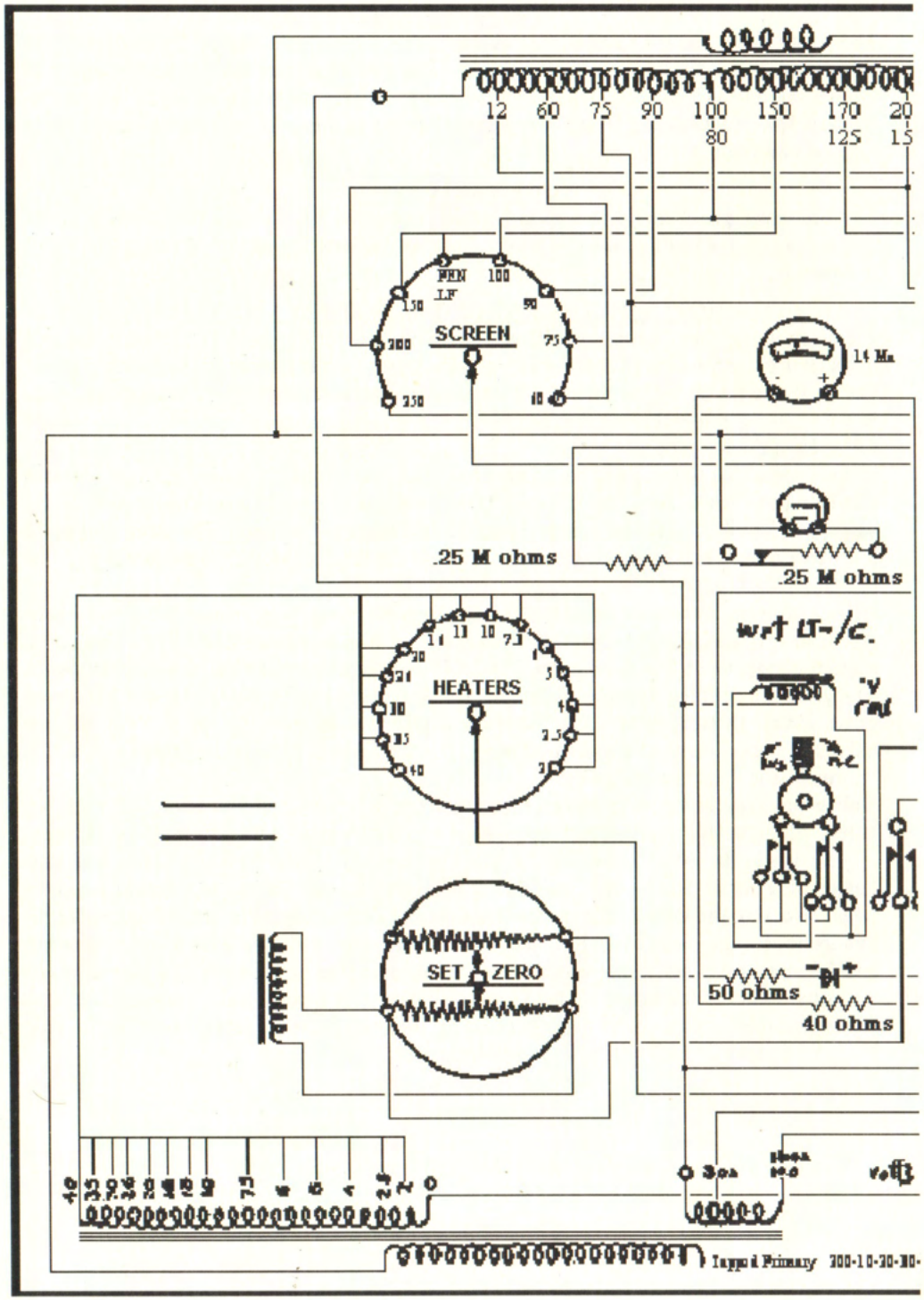
First test the valve for electrode shorts. For this purpose two leads are supplied, one terminating in a crocodile clip and the other in a short prod. These leads should be plugged firmly into the sockets (S) at the foot of the instrument. If now the crocodile clip be clipped on to the anode pin of the valve and the prod touched on the other pins in turn, the neon light (N ) will light if leakage is present between the anode and any other electrode. With valves such as pentodes, in which high voltages are applied to the screen, this process should be repeated with the clip lead clipped on to the screened pin . The the neon glow will indicate the amount of leakage present. *This test is important and should be applied before the valve is inserted in the tester* a short between anode or screen and another electrode might cause excessive current to be taken from the tester. The above test can be utilised for testing filament continuity. It will be noticed that when the testing leads are not inserted in the sockets (S ) the neon lamp merely shows when the instrument is switched on.

Next, consult the data book to ascertain the set up figure which should be set up in the window on the panel. Then *with the instrument switched off,* the correct electrode voltages should be selected by means of the switches on the meter *before the valve is inserted.* The mA/V control should be set to 100 and in the case of triodes, screen grid valves, pentodes, etc. , the anode selector should be set at "normal."

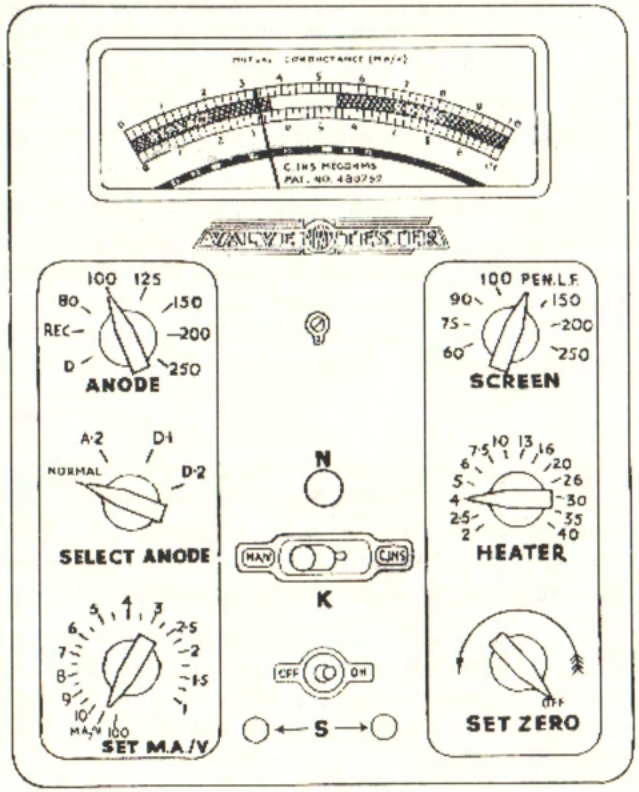
Now with the valve inserted, and the instrument switched on , the meter needle will rise, indicating the initial anode current of the valve.








This current should be backed off to zero by means of the control marked "set zero" and the mA/V control then turned to the position marked "mA/V." The set zero control can now be finally adjusted so that the meter reads zero accurately. If now the key (K) is pressed in the direction marked mA/V, the meter needle will rise and indicate on the scale (calibrated 0-10) the mutual conductance of the valve in mA/V. This can be compared with the figure given for a good valve. An alternative method of testing the comparative goodness of the valve is as follows:- When the initial current of a valve has been backed off to zero, consult the chart and note the mutual conductance figure given. The mA/V control should now be set to this figure and the meter needle set accurately to zero. If now the key (K) is pressed in the direction "mA/V", the position of the needle on the coloured scale will show the valve as good –indifferent– or replace. It will be noted that the mA/V control is set to 100 before a valve is tested as a precautionary measure to prevent the initial current of the valve from damaging the meter. If the initial current gives only a small deflection on this scale, the control may be turned to mA/V position before backing off.




If the valve passes the tests satisfactorily, its heater/cathode insulation can be checked by depressing the key in the direction marked "C ins." when the insulation will be shown in megohms on the black scale. No hard and fast rule can be laid down with respect to a limit value of cathode/heater insulation, but in general with modern valves, this will be found to be several megohms. A valve may be suspected of causing hum in a set if its insulation resistance is less than 250,000 ohms. Before measuring the cathode/heater insulation of pentodes, return the screen voltage switch to "60", otherwise erroneous results might be obtained.

Always return the set zero control to its zero position (as far as possible in a clockwise direction) after a test has been made. Although no harm will be done if the instrument is left on for long periods it is best to switch off at the end of a test so that a subsequent valve is not accidentally inserted when the wrong heater volts are being applied.

## Pentodes.

In isolated cases, when testing certain valves of the H.F. and L.F. Pentode types, the initial anode current does not attain a definite maximum but rises gradually, making it difficult to read mutual conductance. A slight reduction of the screen volts below the rated figure will generally cure this trouble, without causing much error in the mutual conductance reading.

## Q.P.P. Valves.

In the case of Q.P.P. valves, which consist of two pentodes in the same glass envelope, only one set of figures, however, apply to each half of the valve, the two halves being selected by moving the Anode Selector switch to "normal" and A2 respectively.

## Class B.

Similar remarks apply to Class B. valves, but in this case mutual conductance figures are not often given, and it is sufficient to test the two halves of the valves for matching.

## Rectifiers.

Rectifiers are tested for emission by setting the mA/V scale to 100 and an anode selector switch to D.1 in the case of a half wave valve, and D.1 and D.2 respectively for the two halves of a full wave valve. In this test it is not necessary to touch the key or move the mA/V control from 100. The set zero control should be left at its off position during the test. The meter needle reading will show emission of the rectifier in milliamps, full scale deflection representing 100 mA. The figure obtained can be compared with the value given in the chart.

## Diode Test.

H.F. diode and double diode valves are similarly tested for emission with the anode voltage switch set at D. and the mA/V control at mA/V. The emission figure for each diode can then be taken with the anode selector at D.1 and D.2 respectively, full scale representing 10 mA. No definite figure is given but the reading should be greater than 0.5 mA. In general it will be found to be between 1 and 5 mA.

## Multiple Diode Valves.

With multiple diode valves such as D.D. triode, the figures given in the chart refer to the triode only, which is tested as indicated, with the anode selector at normal. The diodes can be tested by moving the anode selector to D.1. And setting the controls as explained in the diode test.

## Frequency Changers.

Frequency changer valves are tested in two halves, two set of figures being given on the chart. The first set of figures relates to the oscillator section of the valve, taken with the anode selector at normal. The second set relates to the hexode or pentode section for which the anode selector should be turned to A.2.

## American Valves.

It will be noticed that the mutual conductance figures given in the American tables are often somewhat higher than those given on the valve makers' lists. This is because the figures given by the makers are dynamic figures, whereas this instruments measures the static mutual conductance of the valve which is generally between 10% and 25% higher than its dynamic equivalent.



## Tuning Indicators.

These valves are treated as triodes, and increasing screen volts should be applied to the target pin until a fluorescent glow appears The manufacturers do not give a figure of mutual conductance for the triode section, but as a general rule it is in the neighbourhood of 1.5, and a reading in any way approximating to this will indicate that the valve is in good condition.

## Dry Battery Valves.

The universal panel includes a modification to enable 1.4 volts to be obtained at the heater sockets for testing battery valves. Full instructions for use are given in the Valve Data Book.

## NOTES ON THE USE OF THE ROTARY SWITCH.

Although at the time of this issue all valves have their set up figure recorded in the data book, it is quite possible that other valves will appear on the market in the future . These can easily be set up by the operator from the pin connections given in the makers' catalogue, always remembering that pin No. 1 is the left hand roller, pin No. 2 the second roller from the left, and so on.

In the case of heptodes, pentodes, triode hexodes, and triode pentodes, the oscillator anode should be set to A(6) and it naturally follows that the reading for this section of the valve will be taken with the Anode Selector switch set to "normal". The other section of the valve must have its anode set to A.2(7) and the reading will then be taken with the selector switch at "A.2.".

All control grids should be set to G (4), top cap grids being plugged into the grid socket.

As "Class B" and Q.P.P. valves are double valves it is necessary to take two reading of mutual conductance but here again, it is not necessary to set up the connections twice. The grids are coupled together by turning the appropriate rollers to G (4), and the screen grids, if any, by turning to S (5), but if the anodes are set to A (6) and A.2 (7), the two halves of the valve can be measured separately by turning the Anode Selector switch to "normal" and "A.2" respectively.

Valves having a heater with a centre tap taken out to a pin should be set up with the two halves of the heater parallel and the voltage applied should be the lower of the two usually shown in the maker's catalogue. The centre-tap pin must be set to H-(2), and both heater pins set to H+(3) thus paralleling the two heaters. Great care should be taken when selecting the heater voltage for these valves as the makers to not always make the connections quite clear. For instance, the U.30 is always shown with a series filament and 26 volts, but when being tested in this instrument it must have parallel filaments and 13 volts. This is important. There are several of this type of valve listed in the data book, and they can easily be distinguished by the fact that their set-up– number invariably carries one "2" and two "3's" somewhere in its make-up