MINISTRY OF AVIATION - DLRD/RRE

VALVE ELECTRONIC **CV 6118**

Specification CV6118
Issue 1, dated 16th July, 1962.
To be read in conjunction with K1001

SECURITY	
Specification	Valve
Unclassified	Unclassified

TYPE OF VALVE : Pulse hydrogen thyratron, tetrode with reservoir,

CATHODE : Directly heated

ENVELOPE : Glass

PROTOTYPE : CV2418, with reservoir requiring 22VA nom.

MARKING

K1001/4 with serial number

DIMENSIONS

See page 6

CONNECTIONS

See page 6
Flying leads

Black: Cathode and Filament
Yellow: Filament
Red : Reservoir
Brown : Reservoir
Blue : Baffle
White : Grid
Top connection: Anode

MOUNTING POSITION

Note D

AXIS of valve within 30° of vertical, top connection uppermost.

JOINT SERVICE CATALOGUE NO.

5960-99-037-3163

BASE

See page 6

Note D

ABSOLUTE RATINGS AND OPERATING CONDITIONS

Not for inspection purposes

		Note
Filament voltage, Volts rms	2.5±7½%	A
Filament current for V_h=2.5V, Amps, rms	40	
Reservoir voltage, Volts rms	5.0±7½%	A
Reservoir current for V_R=5.0V, Amps rms	4.25	
Max. peak forward anode voltage kV	18	
Max. peak anode current A	700	
Max. mean anode current A	1.25	B
Max. operation factor	10^{10}	B,E.
Max. peak rate of rise of anode current A/μs	5000	F
Cathode loading factor $A^2/\mu s$	2×10^6	G
Max. pulse average time μs	5	H
Max. prf pps	2500	
Max. ambient temperature °C	+70	
Min. ambient temperature °C	-25	
Min. tube heating time secs	240	
Min. time to reach max. peak anode voltage from application of anode voltage secs	60	
Max. anode glass/metal seal temperature °C	140	B
Min. peak forward grid voltage V	400	
Max. peak forward grid voltage V	1000	
Min. peak forward baffle voltage V	350	
Max. peak forward baffle voltage V	1000	
Max. negative grid bias V	100	
Maximum time jitter nanoseconds	30	C

NOTES

A. It is recommended that cathode and reservoir circuits be supplied from separate transformers since no pulse voltages must be applied to the reservoir.

B. The temperature of the glass to metal seal of the anode must not exceed 140°C. This can be achieved by cooling the anode with an air stream of about two inches water head depending upon the inlet air temperature.

C. To achieve this level of jitter the trigger arrangements should be as follows:-

(a) Grid Circuit conditions

Unloaded grid bias voltage	100 volts negative
Unloaded grid pulse	500 volts min*
Average rate of rise of grid voltage between	2000 - 4000 volts per μsec.
Unloaded grid pulse duration between	1 and 3 μsecs.
Source impedance of grid pulse generator	250 - 500 ohms.
DC resistance between grid and cathode	2000 ohms max.

*i.e. 400 volts w.r.t. to cathode

(b) Baffle drive

As for "grid drive" but with no bias voltage, the unloaded baffle pulse to precede the unloaded grid pulse by 1.0 ± 0.25 μsecs.

The jitter may be reduced by increasing the grid and baffle unloaded pulses to 1000 volts. See also note K below.

D. The supporting clamp must be insulated from earth.

E. Operation factor is the product of:- Peak forward anode voltage x peak anode current x pulse repetition rate, the units of the parameters being volts, amps and pulses per second.

F. Peak rate of rise of anode current is the maximum value of the instantaneous rate of rise of current on the leading edge of the anode current pulse.

G. Cathode loading factor is the product of the peak rate of rise of anode current and the peak anode current.

H. The pulse average time is the time interval between the instants at which the instantaneous value of the anode current equals 50% of the amplitude of the anode current.

J. The unloaded grid pulse is the voltage pulse at the grid terminal with the thyratron grid terminal disconnected.

K. A simpler method of triggering which results in increased jitter is shown in figure 3.

TEST CONDITIONS, unless otherwise stated for individual tests

The valve shall be tested in a test rig similar to that shown in figure 3. The values of the specified parameters shall be at the discretion of the manufacturer provided they satisfy the given limits.

Parameter	Limits		Units	Notes
	Min.	Max.		
(a) Anode circuit				2
Duty cycle	.00144	-	ratio	
Pulse average time	1.7	1.9	µsecs	
Pulse recurrence rate	720	880	c/s	
Mean anode current	1.0	-	Amps	
Peak anode current	700	-	Amps	
Peak forward anode voltage	18		kV	
Peak rate of rise of anode current	5000		A/µsec	5,11
(b) Grid circuit				2
Unloaded grid bias voltage	-100	-90	Volts	
Unloaded grid pulse	-	450	Volts	
Peak rate of rise of grid voltage	-	2	kV/µs	6
Trigger source impedance	500	-	ohms	
DC resistance between grid and cathode	2000	-	ohms	
(c) Baffle drive				2
On-load baffle bias voltage	0	0	Volts	
Unloaded baffle pulse	-	450	Volts	
Peak rate of rise of baffle voltage	-	2	kV/µs	6
Trigger source impedance	500	-	ohms	
DC resistance between baffle and cathode	2000	-	ohms	
Time interval between unloaded baffle and grid pulses	0.75	1.25	µsecs.	
(d) Heater and reservoir				
Heater and reservoir supply frequency	45	60	c/s	

TESTS

To be performed after a holding period of 96 hours in addition to those applicable in K1001.

Test or Operation	Test Conditions				Units	Limits		Notes
	Time Mins.	Vh Volts	Vr Volts	Va kV		Min.	Max.	
GROUP A								
100% inspection. The tests in this group to be carried out in the stated order.								
(a) Heater and reservoir heating time.	0	2.5	5.0	0				1
(b) Raise EHT (1)	4	2.5	5.0	0-15	trip	-	1	3
(c) Raise EHT (2)	5 Max	2.5	5.0	15-18	trip	-	4	3
(d) Run (1)	6 Max	2.5	5.0	18				4
(e) Jitter	21	2.5	5.0	18	μs	-	0.03	4
(f) Run (2)	26	2.7	5.4	18				4
(g) Run (3)	31	2.3	4.6	18				4
(h) Peak rate of rise	36	2.3	4.6	18	A/μs	4000	-	4
(j) EHT off.	37	2.5	5.0	0				
(k) Heater Current	42	2.5	5.0	0	A	36	44	1
(l) Reservoir Current	42+	2.5	5.0	0	A	3.85	4.65	1
GROUPS B, C, D, E								
No tests								
GROUP F								
Life, information	1 valve every two months Total EHT on-time				Hours	750		7
Shelf life, information					Year	1		10
Life and shelf life test end points								8, 9

NOTES

1. The filament and reservoir voltages shall be measured at the tag ends of the appropriate flying leads.

2. The component values given in note 12 for use in figure 2 are not mandatory. They constitute a set of values which will satisfy the anode circuit requirements, and they may be used at the discretion of the manufacturer.

   The alternative grid and baffle triggering circuit shown in figure 3, fed at the junction of the resistances with the grid circuit parameters as specified, may be used at the discretion of the manufacturer.

3. A trip is deemed to have occurred if the valve looses control for a period longer than 0.1 seconds.

4. In tests (d), (e), (f), (g), (h), taken together a total of one trip is permitted. Should one trip occur, the EHT must be applied at 18 kV within three seconds, and the tests continued in sequence.

5. Peak rate of rise of anode current is the maximum value of the instantaneous rate of rise of current on the leading edge of the anode current pulse.

6. The peak rate of rise of grid (or baffle) voltage is the maximum value of the instantaneous rate of rise of the leading edge of the unloaded grid (or baffle) pulse.

7. One life test on one valve every two months to consist of :-

   (a) Six hours daily performing the following cycle -

      1. 10 minutes with Vh = 2.5 volts, Vr = 5.0 volts
      2. 20 minutes off

   (b) Eighteen hours at Run (1) conditions, except that the peak rate of rise of anode current = 3500A/μsecs min.

8. The valve shall be considered to have reached the end of life when it trips more than four times in a period of five hours, or if it fails catastrophically.

9. The valves shall be subjected to the end point tests at intervals not exceeding 200 hours. A report shall be rendered to the Inspection Authority at intervals not exceeding one month giving results obtained on all valves submitted to life tests.

10. Two per cent of the production shall be stored for up to one year. Details of the procedure to be agreed with the Specification Authority.

11. L3 in Figure 2 shall be adjusted to give 5000 A/μsecs with an approved sample valve.

12. The component values in figure 2, which are not mandatory are:-

   Zo = 12.85 ohms, C1 = .0138 μH, L2 = 2.28 μH, tp = 1.8 μsec.
   R1 = 12.85 ± 0.25 ohms, R2 = 250 ohms, L1 = 2.8H

   This circuit is resonant at 800 cycles and should be designed to give a peak voltage of 18 kV with a plus tolerance.

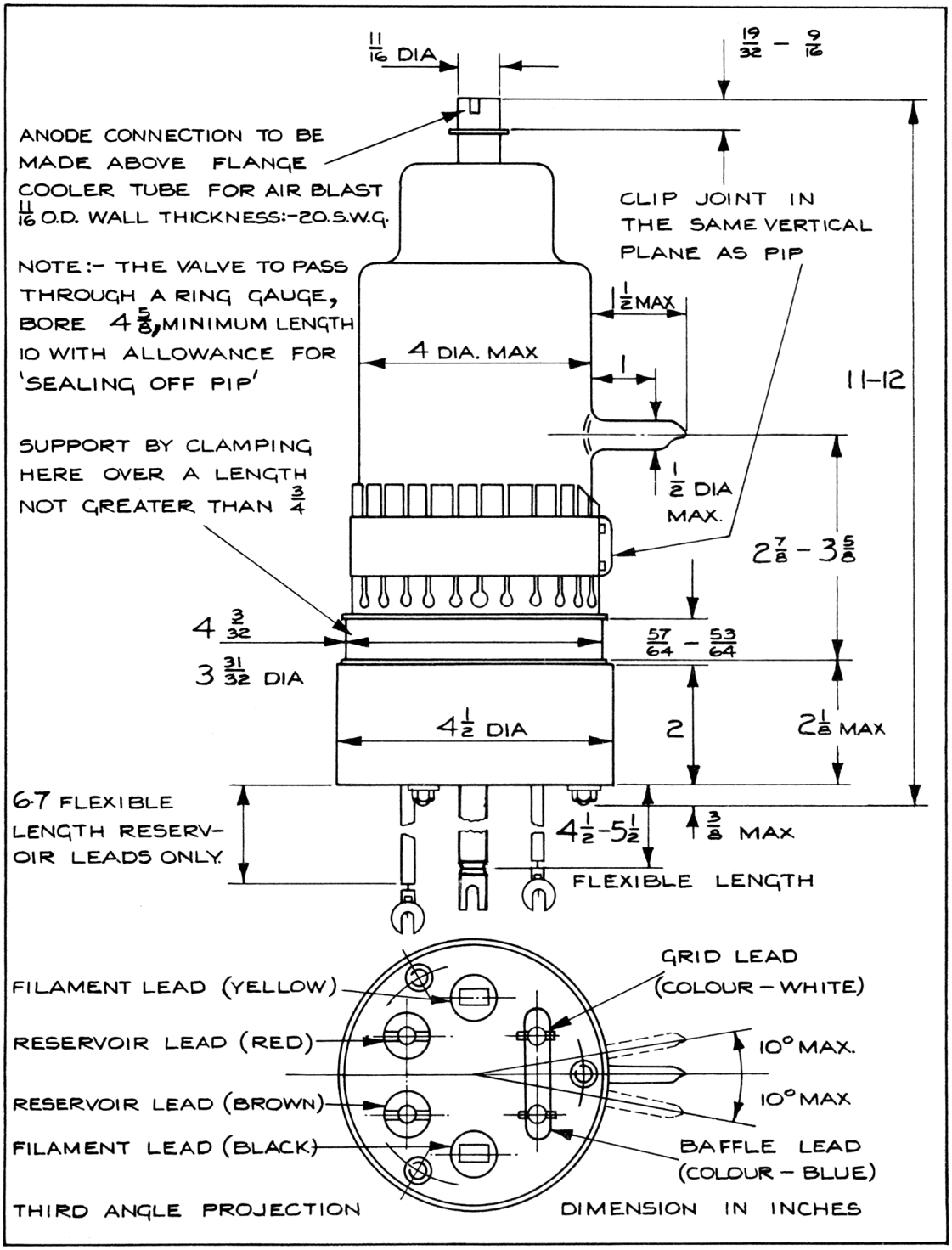
11/16 DIA
19/32 – 9/16
ANODE CONNECTION TO BE MADE ABOVE FLANGE COOLER TUBE FOR AIR BLAST 11/16 O.D. WALL THICKNESS:-20.S.W.G.
CLIP JOINT IN THE SAME VERTICAL PLANE AS PIP
NOTE:- THE VALVE TO PASS THROUGH A RING GAUGE, BORE 4 5/8, MINIMUM LENGTH 10 WITH ALLOWANCE FOR 'SEALING OFF PIP'
1/2 MAX
4 DIA. MAX
1
11-12
SUPPORT BY CLAMPING HERE OVER A LENGTH NOT GREATER THAN 3/4
1/2 DIA MAX.
2 7/8 - 3 5/8
4 3/32
3 31/32 DIA
57/64 - 53/64
4 1/2 DIA
2
2 1/8 MAX
6·7 FLEXIBLE LENGTH RESERVOIR LEADS ONLY.
4 1/2 - 5 1/2
3/8 MAX
FLEXIBLE LENGTH
GRID LEAD (COLOUR – WHITE)
FILAMENT LEAD (YELLOW)
RESERVOIR LEAD (RED)
10° MAX.
RESERVOIR LEAD (BROWN)
10° MAX
FILAMENT LEAD (BLACK)
BAFFLE LEAD (COLOUR – BLUE)
THIRD ANGLE PROJECTION
DIMENSION IN INCHES

FIG. 2
TEST CIRCUIT

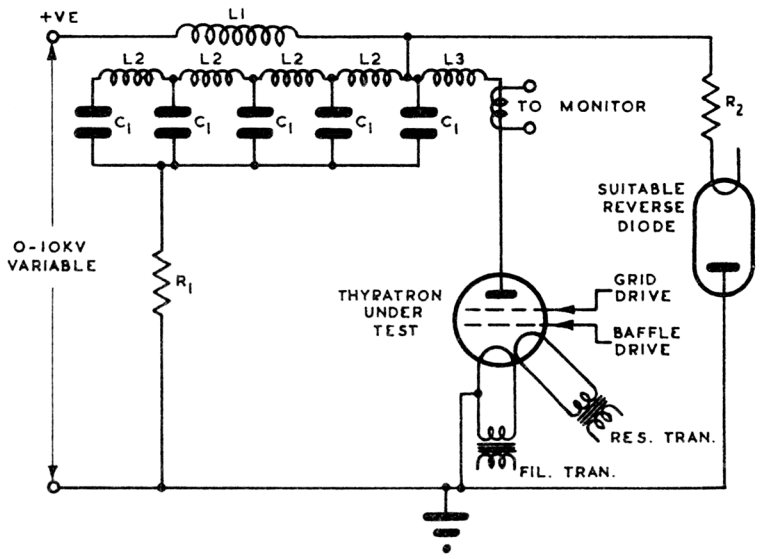

FIG. 3
ALTERNATIVE GRID AND BAFFLE TRIGGERING CIRCUIT