

PATTERSON

THE HICKOK CARBONATIC VALVE TESTER

Programming Instructions

The programming is arranged by selecting certain numbers on the PUNCH CARDS according to the potentials and currents that it is desired to apply to the valve under test.

The information about the valves' required characteristics is obtained from a manufacturers' data book, and from the Technical Manual the related switching is calculated.

The method of transferring the information to the PUNCH Card is to first decide which switch is to be closed, and then with a soft pencil mark a cross on the appropriate circle of the PUNCH CARD.

As each circle on the PUNCH CARD corresponds to a switch in the valve tester, it is easily seen that the switches can be closed or opened by either leaving the circles unpunched or by punching out the centre.

Punching out the centre OPENS the switch, so that switches **SELECTED** are switches to be closed, and are therefore left **UNPUNCHED**.

Thus, when the PUNCH CARD has been fully filled in with pencilled crosses and further checked, **ALL UNMARKED CIRCLES ARE PUNCHED OUT WITH THE SPECIAL PLIERS PROVIDED.**

The card must be carefully and legibly marked with the valve description.

PUNCH CARDS These are marked with 187 circles, each of which corresponds to a switch in the instrument. The circles are mixed in 11 columns, coded from A to L (I is missing) and in 17 rows, numbered from 1 to 17.

The columns correspond to the pins of a valve, thus :-

| | | | | | | | | | | |
|--------|---|---|---|---|---|---|---|---|---|-------|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | T/Cap |
| Column | A | B | C | D | E | F | G | H | J | K |

- Row No. 1, A to J is the heater(pos) line
- 2, A to J is the heater(no.) line
- 3, A to K is the Control Grid line.
- 4, A to K is the Cathode line
- 5, A to J is the Screen Grid line
- 6, A to K is the Suppressor Grid line
- 7, A to K is the Anode line

Internal Shield connections are earthed by switch L 8.
For all the other points, refer to the Technical Manual.

The HICKOX Automatic Valve Tester

Programming Instructions :- In setting up the cards for normal valves, the following instructions are to be adhered to.

- All cathodes are connected to earth.
- All suppressor grids connected to earth.
- Fixed Bias is used in all cases.
- Anode voltages are not considered separately, anodes being connected via Cm Measuring circuit to HF Positive.
- Screen grids are connected to their appropriate potentials.

In special cases where other tests are required, special cards are to be prepared with reference to the Technical Manual for the equipment. Double valves will normally require two cards, each part being tested separately. Dou-triodes with identical halves will require one card.

FILAMENT CONNECTIONS

Fil pos. connections are to Row 1, A-J.
Fil neg. connections are to Row 2, A-J.

Filament supplies are programmed thus :

To connect Rows 1 and 2 to supply,

Select A12 ,B 15.

Required voltage is chosen from following table. One switch of each decade must be selected, making three in all.

| <u>Decade 1</u> | <u>Decade 2</u> | <u>Decade 3</u> | <u>Example</u> |
|-----------------------|-----------------------|-----------------------|---|
| <u>Volts - Switch</u> | <u>Volts - Switch</u> | <u>Volts - Switch</u> | |
| 0 A 9 | 0 A 10 | 0.0 A 11 | To select 6.3v for filaments, switches A 9 0 G 10 6 D11 <u>0.3</u> 6.3 will be selected. |
| 10 B 9 | 1 B 10 | 0.1 B 11 | |
| 20 C 9 | 2 C 10 | 0.2 C 11 | |
| 30 D 9 | 3 D 10 | 0.3 D 11 | |
| 40 E 9 | 4 E 10 | 0.4 E 11 | |
| 50 F 9 | 5 F 10 | 0.5 F 11 | |
| 60 G 9 | 6 G 10 | 0.6 G 11 | |
| 70 H 9 | 7 H 10 | 0.7 H 11 | |
| 80 J 9 | 8 J 10 | 0.8 J 11 | |
| 90 K 9 | 9 K 10 | 0.9 K 11 | |
| 100 L 9 | | | |
| 110 L 10 | | | |

Notes on filament supplies.

For DC filament tubes, switches A 12, B 13 are ~~xxxxx~~ not selected, K 1, Z 2 are to be selected. To tie the filament to the cathode line, select the switch in Row 4 (cathode line) numbered the same as the switch selected in Row 2, (filament negative).

This will short out the 50 ohm resistor used in obtaining the electrical centre of AC filament tubes, and will show as a HEATER/CATHODE short on the meter scale ; therefore switch G 17 must be selected to eliminate the HEATER/CATHODE leakage test.

Switch L 11 places a 100 ohm resistor across the filaments to obtain the electrical centre. DO NOT SELECT IF FILAMENT VOLTAGE IS GREATER THAN 12-6 VOLTS.

CATHODE CONNECTIONS

Cathode connections ~~xxxxx~~ Row 4, A to K

Earth cathode, select L 14.

To select range for HEATER/CATHODE leakage sensitivities, make the following selections. (Note: G 17 must NOT be selected for these tests)

| | | |
|-----------------|----------------------|--|
| 10 microamperes | - no selection | <u>Typical requirements</u> |
| 20 " " | - Select A 14 | Clamping diodes - 10 uA |
| 50 " " | - Select B 14 | R.F. pentodes, diodes 20 uA |
| 70 " " | - Select A 14, B 14. | Triodes, power |
| 100 " " | - Select C 14 | pentodes, - 50 uA |
| 150 " " | - Select B 14, C 14. | DD Rectifiers, up to 150 uA. |

Rejection point is at 10% of Full Scale.

Grid Connections

Grid connections are via Row 3, A to K.

Select the following switches :

- H 14 - this connects the cathode to one end of the bias network.
- A 16 - this connects the grid line onto other end of network.
- C 16 - this connects fixed bias supply to resistor network.
- L 14 - this connects the cathode to (floating) earth.
- J 14 - this connects a 4 ufd condenser from grid to cathode.
- L 13 - this connects a 0.222 volt ac signal in series with bias network.

NOTE: K 13 selected in place of L 13 would connect the grid directly to bias network.

The grid resistor 'R' is to be calculated from the following formula,

$$\text{where 'R' = } \frac{\text{reqd. bias volts} \times 15000}{150 - \text{reqd bias volts.}}$$

When the desired 'R' has been calculated, the relative switch can be deduced from the following table: To bring the 'R' into circuit, this switch number must be PUNCHED OUT, thus opening the switch. All other switches in the table are to be selected. 'R' may have to be made up from several resistors, requiring several switches.

| <u>'R'</u> | | | |
|----------------|-----------------|------------------|--------------------|
| 10 ohms - D 13 | 100 ohms - E 13 | 1000 ohms - F 13 | 10,000 ohms - G 13 |
| 20 ohms - D 14 | 200 ohms - E 14 | 2000 ohms - F 14 | 20,000 ohms - G 14 |
| 30 ohms - D 15 | 300 ohms - E 15 | 3000 ohms - F 15 | 30,000 ohms - G 15 |
| 40 ohms - D 16 | 400 ohms - E 16 | 4000 ohms - F 16 | |

SCREEN GRID CONNECTIONS

Screen Grid connections - Row 5, A to J.
To connect Row 5 to HT Positive, select J 15.

| <u>Reqd.</u> <u>Volts.</u> | <u>Max.</u> <u>mAmps.</u> | <u>Select Switches.</u> |
|-------------------------------|------------------------------|-------------------------|
| 10 | 69 | D 17, L 3, L 4. |
| 20 | 72 | D 17, E 17, L 4. |
| 30 | 75 | D 17, L 4. |
| 40 | 76 | D 17, E 17. |
| 50 | 80 | D 17. |
| 60 | 82 | C 17, D 17, L 3, L 4. |
| 70 | 86 | C 17, L 3, L 4. |
| 80 | 90 | C 17, B 17, L 4. |
| 90 | 95 | C 17, L 4. |
| 100 | 100 | C 17, E 17. |
| 110 | 110 | C 17. |
| 120 | 119 | B 17, L 3, L 4. |
| 130 | 129 | B 17, E 17, L 4. |
| 140 | 140 | B 17, L 4. |
| 150 | 140 | B 17, E 17. |
| 160 | 129 | E 17. |
| 170 | 120 | L 2, L 3, L 4. |
| 180 | 110 | L 2, E 17, L 4. |
| 190 | 102 | L 2, L 4. |
| 200 | 94 | L 2, E 17. |
| 210 | 85 | L 2. |
| 220 | 77 | L 3, L 4. |
| 230 | 60 | E 17, L 4. |
| 240 | 60 | L 4. |
| 250 | 50 | E 17. |
| 260 | 42 | no selection. |

Row 6

SUPPRESSOR CONNECTIONS. IF SUPPRESSOR NOT INTERNALLY CONNECTED
- ~~SELECT~~ SELECT K-16

ANODE CONNECTIONS

Anode connections, Row 7, A to K.

Anodes are not connected directly to HT Positive line, but through the Mutual Conductance measuring bridge to the same potential selected for the Screen Grid.

Thus to connect Gm bridge to HT positive supply, Select H 15.

To connect Gm bridge to Anode line, Select K 17, A 13, B 13, H 13.

For Triode valves, where no screen has been selected,

To connect Gm bridge to HT positive supply, Select K5.

To connect Gm bridge to Anode line, Select K 17, A 13, B 13, H 13.

To Set Mutual Conductance Ranges.

Two ranges of Gm are catered for :-

Range No. 1. - 500 to 26,000 u-mhos. Select L 12.

Range No. 2. - 26,000 to 123,000 u-mhos. Select L 7.

The requisite Gm figure will be obtained from a valve manual, and by applying it to with the correct formula below, the correct CHOICE Number will be calculated.

Thus for Range No. 1, the CHOICE NUMBER = $(Gm - 500) \div 100$

for Range No. 2, the CHOICE NUMBER = $(Gm \div 500) - 1$

This done, the correct meter shunt selecting switches are obtained from the following tables,

| <u>PRIMARY CHOICE NUMBER</u> | <u>METER SHUNT RESISTOR (ohms)</u> | <u>Select Switches. (L 7 or L 12 closed)</u> |
|------------------------------|------------------------------------|--|
| 1 | A (1280) | C 12. |
| 2 | B (640) | D 12. |
| 4 | C (320) | E 12. |
| 8 | D (160) | F 12. |
| 16 | E (80) | G 12. |
| 32 | F (40) | H 12. |
| 64 | G (20) | J 12. |
| 128 | H (10) | K 12. |

Note 1 mA/V - 1,000 u-mhos.

A worked example of this operation is as follows.

Let the Cm be 10,000 U-mhos. Select L 12.

This is Range no. 1, and the formula to be applied is $(Cm - 500) \div 100$.

Thus : $\frac{(10,000 - 500)}{100} = 95$, which is the PRIMARY CHOICE NUMBER.

Applying this number to the tables, we find that there is no 95 on the list, so numbers totalling 95 are selected, thus,

| |
|----------|
| 64 |
| 16 |
| 8 |
| 4 |
| 2 |
| <u>1</u> |
| 95 |

To apply this to the KAMMXX equipment, the switches relative to the chosen shunts are to be selected. In the above case this would mean

| | |
|----------|--------------|
| For 64 | select J 12. |
| 16 | select G 12. |
| 8 | select F 12. |
| 4 | select E 12. |
| 2 | select D 12. |
| <u>1</u> | select C 12. |
| 95 | |

REFERENCE : Tech Manual 5.55.