

VALVE ELECTRONICADMIRALTY SURFACE WEAPONS ESTABLISHMENT

Specification AD/CV6112.	<u>SECURITY</u>	
Issue No. 1 dated 25.5.62	<u>Specification</u>	<u>Valve</u>
To be read in conjunction with K1001 and B.S.1409	Unclassified	Unclassified

<u>TYPE OF VALVE</u> Voltage Tuned Oscillator (Q Band)				<u>MARKING</u>	
<u>CATHODE</u> Indirectly heated.				See K1001/4	
<u>ENVELOPE</u> Glass enclosed in a metal shell				Ser. No. ....	
<u>PROTOTYPE</u> VX 7140					
<u>RATING</u>				<u>BASE</u>	
(All limiting values are absolute)				Flying lead with terminals	
				J.S. Cat. No. 5940-99-940-0053	
				<u>CONNECTIONS</u>	
				<u>Lead</u> <u>Electrode</u>	
				<u>Colour</u>	
Heater Voltage (Nom.) (V) 6.3 A				Yellow Heater-Cathode (Note G)	
Max. Heater Current (A) 0.7					
Max. Heater Current Surge (A) 2.0					
Max. Solenoid Current (A) 10 B				Brown Heater	
Max. Solenoid Voltage (V) 24 B				Green Grid	
Min. Delay line Voltage (V) 680 C				Blue Anode	
Max. Delay line Voltage (V) 3000 C				Red Delay line and Collector (Note D)	
Max. Cathode Current (mA) 15 D				Power output via Waveguide size No. 22 using Coupler Inter-Service Cat. No. Z830018. Note H.	
Max. Anode Voltage (V) 700				Solenoid: Note J.	
Max. Anode Current (mA) 2					
Minimum Total Tuning Range (kMc/s) 26.5 F					
(kMc/s) 40.0					
(mW) 10					
Min. Power Output					
Max. Negative Grid 1 Voltage (V) 450					
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NOTES

- A. The h.t. voltages shall not be applied until at least two minutes after the application of the heater voltage. In all cases the solenoid and delay line voltages must be applied before the anode voltage.
- B. The magnetic field required to collimate the electron beam is provided by a solenoid which is an integral part of the valve. The recommended value of the current to be taken by the solenoid is to be shown on data sheets provided by the manufacturer. It is recommended that a current stabilised solenoid supply be employed.

The value of this current must be 9.0 Amps for which a d.c. supply voltage of 16 V min. to 24 V d.c. max. is necessary. If the variations of the solenoid current (including transients, temperature effects etc.) are greater than  $\pm 0.05$  Amps about the stated value, then variations in the output frequency can be expected, accompanied by variations in power and noise output.

Stray magnetic fields from any source, can, if sufficiently strong, affect the performance of the valve.

The field strength of such magnetic fields should not exceed 30 gauss at the surface of the solenoid to avoid any effects.

- C. In all cases the solenoid and delay line voltages must be applied before the anode voltage.
- D. The delay line and collector are connected inside the valve and therefore, "delay line current" includes collector current.
- E. The valve has been designed for forced air cooling from an axial flow fan and requires an airflow of 25 c.f.m. With this amount of airflow the valve will operate in ambient temperatures up to  $55^{\circ}\text{C}$ .

A fan designed to produce 53 c.f.m. at 0.13 in. total w.g. with an impeller diameter of 3.9 in. will deliver the requisite amount of air.

The airflow must be sufficient to limit the change in solenoid resistance to a factor of 1.4 above its value at  $20^{\circ}\text{C}$ .

- F. The valve is tuned by varying the delay line voltage ( $V_{dl}$ ). The relationship between frequency and delay line voltage is approximately as shown in Fig. 1 on page 7. The valve oscillates at a frequency of 26.5 kMc/s at a delay line voltage not lower than 680V, and at a frequency of 40.0 kMc/s at a delay line voltage not higher than 2750V.
- G. One limb of the heater and the cathode are connected together inside the valve.
- H. The waveguide output coupler is electrically connected to the solenoid shell but is isolated from the delay line of the valve. This permits the valve to be operated with either the line or the cathode at earth potential.

The solenoid shell should therefore be connected to earth potential.

The insulation resistance between all electrodes and the solenoid shell with 4 kV d.c. applied at N.T.P. shall exceed 100 megohms.

- J. The connections to the solenoid are made to a two pin plug type A.P.208600 attached to the metal shell of the solenoid. Pin A is connected to the solenoid and to the shell. Pin B is connected to the solenoid only and should be connected to the positive side of the solenoid supply.
- K. The Joint Service Catalogue No. is:- 5960-99-037-3123.

TESTS

To be performed in addition to those applicable in K1001, and in the specified order unless otherwise agreed with the Inspecting Authority:

Test conditions, unless otherwise stated:-							
$V_h$ (V a.c.) 6.3	$V$ (V) $V_o$ (See Note 1)	$V_{g1}$ (V) 0	I solenoid (A d.c.) 9.0 (See Note 2)	Cooling (See Note 3)	V.S.W.R. 2.0 : 1		
Test	Test Conditions	No. Tested	Symbol	Limits		Unit	
				Min.	Max.		
a	<u>Heater Current</u> (After 2 minutes)	$V_{dl} = V_a = 0$	100%	$I_h$	0.3	0.7	A
b	<u>Oscillation at 26.5 kMc/s</u> (i) Delay line voltage. (ii) Anode Current (iii) Power Output	Adjust $V_{dl}$ for 26.5 kMc/s. Note 5, 6 & 7 (Record)	100%	$V_{dl}$ $I_a$ $P_o$	680 - 10	880 2 -	V mA mW
c	<u>Oscillation at 33.0 kMc/s</u> (i) Delay line voltage. (ii) Cathode current (iii) Anode current (iv) Power Output	Adjust $V_{dl}$ for 33.0 kMc/s. Note 5. (Record)	100%	$V_{dl}$ $I_k$ $I_a$ $P_o$	1260 - - 10	1480 13 2 -	V mA mA mW
d	<u>Oscillation at 40.0 kMc/s</u> (i) Delay line voltage. (ii) Cathode Current (iii) Anode Current (iv) Power Output	Adjust $V_{dl}$ for 40 kMc/s. Note 5. (Record)	100%	$V_{dl}$ $I_k$ $I_a$ $P_o$	2350 - - 10	2750 15 2 -	V mA mA mW
e	<u>Anode Cut-Off</u>  Power Output	Adjust $V_{dl}$ over range given by tests b(i) and d(i). $V_a = 0$ Notes 8 and 5.	100%	$P_o$	-	0	mW
f	<u>Grid 1 Cut-Off</u>  Power output	Set $V_{g1} = -300V$ Adjust $V_{dl}$ over range given by tests b(i) and d(i). Notes 5 and 8.	100%	$P_o$	-	0	mW

	Test	Test Conditions	No. Tested	Symbol	Limits		Units
					Min.	Max.	
g	<u>Stability at</u> 26.5 kMc/s 30.0 kMc/s 33 kMc/s 36.5 kMc/s 40 kMc/s  (i) Power Output (ii) Freq. Deviation	$V_{d1}$ adjusted to test frequencies. Note 5. I solenoid set at 9.0A d.c. and then altered by $\pm 0.05A$ d.c. in turn.	Q.A.				
				$P_o$ $\Delta F$	10 -	- 10	mW Mc/s
h	<u>Frequency Pulling</u>  At 26.5, 33.0, and 40.0 kMc/s.	Adjust $V_{d1}$ for test frequencies. Note 5 and 9	100%	$\Delta F$	-	40	Mc/s
i	<u>Grid Insulation</u>  Grid Current	$V_{d1} = 2750V$ $V_{g1} = -450V$	100%	$I_{g1}$	-	40	$\mu A$
j	<u>Insulation Resistance</u>  (i) Shell to delay line. (ii) Shell to Grid (iii) Shell to Cathode/Heater. (iv) Shell to Anode	No operating voltages. 4kV d.c. applied between test electrode and shell of valve.	100%	$R_{d1}$ $R_{g1}$ $R_{hk}$ $R_a$	100 100 100 100	- - - -	M ohm M ohm M ohm M ohm
k	<u>Life</u>  (i) Time (ii) Power Output	Adjust $V_{d1}$ for 33.0 kMc/s. Note 5 and 10	Q.A. and 2%	$t$ $P_o$	500 6.5	- -	Hour mW

## NOTES

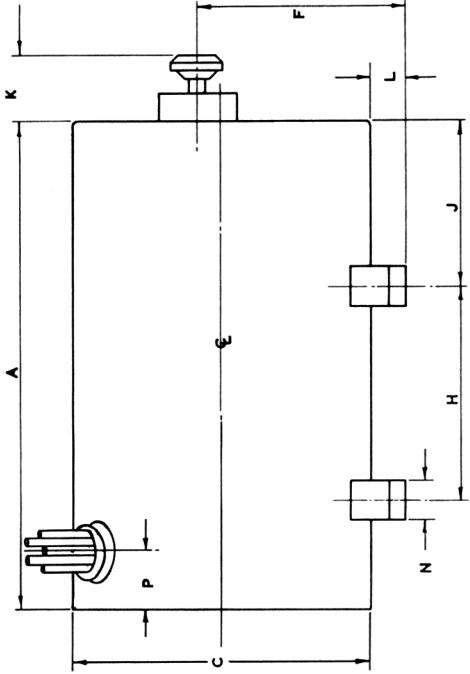
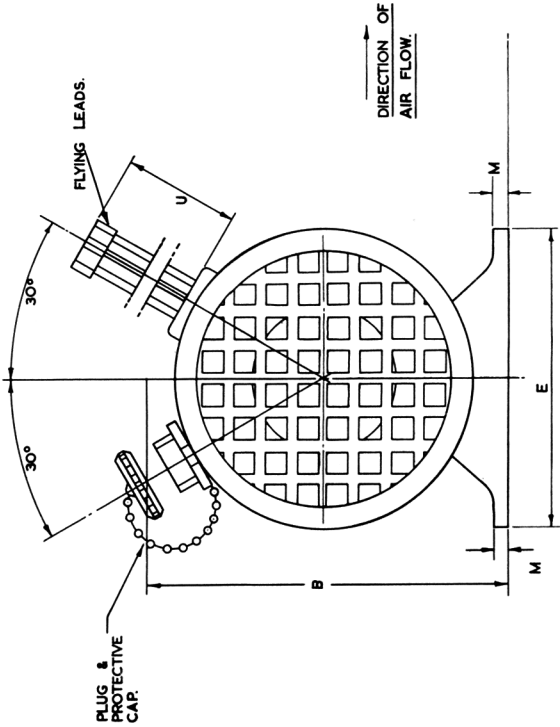
1.  $V_o$  which must be within the limits 200-450V d.c., must be quoted on the data sheets supplied with each valve.  $V_o$  is a single fixed value of  $V_a$  with which  $I_k = 10$  mA when  $V_{d1}$  is set for output at a frequency of 26.5 kMc/s, the other operating conditions being:  $V_h = 6.3V$ .  
I solenoid: as recommended by the manufacturer.  $V_{g1} = 0$ .
2. The solenoid current shall be 9.0 amps (stabilised to within  $\pm 0.05A$ ).
3. The valve must be air-cooled, the air - at ambient temperature - must be fed into the Air Input provided. Air flow should be not less than 25 cu. ft/min.

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4. Vibration tests (as agreed with the specifying authority) shall be carried out on the type approval samples, and a note on the performance of the valve under vibration conditions shall be included at a later date for the guidance of users.
5. The frequency shall be set to within  $\pm 1\%$ .
6. The manufacturer is to supply, with each valve, a frequency versus delay line voltage ( $V_{dl}$ ) characteristic covering the range 26.5 - 40.0 kMc/s. There must be no frequency discontinuities over this range.
7. The manufacturer is to supply, with each valve, a power output ( $P_o$ ) versus delay line voltage ( $V_{dl}$ ) characteristic covering the range of frequencies from 26.5 - 40.0 kMc/s. The power output shall not fall below 10 mW at any point in this range.
8. The manufacturer is to supply, with each valve, a power output ( $P_o$ ) characteristic plotted against anode voltage (0 to  $V_o$ ) and negative grid 1 voltage (0 to -300V) at the test frequencies 26.5, 33.0 and 40.0 kMc/s.
9. The pulling figure is the difference between the maximum and minimum frequencies recorded when a mismatch, placed in the output section is varied through all phases. The v.s.w.r. of the mismatch shall lie between 1.5 and 1.6 at each microwave frequency, but the manufacturer may, at his discretion exceed a v.s.w.r. of 1.6 during this test.
10. The life of a valve shall be considered to be terminated when, at any frequency in the range 26.5 - 40.0 kMc/s, the power output falls below 5 mW, and the valve falls outside any one of limits specified, with the following exceptions:- tests b. c. and d.  $P_o$  min. shall be 5 mW; and  $V_o$ , as specified in Note 1, must lie within the limits 200-700 volts d.c. The quantity of valves from production which are to be subjected to life tests, and the procedure to be adopted in the event of failure in life testing, will be decided by the purchasing authority. Amend 1  
Amend 1

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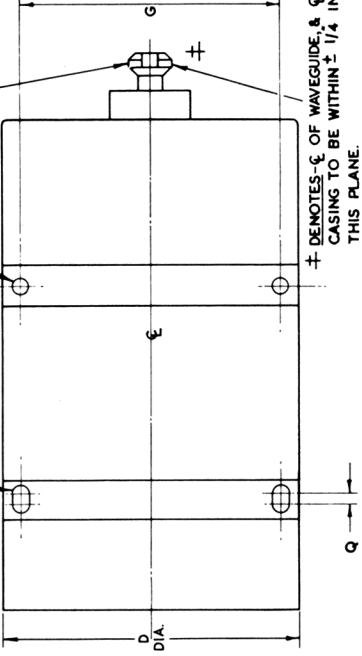
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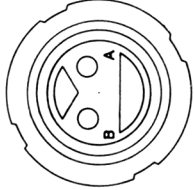
FLYING LEAD CONNECTIONS:  
COLOUR MARKER: ELECTRODE.  
BROWN. HEATER.  
YELLOW. HEATER CATHODE.  
GREEN. GRID NO. 1.  
BLUE. GRID NO. 2 (ANODE).  
RED. DELAY LINE.

PIN CONNECTIONS:  
PIN. A. SOLENOID AND SOLENOID CASE.  
PIN. B. SOLENOID.

2-2 BA. ELONGATED CLR. HOLES.  
W/G. COUPLING. INTER. SERVICE. CAT. NO. Z 830018.



OUTLINE DRAWING.

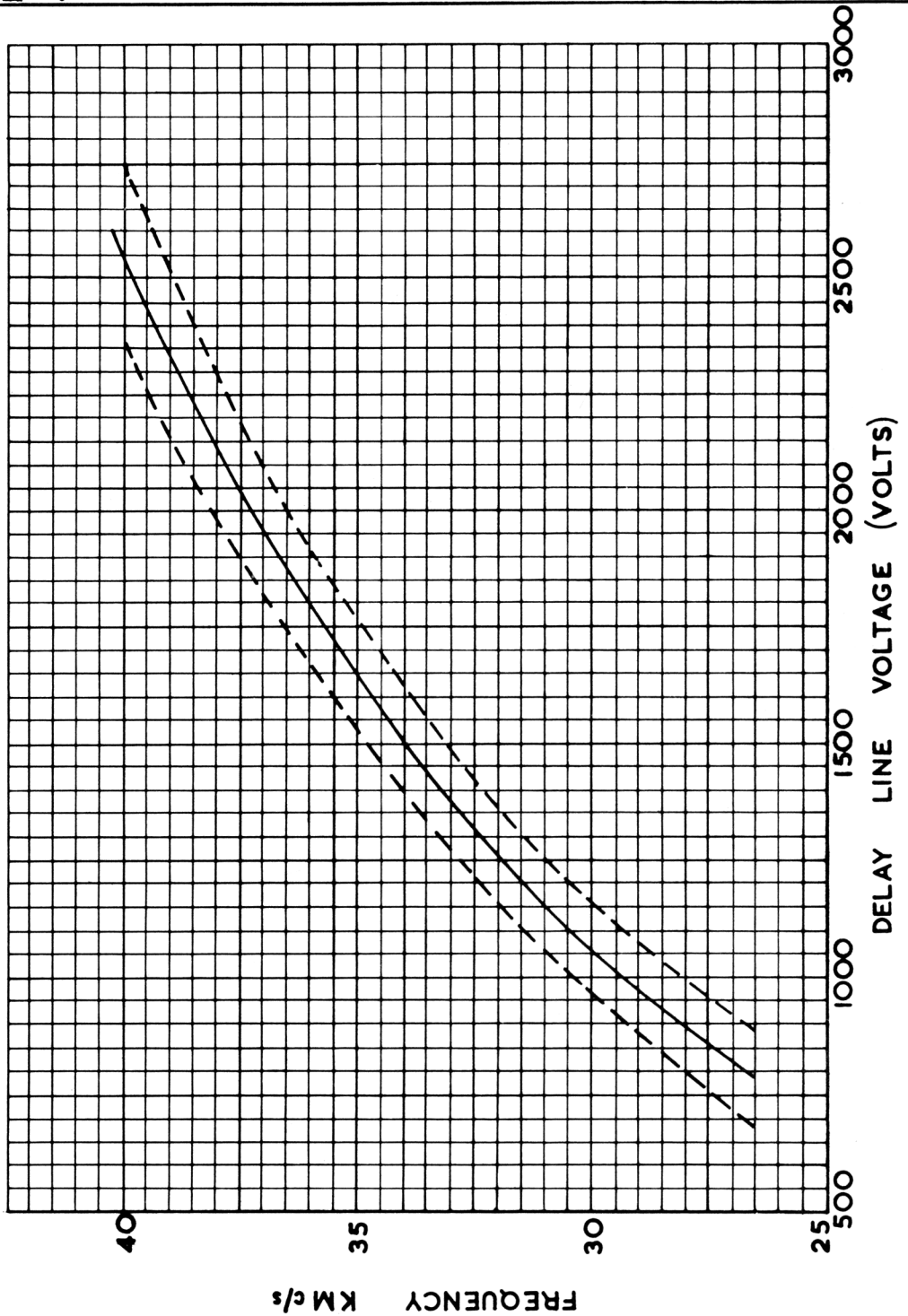


2 PIN PLUG INTER. SERVICE CAT. NO. Z 560050.

± DENOTES - & OF WAVEGUIDE & OF CASING TO BE WITHIN ± 1/4 IN THIS PLANE.  
NOTE-BASIC DIMENSIONS ARE INCHES.

DIM.	MILLIMETRES	INCHES	DIM.	MILLIMETRES	INCHES
A	225.4 MAX.	8 7/8 MAX.	J	73.0 ± 1.6	2 7/8 ± 1/16
B	155.6 APPROX.	6 1/8 APPROX.	K	27.0 APPROX.	1 1/16 APPROX.
C	149.2 MAX.	5 7/8 MAX.	L	12.7 ± 1.6	1/2 ± 1/16
D	135.5 MAX. DIA.	5 3/8 MAX. DIA.	M	6.4 ± 1/16	1/4 ± 1/16
E	193.4 ± 0.8	5 1/4 ± 1/32	N	12.7 ± 0.8	1/2 ± 1/32
F	99.7 ± 4.8	3 7/32 ± 3/16	P	25.4 ± 1.6	1 ± 1/16
G	120.65 ± 0.13	4.750 ± 0.005	Q	3.18 ± 0.13	0.125 ± 0.005
H	95.3 ± 1.6	3 3/4 ± 1/16	U	610 APPROX.	24 APPROX.

DELAY LINE VOLTAGE VERSUS FREQUENCY



ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION AD/CV.6112 ISSUE No.1 DATED 25.5.62

AMENDMENT No. 1

(a) Page 4 Test clause k(Life)

(ii) Power Output. In the column headed  
"Limits, Min" delete "5mW" and substitute  
"6.5mW".

(b) Page 5 Note 10

In the third and fifth lines delete "5mW" and  
substitute "6.5mW".

September, 1964.  
(190455)

T.V.C. for A.S.W.E.

✓ AAS  
30/9/64