VALVE ELECTRONIC

CV965

ADMIRALTY SIGNAL & RADAR ESTABLISHMENT

Specification AD/CV965 Issue 7 Dated 7.12.50. To be read in conjunction with K1003.	SECURITY Specn. Unclassified Valve Unclassified

TYPE OF VALVE:- Cathode Ray Tube.

TYPE OF DEFLECTION AND FOCUS:- Magnetic.

BULB:- Internally coated with conductive layer.

SCREEN:- Dark Trace Type.

PROTOTYPE:- VCR 520 modified with respect to decay characteristic etc.

RATINGS

Heater Voltage	(V)	4.0
Heater Current	(A)	1.15
Max. Anode Voltage	(KV)	15.0

MARKING

See K1003/7 and Note 'A' below

BASE AND CONNECTIONS

See K1001/AIV/D2.[10]

Pin	Electrode
1	No connection
2	Heater
3	Pin omitted
4	" "
5	Grid
6	Pin omitted
7	Heater
8	Cathode
Side connection See Note 'B'	Anode

DIMENSIONS

See page 6.

PACKING

See K1005.

NOTES

A. A white line approximately 1 cm. long shall be marked on the edge of the cylindrical portion of the tube at the screen end. This line shall be marked within 90° of the anode side arm, and at the end of that diameter of the screen that is at right angles to the axis of the tube. (When the tube is set up in the equipment the white line will be positioned at the top. This will ensure that the tilt of the screen can be corrected by purely horizontal movement of the tube).

B. Where pins are required to be omitted from the base, the resulting holes shall be filled.

C. Four aquadag spots, approximately 0.5 mm. in diameter and in no case greater than 1.0 mm shall be marked on the inside of screen on the circumference of the circle which is 74 mm. in diameter and concentric with the screen itself. One spot shall be on the same radius as the white line described in Note 1 and each pair of adjacent spots shall subtend an angle of sensibly 90° at the centre of the screen. Another similar spot shall be marked as near as possible to the centre of the screen, and within a circle, concentric with the screen, of diameter 5 mm.

TESTS

To be performed in addition to those applicable in K1003.

In all tests, unless otherwise stated, Vh = 4.0 V., Va = 10 KV.

	Test Conditions	Test	Test Limits Min.	Test Limits Max.	No. Tested
a		Ih (A)	1.1	1.2	100%
b	As K1003/5.14 with Va = 15KV	Modulator/Anode Leakage current (μA)	-	4.0	100%
	TESTS OF SCREEN QUALITY				
c	Screen observed when tube is not operating.	(i) Screen Colour	The screen shall not be darker in any part than the darkest tint in the approved scale of tints.		100%
		(ii) Variation in screen colour	Variations in whiteness of the screen to be not greater than that between consecutive tints in the scale.		100%
d	The tube shall be operated with optimum focus and a 'Z' scan as detailed in Note 1.	Screen Efficiency	60%	-	100%
e	With conditions as in test 'd' the decay characteristic shall be measured as described in Notes 1 and 2.	Decay Characteristic	62%	72%	100%
	TESTS OF GUN QUALITY				
f	As for test 'd' but Vmod adjusted for I_b cut-off.	Vmod for Cut-Off (V)	-65	-125	100%
g	D.C. current passed thro' scan coils to deflect beam off screen on to aquadag. Vmod adjusted to, say Vmod-a, to give Ib = 5 μA Vmod adjusted to, say Vmod-b, to give I_b = 400 μA.	(i) Vmod-a (V)	-60	-120	100%
		(ii) Vmod-a minus Vmod-b	To be less than the values given by the curve in Fig.3.		100%

TESTS (Contd.)

	Test Conditions	Test	Test Limits Min.	Test Limits Max.	No. Tested
h	The tube shall be operated with optimum focus and deflecting coils supplied with 'Z' scan impulses to produce a 20 line raster 25 frames/sec. of size 6.3 cms x 4.8 cms. D.C. bias on grid to be set to give just perceptible trace on screen. A superimposed single pulse of amplitude equal to Vmod-a minus Vmod-b (test g(ii)) lasting 1/25th sec. to be applied to the modulator electrode from an approved pulse generator. The mercury vapour lighting shall be extinguished for this test.	Focus quality (line width) (mm)	-	0.375	100%
j	Vmod set at cut off. Deflection and focus fields removed. Vmod gradually raised until a faint spot appears on tube face. Deviation from centre of face measured.	Deviation of unfocussed spot from centre of tube face (mm)	-	6.0	100%

NOTES

1. Method of Measuring Screen Characteristics.

Focussing and scanning fields are provided by approved equipment. A television type Z scan of 405 lines per frame at 25 frames sec (sequential or interlaced) with a ratio writing time/elapsed time of 0.77:1 is to be applied. With mercury lighting on, the D.C. bias (Vmod) is adjusted to produce a just perceptible trace on the tube face with a continuously operating raster, the raster size on the tube face (1.36 x 1.36 cms) being adjusted for amplitude and position until its projected image completely fills an area of 10.88 x 10.88 cms (x8 magnification) marked out on a frosted translucent screen provided (See Note 2).

2. For the purpose of measuring contrast and decay the tube face shall be illuminated with at least 5000 foot candles (green) (See Note 3) of high pressure mercury vapour discharge light, while maintained at a temperature between 30°C and 40°C by means of an approved light box and blower. An image of the tube screen, with a magnification of X8, is projected by means of the standardised optical apparatus on to the translucent viewing screen for centering, and then after removal of this screen on to the photocell arrangement shown in Fig.1. The photocell is connected to a suitable galvanometer or, other instrument whose maximum period is 1/3 sec. The aperture of the cell is first illuminated by the light reaching it from the unscanned, and therefore undarkened tube screen and the instrument reading noted. The light from the tube face is then prevented from reaching the cell, and the resultant change in reading "P" corresponding to "total blackness" of the screen is noted. Light from the screen is again allowed to reach the cell and the portion of the screen "seen" by the cell is traversed (and thus partially

NOTES (Contd.)

blackened) by the scanning sweep whose intensity has been increased by a pulse signal applied to the modulator electrode so as to increase the beam current to 600 μA for 2 successive scan frames (i.e. total elapsed time of 2/25 secs) only; on a 1.36 x 1.36 cms raster and allowing for suppression, this corresponds to a 20 μ coulombs per cm^2 excitation. The maximum change in deflection "Q" produced by this partial blackening of the screen is noted, as is also the amount "X" by which the deflection falls from Q in 10 secs. The galvanometer or instrument reading is observed by eye or photographically recorded. For the latter case a curve of the type shown in Fig.2 will be obtained. The contrast or screen efficiency is defined as the percentage value given by 100q/F. The decay rate (or number) is defined as the percentage value given by 100X/q and approaches 100 for a very "fast" tube.

3. The illumination from the mercury vapour lamps is measured as follows. A 45 mm Dia. EEL barrier layer selenium cell without any filter is illuminated to a known density by a Tungsten lamp calibrated to operate at 2848°K, the cell working into a meter of 1000 ohms (max.) (preferably 200 ohms) impedance. The sensitivity of the cell in μA/lumen is then obtained. A green filter (Wratten 59) is placed in front of the cell and the current again measured. The measurement of μA/"green lumen" thus obtained is used to measure the intensity of the mercury vapour lighting placing the EEL cell in the position which the tube face will occupy. Protection against overload of the EEL cell is provided by neutral filters of known density (in addition to the green filter) and allowance is made for the light absorbtion in the neutral filters.

4. Cathode and Modulator Test.

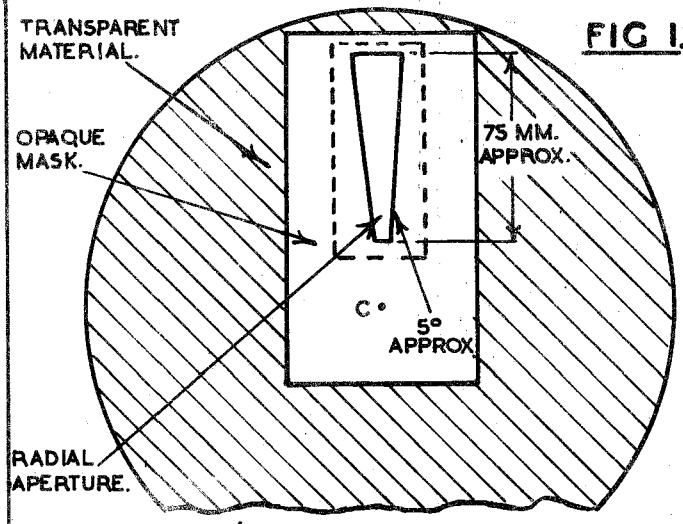
The purpose of the test is to examine cathode emissivity. A poor cathode will be indicated by a falling-off in the slope of the Ib/Vmod curve as Ib is increased to 400 μA. A measure of the average slope of the Ib/Vmod curve is obtained by measuring the change (Vmod A - Vmod B) in modulator voltage required to increase Ib from 5 to 400 μA. The smaller this change the greater the slope. With a good cathode in the gun the slope will depend only on the gun geometry which, in turn, will determine the voltage Vmod-A. The greater the numerical value of Vmod-A the smaller will be the "geometrical" slope and the greater will be the difference between the Vmod-A and Vmod-B, as shown in Fig.3.

If a gun which gives a particular Vmod-A has a value of (Vmod-A - Vmod-B) greater than indicated on the curve of Fig.3, it means that the slope is less than it should be for that particular geometry and that, therefore, the cathode emission is inadequate.

During this test the beam should be deflected by DC through the scan coils so that it no longer strikes the screen of the tube.

CV965.

FIG 1.



THE PHOTOCELL (TYPE EEL, EQUIPPED WITH GREEN FILTER) PLACED AS SHEWN BY THE DOTTED RECTANGLE. DISTANCE FROM 'C' TO CENTRE OF CELL: 133 MM.

FIG 2

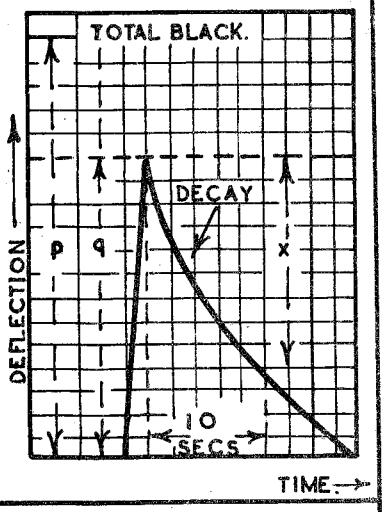
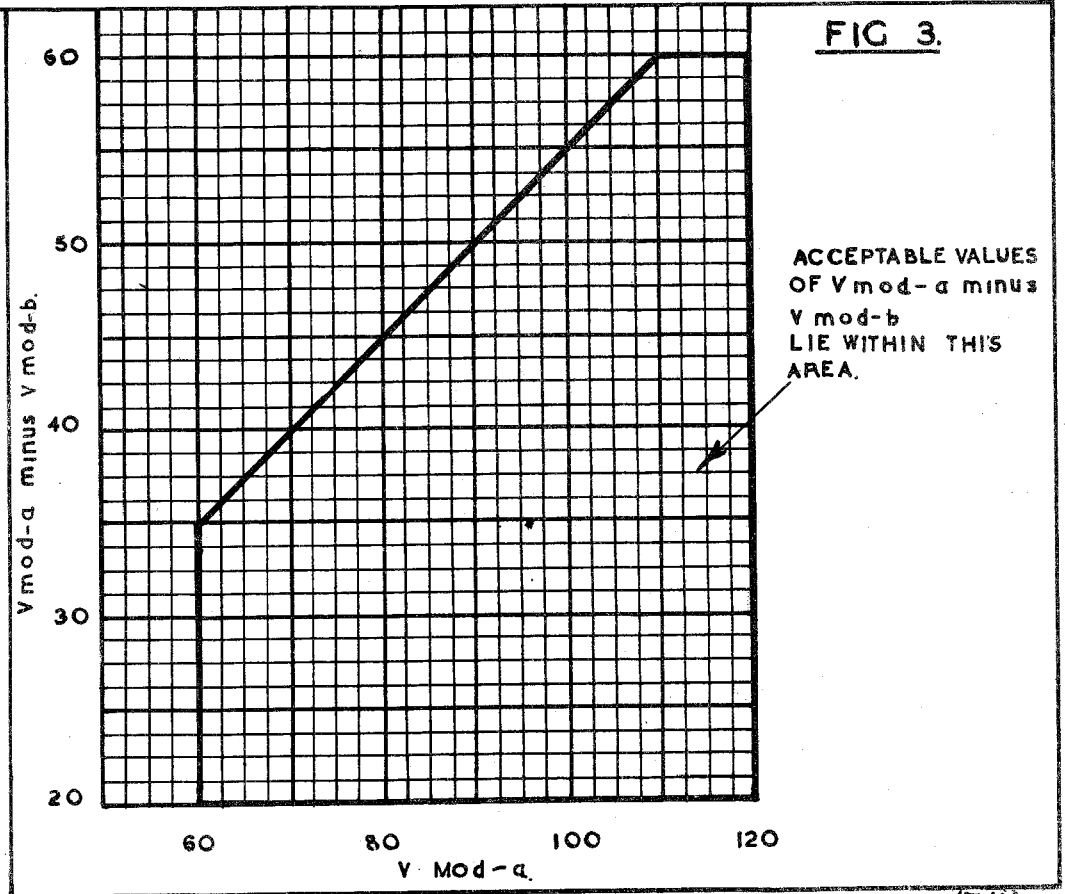
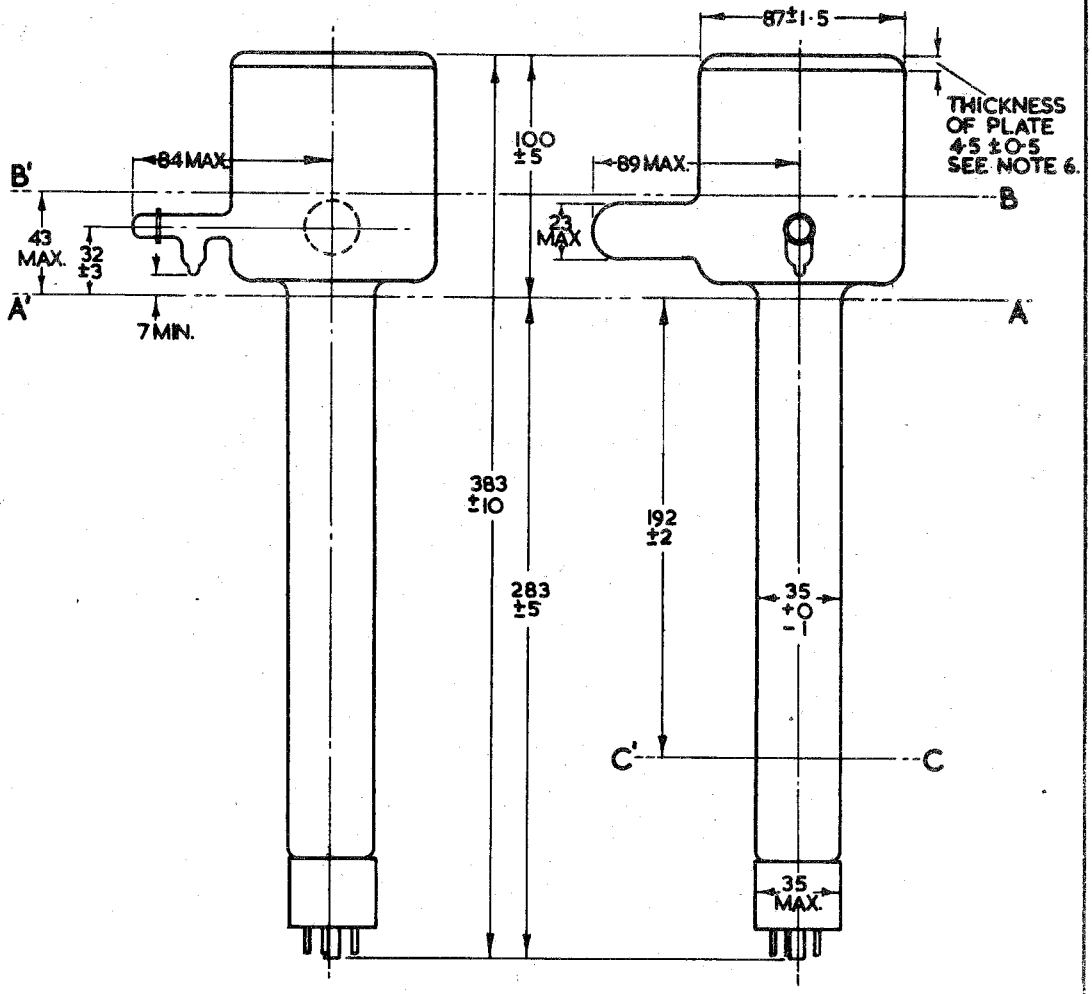


FIG 3.





NOTES

1. AXIS A'A REPRESENTS THE PLANE OF CONTACT OF 38 MM. DIA. RING GAUGE.
2. AXIS B'B IS SUCH THAT THE SECTION OF THE BULB FROM B'B TO THE FACE OF THE TUBE MUST BE TRULY CYLINDRICAL.
3. AXIS C'C REPRESENTS THE PLANE OF THE MODULATOR OR LIMITING APERTURE.
4. THE INTERNAL CONDUCTIVE COATING SHALL BE OF SUCH DIMENSIONS THAT IT FUNCTIONS EFFECTIVELY BUT DOES NOT OBSCURE THE REQUIRED USEFUL SCREEN AREA.
5. THE NECK OF THE TUBE SHALL BE SUFFICIENTLY STRAIGHT FOR A 100 MM. LONG GAUGE OF 36 MM. MAX. INTERNAL DIA. TO SLIDE FREELY OVER THE NECK AND BASE.
6. THE MINIMUM USEFUL SCREEN AREA SHALL BE A CIRCLE OF RADIUS 38 MM. CENTRED ON THE CENTRE OF THE SCREEN. OVER THIS AREA THE FLATNESS OF THE INNER SURFACE OF THE GLASS PLATE MUST BE SUCH THAT ALL POINTS ON THE INNER SURFACE LIE BETWEEN TWO PARALLEL PLANES 0.15 MM. APART, WITH AN ANGLE OF TILT TO THE AXIS OF THE TUBE NOT GREATER THAN 1.0°.
7. ALL DIMENSIONS IN MILLIMETRES.