MINISTRY OF AVIATION, D.L.R.D./R.A.E.

VALVE ELECTRONIC

C.V.2659

SPECIFICATION M.O.A./CV.2659	SECURITY	
	SPECIFICATION	VALVE
Issue 3 Dated 2.11.59.	Unclassified	Unclassified
To be read in conjunction with BS.448, BS.1409 and K.1001.		

TYPE OF VALVE: Beam Tetrode for Pulse Modulator and Blocking Oscillator Service

CATHODE: Indirectly Heated

ENVELOPE: Glass, unmetallised

PROTOTYPE: 3D21A

MARKING

See K.1001/4.

See K1001/A1D/B2
M Dimension BASE
(V) Applies BS.448/10.

RATINGS
(All limiting values are absolute)

			NOTES
Heater Voltage	(V)	6.3	A,B
Heater Current	(A)	1.7	A,B
Heater Voltage	(V)	12.6	A,C
Heater Current	(A)	0.85	A,C
Max. Peak Anode Voltage	(kV)	5	D
Max. D.C. Anode Voltage	(kV)	3.5	E,F
Max. Screen Grid Voltage	(V)	850	F
Max. Peak Negative Control Grid Voltage	(V)	500	D
Max. Peak Positive Control Grid Voltage	(V)	220	
Max. Anode Dissipation	(W)	15	
Max. Control Grid Dissipation	(W)	0.5	
Max. Screen Dissipation	(W)	3	
Max. Heater-Cathode Voltage	(V)	±150	
Max. Pulse Length	(μ secs)	10	G
Anode Current	(mA)	31.5	H
Screen Current	(mA)	2.5	H
Mutual Conductance	(mA/V)	5.2	H
→ Max. Acceleration (continuous operation)	(g)	1.0	
→ Max. Shock (short duration)	(g)	500	

CAPACITANCES (pF)

C in (nom.)	17
C out (nom.)	10
Ca,g1 (max.)	1.2

CONNECTIONS

Pin	Electrode	
1	Heater CT	h(tap)
2	Heater	h
3	No connection	NC
4	Screen Grid	g2
5	No connection	NC
6	Control Grid	g1
7	Heater	h
8	Cathode	k
T.C.	Anode	a

DIMENSIONS

See K.1001/A1/D1.

Dimension (mm)	Min.	Max.
A	-	122
B	-	46

MOUNTING POSITION

Vertical.

NOTES

A. Cathode must be preheated for a minimum of 30 seconds before applying grid pulse.

B. Heaters parallel-connected.

C. Heaters series-connected.

D. Including transients.

E. With maximum screen voltage of 400 volts and when no transients are present (essentially resistive anode load) a maximum D.C. anode voltage of 4500V D.C. may be applied.

F. Series resistance must be inserted in the power supply to limit the D.C. short-circuit current to less than 0.5A.

G. Total pulse length in any 240μ second period shall not exceed 12μ seconds.

H. Measured at Va = 600V D.C. Vg2 = 300V D.C. Rk = 825Ω.

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TEST CONDITIONS: Unless otherwise stated.

Vh (V)	Va (V)	Vg2 (V)	Rk (Ω)
6.3	600	300	825

K.1001 Ref.	TEST	TEST CONDITIONS	AQL %	Insp. LEVEL	SYMBOL	LIMITS MIN.	LIMITS BOGEY	LIMITS MAX.	UNITS
	GROUP A								
	Heater Current		-	100%	Ih	1.5	1.7	1.9	A
5.3	Heater Cathode Leakage Current.	Vhk = ± 100V. Note 1.	-	100%	Ihk	-	-	175	µA
	Reverse Grid Current		-	100%	-Ig1	-	-	5	µA
	Anode Current (1)		-	100%	Ia	28	31.5	35	mA
	Screen Current		-	100%	Ig2	-	-	3	mA
	Mutual Conductance		-	100%	gm	4.2	5.2	6.2	mA/V
	Anode Current (2)	Va = 4 kV., Vg2 = 300V. Vg1 = -150V. Rk = 0 RL = 2 MΩ	-	100%	Ia	-	-	300	µA
	High Voltage Pulse Operation	Va = 4 kV., Vg2 = 800V. Vg1 = -150V., Vg1 peak pulse volts = +150V. Note 2.	-	100%	-		NOTE 3		-
	Peak Anode Current	Va = 420V. Vg2 = 800V. Vg1 = -150V. Vg1 peak pulse volts = +150V. Note 4.	-	100%	Iapk	6.5	-	-	A
	Peak Screen Current	As for Peak Anode Current test. Note 4.	-	100%	Ig2pk	-	-	4.0	A
	Peak Grid Current (1)	As for Peak Anode Current test. Note 4.	-	100%	Ig1pk	-	-	2.0	A
	Peak Grid Current (2)	As for Peak Anode Current test except that Vg1 Peak pulse volts = +50V. Note 4.	-	100%	Ig1pk	30	-	-	mA
	GROUP B								
A.III	Capacitance	Measured on 1Mc/s bridge in fully shielded holder. Valve unscreened. Note 5.	6.5	IA	Cag1 Cin Cout	- 13 7.5	- 17 10	1.2 21 12.5	pF pF pF
→	GROUP C								
11.2	Resonance Search	Vh = 12.6V., Va = 250V., Vg2 = 100V., Vg1 = -10V., RL = 2 kΩ. Acceleration = 2 g min. Frequency Range = 30-250c/s	6.5	IC	- Va(rms)	- -	- -	- 500	- mVrms
11.3	Fatigue	Vh = 6.3V. No other voltages Acceleration = 2.5 g min. Frequency = 170 ± 5 c/s. Note 6.		IA	-	-	-	-	-

TESTS (Contd.)

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K.1001 Ref.	TEST	TEST CONDITIONS	AQL %	INSP. LEVEL	SYMBOL	LIMITS MIN.	LIMITS BOGEY	LIMITS MAX.	UNITS
	Post Fatigue Tests								
5.3	Heater-Cathode Leakage Current	Vhk = ± 100V. Note 1.	6.5	-	Ihk	-	-	175	µA
	Reverse Grid Current		6.5	-	-Igl	-	-	10	µA
	Mutual Conductance		6.5	-	gm	4.2	5.2	6.2	mA/V
11.4	Shock Test	No voltages. Hammer angle = 30°. Number of shocks in each direction = 5.	-	IA	-	-	-	-	-
	Post Shock Tests								
5.3	Heater-Cathode Leakage Current	Vhk = ± 100V. Note 1.	6.5	-	Ihk	-	-	175	µA
	Reverse Grid Current		6.5	-	-Igl	-	-	10	µA
	Mutual Conductance		6.5	-	gm	4.2	5.2	6.2	mA/V
→	GROUP D								
AVI/5.3	Life. Note 7.	Va = 3.5kV., Vg2 = 800V. Vg1 = -150V., Vg1 peak pulse volts = +150V.	-	IC	-	-	-	-	-
AVI/5.6	Life Test End Point (500 hours)								
	Peak Anode Current	As for Peak Anode Current in Group A.	6.5	-	Iapk	5.0	-	-	A
→	GROUP E								
AIX/2.5	Electrical Retest after 28 days holding period.		-	100%					
AVI/5.6	Inoperatives.		0.5	-	-	-	-	-	-

NOTES

1. 100 kΩ resistance connected in series with Vhk.
2. After a minimum pre-heat time of 30 secs. with heater volts only, the valve shall be subjected to the following pulse conditions in the circuit on page 5, Fig.1.
   A substantially rectangular pulse having a peak amplitude as specified and a duty cycle of not less than .001 (averaged over a time interval of less than 20 m.secs.) shall be applied to the grid of the valve under test.
3. Initial arcing may be tolerated but the valve shall be free from arcing after a period of one minute.
4. After a minimum pre-heat time of 30 secs. with heater volts only, the valve shall be subjected to the following pulse conditions in the circuit shown on page 5, Fig.2.
   A substantially rectangular pulse having a peak amplitude as specified and a duty cycle of not less than .001 (averaged over a time interval of less than 20 m.secs.) shall be applied to the grid of the valve under test.
5. The capacitance connections shall be:-

TEST	HP	LP	E
Cag1	6	TC	1,2,4,7,8.
Cin	6	1,2,4,7,8.	TC
Cout	TC	1,2,4,7,8.	6

NOTES (Contd.)

6. Valves shall be vibrated in each of the three required planes for not less than 23 hours. Heater switched 1 minute on 3 minutes off. No other voltages applied.

7. Valves shall be operated in a suitable circuit under the conditions specified with the following pulse applied.

A substantially rectangular pulse having a peak amplitude as specified and a duty cycle of not less than .001 (averaged over a time interval of less than 20 m.secs.) shall be applied to the grid of the valve under test.

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DRAWING NOTES.

(1.) PEAK Ia = $\frac{\text{PEAK Va}}{25}$

(2.) PEAK Ig2 = $\frac{\text{PEAK Vg2}}{2}$

(3) ADJUST TO GIVE + 150 V PEAK AT SWITCH POSITION B, PEAK Ig1 = $\frac{\text{MEAN Ig1}}{\text{DUTY CYCLE}}$ OR $\frac{\text{PEAK VOLTS AT A - PEAK VOLTS AT B.}}{25}$

(4) USE PAPER OR MICA DIELECTRIC CAPACITORS.

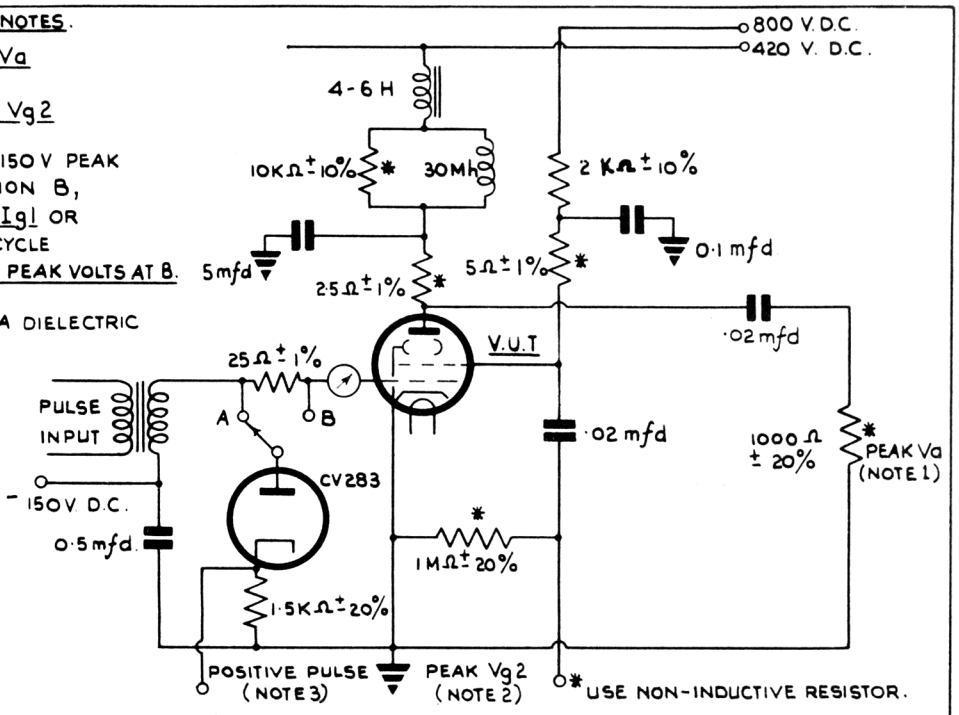

FIG.2. LOW ANODE VOLTAGE PEAK CURRENTS.

NOTES.

(1) L1 & R1 ADJUSTED FOR VOLTAGE BACK SWING EQUAL TO 50% OF FORWARD SWING L1 = 5·5 mH.

(2) USE PAPER OR MICA DIELECTRIC CAPACITORS.

* USE NON-INDUCTIVE RESISTOR.

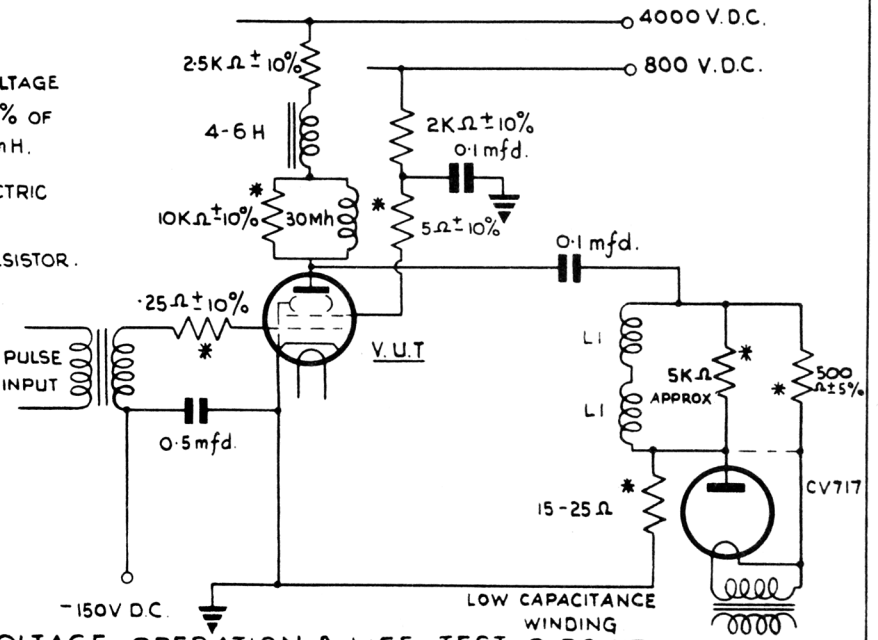

FIG.1. HIGH VOLTAGE OPERATION & LIFE TEST CIRCUIT.