CV6098

VALVE ELECTRONIC

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

Specification AD/CV6098 Issue 1 dated 31-12-'61 To be read in conjunction with K1001	SECURITY Specification: Unclassified Valve: Unclassified

TYPE OF VALVE: Low noise Travelling Wave Amplifier
CATHODE: Indirectly heated
ENVELOPE: Metal and Glass
PROTOTYPE: VX2526

MARKING

See K1001/4

BASE

BS.448/B8-0 but see drawing on Page 6

RATING

(All limiting values are absolute and non-simultaneous)

		Note
Heater Voltage (V)	6.3±5%	
Heater Current (Nom.) (A)	0.36	
Heater Current (peak starting) (A)	4	
Max. Grid 1 Voltage (Negative) (V)	100	B
Max. Grid 1 Dissipation (W)	0.1	
Max. Grid 2 Voltage (V)	150	A
Max. Grid 2 Dissipation (W)	0.1	
Max. Grid 3 Voltage (V)	300	A
Max. Grid 3 Dissipation (W)	0.1	
Max. Grid 4 Voltage (V)	650	A
Max. Grid 4 Dissipation (W)	0.1	
Max. Helix Voltage (V)	650	A
Max. Helix Current (μA)	25	
Max. Collector Voltage (V)	800	A,C,D
Max. Collector Current (μA)	400	
Peak R.F. Input Power (W)	100	
Mean R.F. Input Power (W)	0.5	
Min. Cathode Pre-heating time (mins.)	1.5	E
Max. Capsule Temperature (°C)	150	

CONNECTIONS

PIN	ELECTRODE
1	Cathode and Heater k, h
2	Heater h
3	Grid 2 g2
4	Grid 4 g4
5	Helix hel.
6	Collector and Capsule Col.
7	Grid 1 g1
8	Grid 3 g3

R.F. CONNECTORS

Both the "Input" and "Output" connectors are to Joint Services Catalogue No. 5935-99-911-6861.

DIMENSIONS

See Drawing on Page 6

MOUNTING POSITION

ANY, but see Note J on Page 3

TYPICAL OPERATING CONDITIONS

		F
Grid 1 Voltage (Negative) (V)	7.5	A,B
Grid 2 Voltage (V)	45	A
Grid 3 Voltage (V)	70	A
Grid 4 Voltage (V)	440	A
Helix Voltage (V)	585	A
Collector Voltage (V)	720	A
Helix Current (μA)	1	
Collector Current (μA)	350	
Magnetic Field (oersteds)	520	G
Frequency Range (kMc/s)	4.1 to 7.0	
Noise Factor (4.5 to 6.5k Mc/s (dB)	9.5	H
Noise Factor (4.1 to 7.0k Mc/s (dB)	10.0	H
Working Saturated Power Output (4.5 to 6.5k Mc/s) (mW)	4.5	H
Working Saturated Power Output (4.1 to 7.0k Mc/s) (mW)	3.5	H
Small Signal Gain (4.5 to 6.5k Mc/s) (dB)	40.0	H
Small Signal Gain (4.1 to 7.0k Mc/s) (dB)	37.0	H
Cold Attenuation (4.1 to 7.0k Mc/s) (dB)	65.0	H

OPERATING TEMPERATURE

Absolute maximum ambient temperature = 70°C but see Note K on Page 3.

WEIGHT

Solenoid (approx.) 19 lbs
Valve (approx.) 1¼ lbs

NOTES

For Notes A to M incl. see Pages 2 and 3.

NOTES

A. These potentials are positive with respect to cathode.

B. Grid 1 voltage is negative with respect to cathode.

C. Collector, R.F. connectors and capsule are internally connected and are at the same potential as the solenoid frame which is usually earthed.

D. The collector potential must be a minimum of 100 volts positive with respect to the helix.

E. The time between application of full heater voltage and the subsequent drawing of current from the cathode.

F. The setting-up procedure is as follows:-

Note: This tube is operated in a focussing solenoid and H.T. voltages must not be applied to the tube unless the solenoid is switched on.

1. Insert the tube in the solenoid. Apply pressure to the end cap rather than the R.F. connectors and ensure that the tube is fully home in the socket. Secure the locking device and centralise the tube with the adjusting screws.

2. Set grid 2 voltage control to its minimum position and switch on heater and H.T. voltages.

3. Allow approximately two minutes for the cathode to heat up and adjust all voltages except grid 2 to their recommended values.

4. Increase grid 2 voltage slowly observing both the helix and collector currents. The helix current will normally rise rapidly to its limiting value and it will be necessary to adjust the centering of the tube to obtain a minimum. Continue to increase grid 2 voltage and adjust the centering until a collector current of 350 μA is obtained with a helix current of less than 10 μA. The helix current should never be allowed to exceed 25 μA and should be finally set to the lowest possible value.

Note: For subsequent operation the tube may be switched on without adjustment.

5. If the recommended voltages on the test sheet accompanying the tube have been adhered to the tube should now be ready for use over the whole frequency band 4100 to 7000 Mc/s.

If the full "setting-up" information is not available or it is desired to obtain optimum performance over a particular band of frequencies the following procedure should be followed:-

Apply an R.F. signal of power level less than -50 dbm to the input of the tube, connect a suitable receiver to the output and adjust the helix voltage to give maximum power output.

Remove the input signal and adjust grid 3 and grid 4 voltages alternately until the receiver output is a minimum.

The tube is now set up to give the lowest noise factor for the frequency used. To obtain best full band performance these operations should be carried out at 5600 Mc/s.

G. When operated in the approved solenoid the current in the field coils giving this field strength is 9.0A, at approx. 18 volts.

NOTES (CONT'D)

H. The typical value is the average over the frequency range when the tube has been adjusted for best performance at 5.6k Mc/s.

J. The valve will operate in any position with suitable fixing arrangements on the mount.

K. This absolute maximum ambient temperature of 70°C is permissible only so long as the solenoid is mounted on a heat sink consisting of an aluminium or brass plate 10 inches x 19 inches by at least $\frac{1}{8}$ inch thick or equivalent. The maximum ambient temperature allowable without the heat sink is 50°C.

L. The solenoid is not supplied with the valve.

M. The Joint Services Catalogue Number is:- 5960-99-037-2563.

TESTS

To be performed in addition to those applicable in K1001

Tests are to be performed in the specified order unless otherwise agreed with the Inspecting Authority.

Test conditions - unless otherwise stated:- (Note 1)

V_h (V)	V_{g1} (V)	V_{g2} (V)	V_{g3} (V)	V_{g4} (V)	V_{hel} (V)	V_{col} (V)	I_{col} (μA)	Magnetic Field (oersteds)
6.3	-7.5	Adjust	Adjust	Adjust	Adjust	720	350	520

	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limits Min.	Limits Max.	Units
a	Heater Current	No voltages except V_h No magnetic field		100%	Ih	0.33	0.39	A
b	(i) Helix Current	V_{g3} = 70V V_{g4} = 440V V_{hel}= 585V Note 2		100%	Ihel		10	μA
	(ii) Grid 2 Voltage	V_{g3} = 70V V_{g4} = 440V V_{hel}= 585V I_{hel}= value obtained in (i) above. Note 2		100%	V_{g2}	30	60	V
c	(i) Helix Voltage	V_{g2} = Value obtained in test "b(ii)" Notes 2 and 3		100%	V_{hel}	565	605	V
	(ii) Grid 3 Voltage			100%	V_{g3}	50	90	V
	(iii) Grid 4 Voltage at a frequency of 5.6k Mc/s	V_{hel} = Value obtained in test "c(i)"		100%	V_{g4}	380	500	V
d	Noise Factor at	Conditions as in test "c"						
	(i) 4.5 to 6.5k Mc/s			100%		-	11.0	dB
	(ii) 4.1 to 7.0k Mc/s			100%		-	13.5	dB
e	Small Signal Gain at	Conditions as for test "c"						
	(i) 4.5 to 6.5k Mc/s	Note 4		100%		32	-	dB
	(ii) 4.1 to 7.0k Mc/s	Note 5		100%		27	-	dB

CV6098

TESTS (CONT'D)

	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	Limits Max.	Units
f	Working Saturated Power Output at	Conditions as for test "c"						
	(i) 4.5 to 6.5k Mc/s	Note 4		100%		1.0	-	mW
	(ii) 4.1 to 7.0k Mc/s	Note 5		100%		1.0	-	mW
g	Stability Oscillation Power	V_{g3} =)Values obtained V_{g4} =)in test "c" V_{hel} = Vary 500V to 650V I_{col} = 400 µA Notes 2 and 6		100%		-	10^{-5}	W

1. These tests are to be performed in a solenoid which has been approved by the Type Approving Authority by comparison with the reference standard held by that Authority.

   These tests shall not be made until at least three minutes after full heater voltage has been applied.

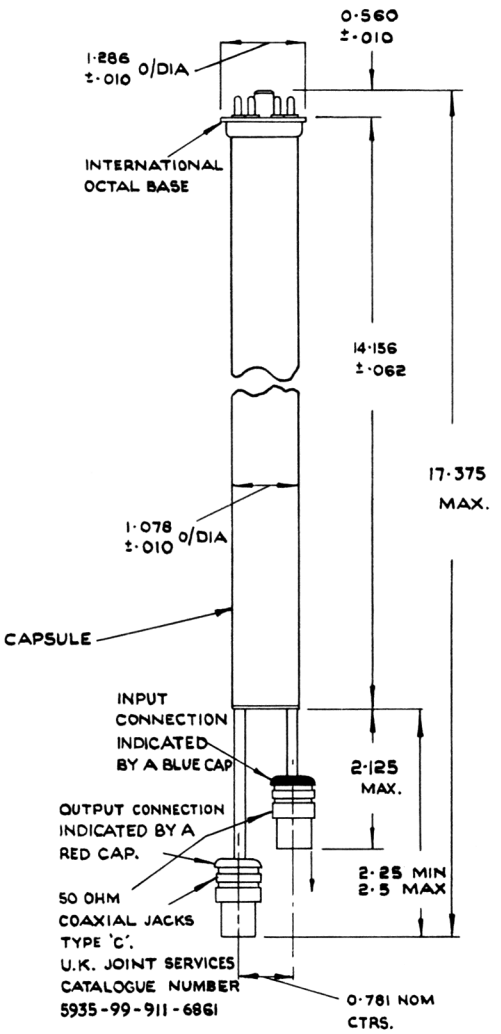
2. Initially grid 2 potential is set to its minimum voltage and then slowly increased, observing helix and collector current. The centering screws of the solenoid are then adjusted to reduce the helix current to a minimum as the collector current is increased to the required value.

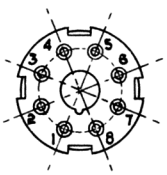
3. With an input signal of 5.6k Mc/s weaker than -50 dBm the helix potential is adjusted to give maximum power output. Then with no input signal grid 3 and grid 4 potentials are adjusted to give minimum noise power output. These voltage adjustments should then be checked to ensure optimum performance.

4. Measurements are to be made at 4.5, 5.0, 5.5, 6.0 and 6.5k Mc/s.

5. Measurements are to be made 4.1, 4.2, 6.9 and 7.0k Mc/s.

6. The valve shall be focused as in Note 2 but with the higher collector current indicated. The input and output of the tube shall be terminated in short circuits of variable phase, the output shall also be connected to a calibrated power detector, and the helix voltage shall be varied over the range indicated. Any spurious oscillation present shall be maximised by adjustment of the short circuits and helix voltage and its power measured.



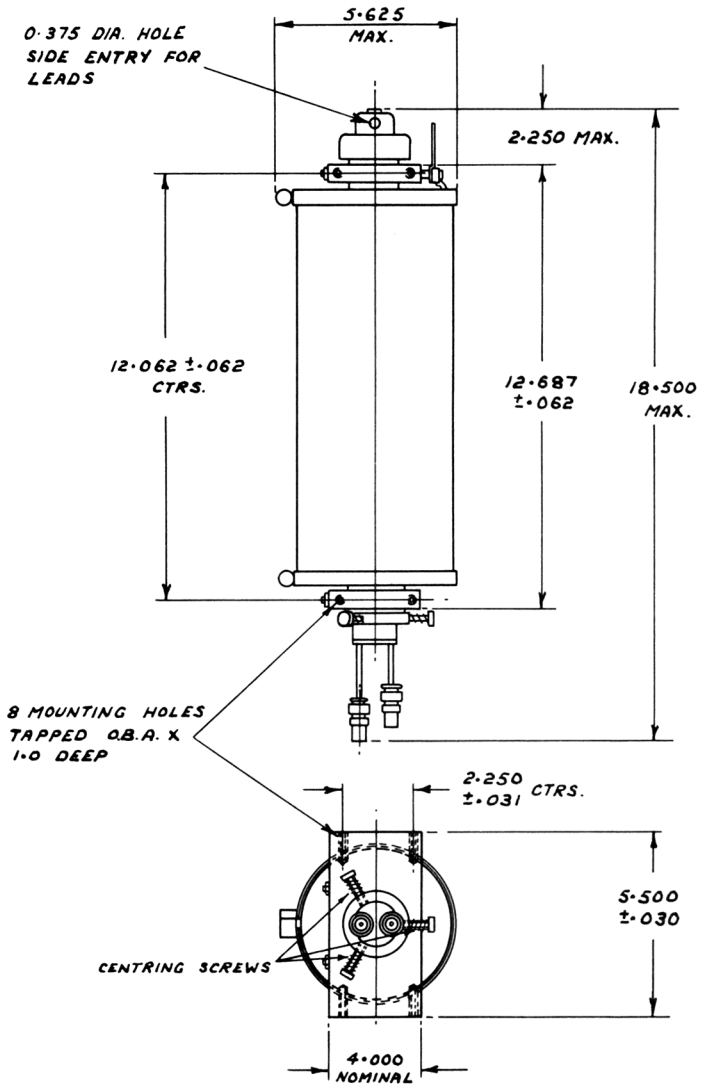


VIEW SHOWING
BASE PIN CONNECTIONS

PIN No.	CONNECTION
1	CATHODE & HEATER
2	HEATER
3	GRID 2
4	GRID 4
5	HELIX
6	COLLECTOR & CANISTER
7	GRID 1
8	GRID 3

OUTLINE DRAWING OF TUBE IN CAPSULE

DIMENSIONS IN INCHES



NOTE:- WITHDRAWAL CLEARANCE OF VALVE FROM SOLENOID TO BE A MINIMUM OF 16 INCHES

OUTLINE DRAWING OF TUBE IN SOLENOID
FOR INFORMATION OF EQUIPMENT DESIGNERS

DIMENSIONS IN INCHES