VALVE ELECTRONIC

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

# CV6019

| Specification AD/CV6019<br>Issue 2 Dated 14th April, 1961.<br>To be read in conjunction with K1001 | SECURITY<br>Specification Unclassified | Valve Unclassified |
|---|---|---|

→ Indicates a change.

TYPE OF VALVE - Cathode Ray Tube with two guns

TYPE OF DEFLECTION - Electrostatic (Symmetrical)

TYPE OF FOCUS - Electrostatic

ENVELOPE - Glass: internally coated with conductive coating.

SCREEN - GG2

PROTOTYPE - D5AK/611

**Marking**

See K1001/4

**BASE**

B24A

See drawing on Page 6.

**CONNECTIONS**

See drawing on Page 6.

**DIMENSIONS**

See drawing on Page 6.

**MOUNTING POSITION**

Any

**RATINGS** (for each gun)

(All limiting values are absolute)

| | | | Note |
|---|---|---|---|
| Heater Voltage | (V) | 6.3 | |
| Heater Current | (A) | 1.0 | A |
| Max. Anode 1 Voltage | (kV) | 2.0 | |
| Max. Anode 2 Voltage | (V) | 500 | |
| Max. Anode 3 Voltage | (kV) | 2.0 | |
| Max. Anode 4 Voltage | (kV) | 12.0 | |
| Max. Negative Grid Voltage | (V) | 100 | |
| Max. Heater-Cathode Voltage | (V) | 100 | |
| **TYPICAL OPERATING CONDITIONS** | | | |
| Anode 1 Voltage | (kV) | 1.6 | |
| Anode 2 Voltage | (V) | 300 | |
| Anode 3 Voltage | (kV) | 1.6 | |
| Anode 4 Voltage | (kV) | 10 | |
| Grid Cut-off Voltage | (V) | -40 | |
| Performance under these conditions, see Note B. | | | B |

**NOTES**

A. This is the total heater current with the two heaters connected in parallel. The heaters should always be operated in parallel.

B. Under these operating conditions the X and Y deflection factors are about 31 V/cm and 7 V/cm respectively, the maximum X and Y deflections are 10.5 cms and 5 cms respectively, and the two traces may be made to overlap by at least 1 cm as measured in the Y direction.

C. Joint Services Catalogue No. 5960-99-037-2094.

## TESTS

To be performed in addition to those applicable in K1001. In each test, except tests 'b', 'l', 'o', 'p', 'r', 's', 't', 'u', each gun is to be considered separately and is identified where necessary by the suffix A or B. The deflecting voltage shall be applied symmetrically.

| | Test Conditions | | | | | | Test | Limits Min. | Limits Max. | No. Tested |
|---|---|---|---|---|---|---|---|---|---|---|
| a | See K1001/5.A.13 | | | | | | CAPACITANCES (pF) | | | |
| | | | | | | | (1) Grid to all other electrodes | - | 10 | T.A. |
| | | | | | | | (2) Cathode to all other electrodes | - | 10 | |
| | | | | | | | (3) Y1 to all other electrodes except Y2. | - | 7 | |
| | | | | | | | (4) X1 to all other electrodes except X2. | - | 5 | |
| | | | | | | | (5) X1 to X2 | - | 2.5 | |
| | | | | | | | (6) Y1 to Y2 | - | 2 | |
| | | | | | | | (7) X to X (See Note 1) | - | ~~0.7~~ 2.0 | |
| | | | | | | | (8) $X_A$ to $X_B$ (See Note 1) | - | ~~0.2~~ 1.0 | |
| | | | | | | | (9) $Y_A$ to $Y_B$ (See Note 1) | - | ~~0.3~~ 0.5 | |
| | | | | | | | (10) $Y2_A$ to $Y1_B$ (See Note 1) | - | ~~0.3~~ 0.5 | |
| | Vh (V) | Va4 (kV) | Va3 (kV) | Va2 (V) | Va1 (kV) | Vg (V) | | | | |
| b | 6.3 | 0 | 0 | 0 | 0 | 0 | Heater Current (For the two heaters in parallel) (A) | 0.8 | 1.2 | 100% |
| c | 6.3 | 0 | 0 | 0 | 0 | 0 | Heater-cathode leakage (μA) | - | 100 | 100% |
| | Test voltage = ± 100V (See K1001/5.A.3.3) | | | | | | | | | |
| d | 6.3 | 10 (See note 7) | 2 | Optimum Focus Value | 2 | Adjust for cut-off | Negative Vg for cut-off (V) | 30 | 70 | 100% |
| | (See K1001/5.A.10) | | | | | | | | | |
| e | 6.3 | 10 (See note 7) | 2 | Adjust for Optimum focus | 2 | Adjust | 1. Negative Vg (V) | 1 | - | 100% |
| | Vg adjusted to give a light output of 0.25 candela from a close raster of convenient size. | | | | | | 2. Change in value of Vg from that noted in test (d) (V) | - | 30 | 100% |
| f | 6.3 | 10 (See note 7) | 2 | Adjust for optimum focus | 2 | Adjust | 1. Line width (mm) | - | 0.8 | 100% |
| | Deflection: With a linear timebase of 10 kc/s nom. and a line length of 45 mm in the X and Y directions successively, the line width shall be measured at the centre of the trace. Grid: The grid shall be pulsed positively from cut-off with amplitude equal to the value obtained in test e (2). The nominal pulse duration shall be 100 microsecs and the recurrence rate 100 p.p.s. Also, see Note 2. | | | | | | 2. Va2 (V) | 230 | 330 | 100% |

Amdt 2

TESTS (Cont'd)

CV6019

| Test Conditions | | | | | | | Test | Limits | | No. Tested |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vh (V) | Va4 (kV) | Va3 (kV) | Va2 (V) | Va1 (kV) | Vg (V) | | Min. | Max. | |
| g | 6.3 | 0 | 0 | 0 | Adjust See Note 3 | | Cathode current (μA) | 400 | - | 100% |
| h | 6.3 | 10 See Note 7 | 2 | 500 or (2) With recommended method of K1001/5A.3.2. using a 7 megohm resistor | 2 | -70 | Grid Insulation (1) Leakage Current (μA) | - | 10 | 100% |
| | | | | | | | (2) Increase in voltmeter reading | - | 100% | 100% |
| j | 6.3 | 10 See Note 7 | 2 | Adjust for optimum focus. (See Note 4) | 2 | Adjust for convenient brightness. | Rectilinearity, measured as angle between adjacent sides of a nominal 4 cms X 8 cms raster. | 88° | 92° | 100% |
| k | 6.3 | 10 See Note 7 | 2 | Adjust for optimum focus. (See Note 4) | 2 | Adjust for convenient brightness. | "Pincushion" and "Barrel" distortion. Deviation from straight lines of the sides of a nominal 4 cms X 8 cms raster (mm) | - | 1 | 100% |
| l | 6.3 | 10 See Note 7 | 2 | Adjust for optimum focus. (See Note 4) | 2 | Adjust for convenient brightness. | 1. Deviation from the face centre of the centre of the straight line joining the two undeflected spots (mm) | - | 5 | 100% |
| | | | | | | | 2. Separation, measured in X-direction, between the two traces obtained by deflecting the two spots in the Y-direction (mm) | - | 10 | 100% |
| m | 6.3 | 10 See Note 7 | 2 | Adjust for optimum focus. (See Note 4) | 2 | Adjust for convenient brightness. | Orthogonality between X and Y axes of deflection. | 88° | 92° | 100% |
| n | 6.3 | 10 See Note 7 | 2 | Adjust for optimum focus (See Note 4) | 2 | Adjust for convenient brightness | Useful Screen Area 1. X deflection (mm) | 100 | - | 100% |
| | | | | | | | 2. Y deflection (mm) See Note 8 | 45 | - | 100% |

| | Test Conditions | | | | | | Test | Limits | | No. Tested |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Min. | Max. | |
| | Vh (V) | Va4 (kV) | Va3 (kV) | Va2 (V) | Va1 (kV) | Vg (V) | | | | |
| o | 6.3 | 10 Sensitivity | 2 | Adjust for optimum focus (See Note 4) | 2 | Adjust for convenient brightness | Overlap, measured in Y direction, between the largest possible raster produced by Gun A and the largest possible raster produced by Gun B. (mm) | 10 | - | 100% |
| p | 6.3 | 10 Sensitivity | 2 | Adjust for optimum focus (See Note 4) | 2 | Adjust for convenient brightness | Angle between the X axes of deflection for the two guns. | - | 1° | 100% |
| q | 6.3 | 10 Sensitivity | 2 | Adjust for optimum focus (See Note 4) | 2 | Adjust for convenient brightness | X deflection factor (V/cm) | 35 | 43 | 100% |
| | | | | | | | Y deflection factor (V/cm) (See Note 5) | 8 | 10 | 100% |
| r | 6.3 | 10 Sensitivity | 2 | Adjust for optimum focus | 2 | Adjust for convenient brightness | Deflection (caused by interaction) of the spot produced by one gun when the full deflection voltages are applied to the other gun (mm) | - | 0.5 | 100% |
| s | 6.3 | 0 | (See Note 6) | | 0.45 | Adjust | Gas current (μA) (See Note 6) | | 0.05 | 100% ← |
| t | 6.3 | 10 Sensitivity | 2 | Adjust The useful screen area to be covered by unfocused rasters. | 2.0 | Adjust for convenient brightness. | 'Dead' spots on the screen shall not exceed 1.0 mm in diameter. The number of 'Dead' spots greater than 0.5mm in diameter. | - | 10 | 100% |
| u | 0 | 10 | 0 | 0 | 0 | 0 | Current in the P.D.A. helix (μA) | - | 200 | 100% |

NOTES

NOTE 1 The capacitance to be measured is:- in (7), that between the X-plates of the gun joined together and the Y-plates of the same gun joined together; in (8), that between the X-plates of gun A joined together and the X-plates of gun B joined together; in (9), that between the Y-plates of gun A joined together and the Y-plates of gun B joined together; and in (10), that between the Y2-plate of gun A and the Y1 plate of gun B (these being adjacent plates).

NOTE 2 The mean Y-plate potential may be varied with respect to the A3 potential, but by not more than ± 50 volts, in order to reduce the spot astigmatism and, hence, the line width.



/NOTE 3 ....

NOTES (CONT'D)

CV6019

**NOTE 3** With Vg = - 30V, adjust Va1 to the value V at which the cathode current is 1 μA. Then measure the cathode current when Va1 = V and Vg = 0. The required minimum value of this current is 400 μA.

**NOTE 4** The potential of the X-plate Screen, S, which is connected to pin 18, may be varied with respect to the A3 potential, but by not more than ± 150V, in order to improve the linearity in test (j) and to diminish the distortions in test (k). The optimum value so found for the potential of the X-plate screen shall be maintained in the subsequent tests (l), (m), (n), (o), (p), and (q).

**NOTE 5** The deflection factors of one gun shall not differ by more than 5% from the corresponding deflection factors of the other gun.

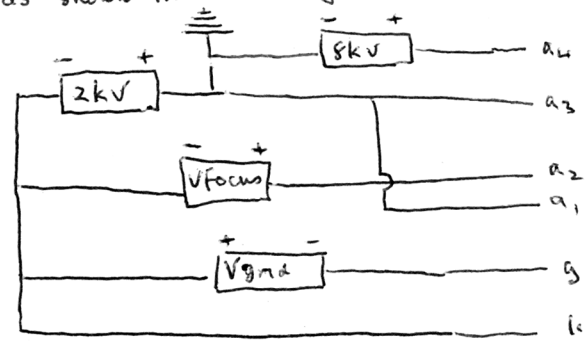
Amdt 1

**NOTE 6** "FOR THIS TEST ONLY the deflection and P.D.A SYSTEMS ARE TO BE ISOLATED"

For this vacuum test, Va1 = 450V, anodes 2 and 3 are joined together and are at - 75V, and Vg is adjusted so that the cathode current is 50 μA. The 'gas current' is the positive ion current collected by the joined anodes 2 and 3. Either gun A or gun B may be used for the test.

NOTE 7 "THE A3 SHOULD BE AT OR NEAR EARTH POTENTIAL AND TO ENSURE this the P.D.A. VOLTAGE should be 8 K.V CONECTED DIRECTLY ACROSS the P.D.A helix as shown in the diagram:

Amdt 1




NOTE 8. It is permissible for the contours of the useful screen area to overlap the edge of the screen. The useful screen area is to be measured symmetrically about a point 19mm vertically above the centre of the screen (in the case of gun "A") and 19mm vertically below the centre of the screen (in the case of gun "B")

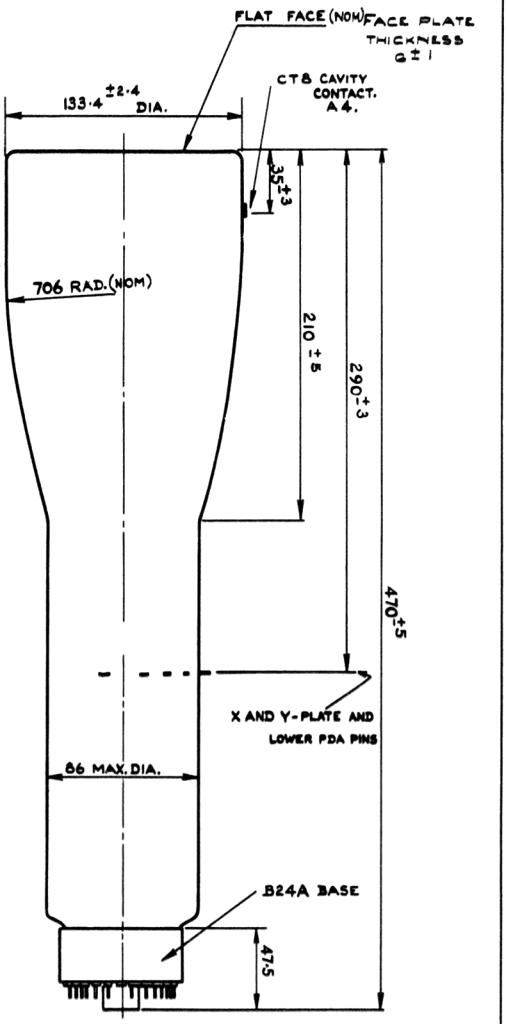
## NOTES.

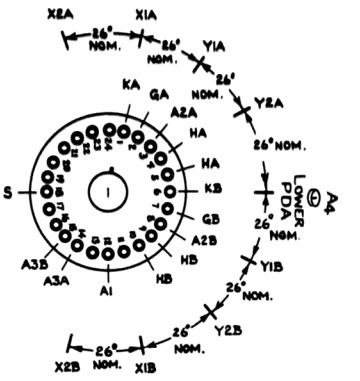
WHEN THE SCREEN IS VIEWED WITH THE TUBE POSITIONED SO THAT ITS AXIS IS HORIZONTAL AND PIN 24 IS UPPERMOST, A POSITIVE VOLTAGE APPLIED TO THE X1A PIN DEFLECTS THE SPOT TO THE LEFT, AND A POSITIVE VOLTAGE APPLIED TO THE Y1A PIN DEFLECTS THE SPOT UPWARDS; AND SIMILARLY FOR THE X1B AND Y1B PINS, RESPECTIVELY.

THE PIN CONNECTION MARKED "LOWER P.D.A." IS THE CONNECTION TO THE LOW-POTENTIAL END OF THE P.D.A. HELIX. IN ALL THE TESTS IN THIS SPECIFICATION, AND ALSO WHEN THE TUBE IS IN USE, THE POTENTIAL OF THIS CONNECTION IS THE SAME AS THAT OF A3.

THE EIGHT SIDE-PIN CONNECTIONS TO THE DEFLECTING PLATES, AND THE SIDE-PIN CONNECTION TO "LOWER P.D.A." ARE EACH 7-10mm LONG AND 0·05 INCH IN DIAMETER.

THE ORIENTATION OF THE A4 CONTACT SHALL BE WITHIN ± 15° OF THAT OF THE "LOWER P.D.A." PIN, AND WITHIN ± 15° OF THAT OF PIN 5 IN THE BASE.




DIMENSIONS IN MM.

BASE AND SIDE-PIN CONNECTIONS

ELECTRONIC VALVE SPECIFICATIONS
SPECIFICATION AD/CV 6019

ISSUE 2 DATED 14th APRIL, 1961

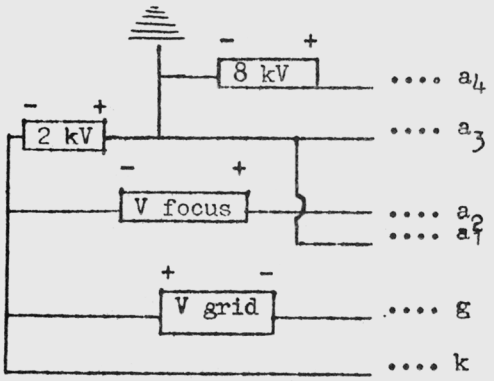
AMENDMENT No. 1

Pages 2, 3 and 4. Clauses d, e, f, h, j, k, l, m, n, o, p, q, r and t

In the $V_{a4}$ and $V_{a3}$ columns under 10 and 2, respectively, add:- "See Note 7."

Page 5 Add: Note 7

"The $a_3$ should be at or near earth potential and to ensure this the p.d.a. voltage should be 8 kV connected directly across the p.d.a. helix as shown in the diagram:




Page 3 Clause "1"

Delete existing sentence at "2" and re-word as follows:

"With an a.c. deflecting voltage applied to y plates, and the x plates operating at $A_3$ potential, the horizontal separation of the two traces is measured.

Page 5 Note 6

Add the following sentence:

"For this test only the deflection and p.d.a. systems are to be isolated."

Page 6 Drawing

NOTES

The second paragraph should be amended to read as follows:

"The pin connection marked lower p.d.a. is the connection to the low potential end of the p.d.a. helix. In all the tests in this specification (with the exception of test "s") and also when the tube is in use, the potential of this connection is the same as that of $a_3$. In the case of test clause "s" the p.d.a. and deflection systems are to be isolated."

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION AD/CV6019/ISSUE 2 DATED 14 APRIL 1961

AMENDMENT NO 2

1. Test (a)

Amend the max limits as indicated below:-

(7) from 0.7 to 2.0

(8) from 0.2 to 1.0

(9) from 0.3 to 0.5

(10) from 0.3 to 0.5

2. Test (n)

In the Test column insert 'See Note 8'.

3. Page 5

Insert a new note 8 as follows:-

'It is permissible for the corners of the useful screen area to overlap the edge of the screen. The useful screen area is to be measured symmetrically about a point 19 mm vertically above the centre of the screen (in the case of gun 'A') and 19 mm vertically below the centre of the screen (in the case of gun 'B').'

12/11

ASWE - April 1970

SPECIFICATION AD/CV6019/ISSUE 2 DATED APRIL 1961

AMENDMENT NO 3

1 Page 3 Test n

DELETE the existing information given in the 'Test' 'Limits' and 'No Tested' columns.

INSERT the following:-

| | | | | | |
|---|---|---|---|---|---|
| a | Useful Screen Areas (See Note 8) | | | | |
| | (1) X deflection | (mm) | 100 | - | 100% |
| | (2) Y deflection | (mm) | 45 | - | 100% |
| b | Usable Screen Area | | | | |
| | (1) X deflection | (mm) | 100 | - | 100% |
| | (2) A Gun: | | | | |
| | Y deflection above centre line of tube | (mm) | 30 | - | 100% |
| | (3) B Gun: | | | | |
| | Y deflection below centre line | (mm) | 30 | - | 100% |

2 Page 5 Note 8

DELETE the existing second sentence entirely.