ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

VALVE ELECTRONIC CV6157

Specification AD/CV6157
Issue No. 1 dated November 1967
To be read in conjunction with K1001

SECURITY

Specification	Valve
Unclassified	Unclassified

TYPE OF VALVE: S-band travelling wave tube power amplifier with low modulation noise.

CATHODE: Indirectly heated

ENVELOPE: Metal capsule

PROTOTYPE: VX3290

MARKING

See K1001/4

BASE

B.S.448/B80

RATINGS

(All limiting values are absolute and non-simultaneous)

			Note
Heater Voltage	(V)	3.5	
Max. Heater Current	(A)	4.5	F
Max. Grid 1 Voltage	(kV)	2.5	A B
Max. Grid 1 Current	(mA)	1.5	A
Max. Helix Voltage	(kV)	2.7	A B
Max. Helix Current	(mA)	1.5	A
Max. Collector Voltage	(kV)	3	A B
Max. Collector Current	(mA)	20	A

CONNECTIONS

PIN	ELECTRODE	
1	Heater	h
2	N.C.	
3	Omitted	
4	Grid 1	g1
5	N.C.	
6	Helix	hel
7	Omitted	
8	Heater/Cathode	h,k
Case	Collector/Earth	Col

TYPICAL OPERATING CONDITIONS — Note H

Heater Voltage	(V)	3.5
Heater Current	(A)	3.5–4.5
Grid 1 Voltage	(kV)	0.5–1.0 A B
Grid 1 Current	(mA)	0–1.0 A
Helix Voltage	(kV)	2.0–2.3 A B
Helix Current	(mA)	0–1.0 A
Collector Voltage	(kV)	2.0–2.5 A B
Collector Current	(mA)	14–16 A
Min. Working Saturated Power Output	(W)	0.5 G
Frequency Range	(GHz)	2.5–4.1
Min. Gain at a Power Output of 0.5 watts	(dB)	20
Max. Noise Factor	(dB)	30
Min. Insertion Loss	(dB)	25

DIMENSIONS

See drawing on page 6

MOUNTING POSITION

Any (but see Note D re cooling)

WEIGHT

Valve only: $2\frac{1}{8}$ lbs

Valve in solenoid mount assembly $43\frac{3}{4}$ lbs (See Note J)

NOTES

A. These figures are for operation in the approved solenoid mount assembly (see Note 2 on Page 4) and adjusted for minimum helix current. The minimum solenoid current required to focus the electron beam is 4 Amps when valve and mount are aligned for minimum helix current by means of the adjusting screws on the solenoid. The max. solenoid current is 8 Amps and the solenoid operating voltage is 16 volts (approx.). Max. voltage 32 volts. All voltages are positive relative to the cathode. The collector is connected to the capsule which is normally earthed. The helix voltage should never exceed the collector voltage.

NOTES (CONT'D)

B. Adjusted in operation.

C. The v.s.w.r. of the output and input couplers, measured when I col = 0 is not greater than 3:1. The valve must be operated in an r.f. circuit presenting a v.s.w.r. not greater than 5:1.

D. The valve is designed for operation without forced air cooling when mounted in a horizontal position at an ambient temperature of 20°C. Cooling is normally effected by thermal conduction through the base plate, which must be mounted on a suitable heat sink, and by thermal convection from the radiator.

When operated in other mounting positions and/or higher ambient temperatures, forced air cooling may be required. The solenoid must be so mounted and cooled that no external part of the valve capsule is at a temperature in excess of 130°C.

E. The performance of four tubes has been examined while operating and while subjected to the following tests:-

(i) Resonance Search, amplitude 0.004" frequency sweep 0-30 c/s for 2 minutes, test performed three times.

(ii) Vibration

Amplitude Inches	Frequency c/s	Time Mins.
0.030	0-11	2
0.020	11-16	1
0.010	16-21	1
0.004	21-30	2

Test performed three times

(iii) Fatigue

Vibrated for 25 minutes with an amplitude of 0.010" at a frequency of 20 c/s.

Test performed six times.

Results

There was no measurable effect on gain, noise output and r.f. power output.

F. The surge current shall not exceed 8 Amps.

G. Conditions as in test clause f on page 3.

H. A data sheet giving operating conditions is supplied with each valve.

J. The solenoid mount assembly is not supplied with the valve.
An outline drawing showing the valve in the solenoid mount assembly is shown on Page 7.

K. The N.A.T.O. Stock number is 5960-99-037-4305.

CV6157

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 Specified

Vh (V) 3.5
V Col (kV) Vhel+150V

Clause	Test	Test Conditions	AQL %	Insp. Level	Symbol	Limits Min.	Limits Max.	Units
a	Heater Current	No voltages except Vh		100%	Ih	3.5	4.5	A
b	Grid 1 Voltage	Vhel = 2.3 kV increase Vg1 from zero until I Col = 15 mA Note 2		100%	Vg1	0.5	1.0	kV
c	Grid 1 Current	Conditions as in test b. Note 2		100%	Ig1	-	1.0	mA
d	Helix Current	Conditions as in test b. Note 2		100%	Ihel	-	1.0	mA
e	Helix Voltage	Increase Vg1 from zero until I Col = 15 mA Apply a signal of r.f. power 5 ± 0.5 mW frequency 3.3 GHz ± 50 MHz to the input. Adjust Vhel to give Max r.f. power output. Note 2		100%	Vhel	2.0	2.3	kV
f	R.F. Power	Increase Vg1 from zero until I col = 15 mA Vhel = value obtained in Test Clause (e)						
	(i) Output 1	Apply a signal of r.f. power 5 ± 0.5 mW to the input at frequencies		100%				
		2.5 GHz ± 20 MHz				0.5		W
		3.3 GHz ± 20 MHz				0.5		W
		4.1 GHz ± 20 MHz Note 2				0.5		W
	(ii) Input	Increase the r.f. power input until the output falls beyond saturation to 500 mW Note 2		100%		65.0		mW

Clause	Test	Test Conditions	AQL %	Insp. Level	Sym-bol	Limit Min.	Limit Max.	Units
	R.F. Power (Contd.)							
f	(iii) Output 2	As in f (i) Increase the r.f. power input to 70 mW Note 2		100%		0.4	2.8	W
	(iv) Output 3	As f (i) at frequency intervals of 100 MHz ± 20 MHz over the band 2500 to 4100 MHz		Q.A.		0.5		W
g	High Level Noise Factor	Conditions as in test f (i) frequency of r.f. signal = 3.3 GHz ± 20 MHz. Notes 2 and 3		100%		-	30	dB
h	Cold v.s.w.r.	No voltages Measured over the frequency range 2.5 to 4.1 GHz		100%		-		
		(a) Input				-	3:1	Ratio
		(b) Output				-	3:1	Ratio
j	Hot v.s.w.r.	D.C. conditions as in f(i). Measured over the frequency range 2.5 to 4.1 GHz		100%				
		(a) Input					6.5:1	Ratio
		(b) Output Note 2					6.5:1	Ratio
k	Life	Note 4		Note 4		Note 4		

NOTES

1. The surge current shall not exceed 8 Amps.

2. Measured with the valve operating in a solenoid mount assembly which has been approved by comparison with the reference standard held by the Qualification Approval Authority. During adjustment and test the helix current must not exceed 1.5 mA.

3. The noise factor is measured by comparing the noise with that from a standard noise source, the detector being a broad-band crystal and receiver having a pass-band 5-50 MHz.

NOTES Cont'd.

4. (a) The sample size shall be as follows:-

Lot Size	Sample Size
1-25	1
26-50	2
51-100	3
100 or greater	2%

The manufacturer may test additional samples at his discretion.

(b) For the first lot of any production order, deliveries shall be held until satisfactory completion of a minimum of 500 hours life.

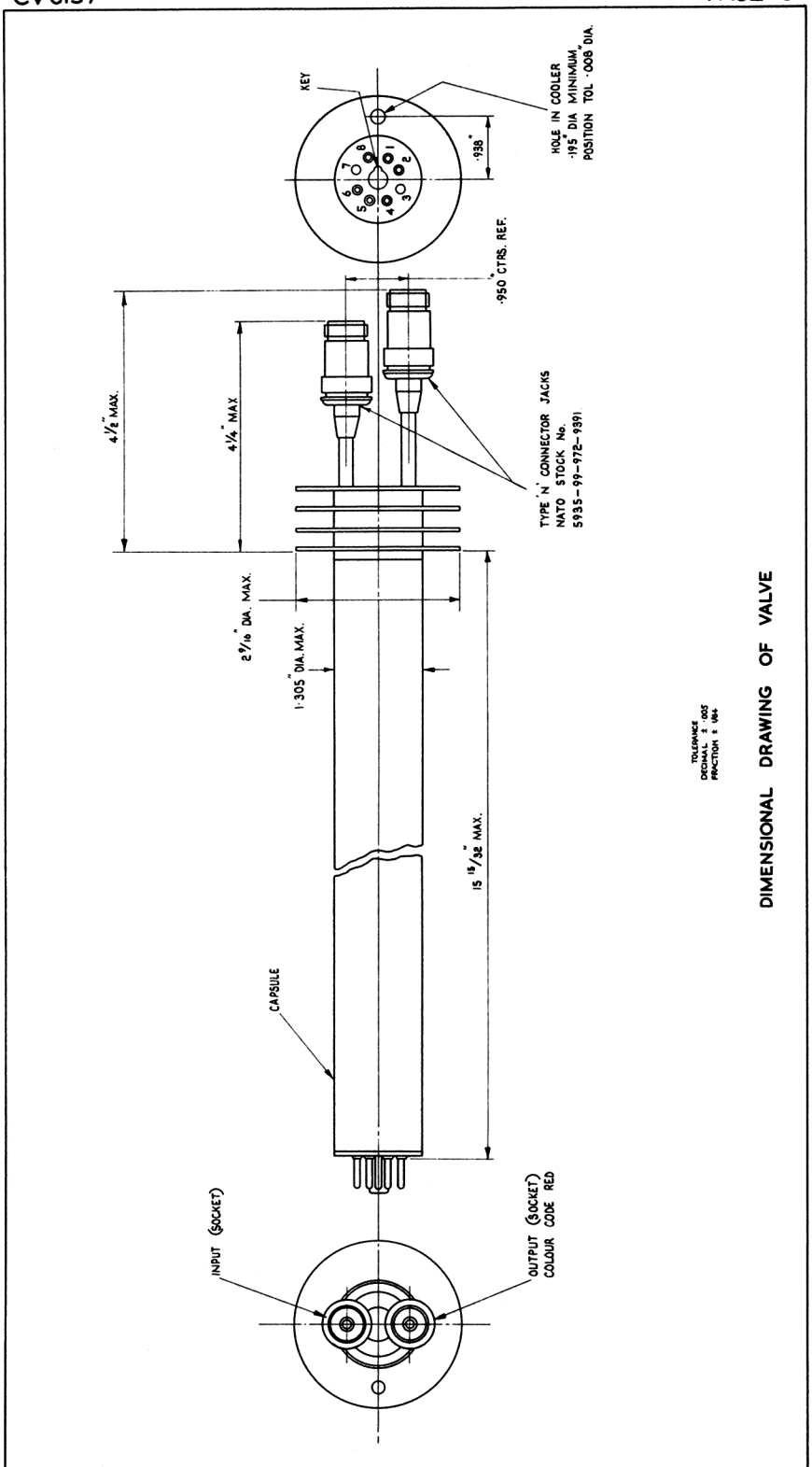
Where previous life test data is available deliveries may be released at the discretion of the Inspection Authority.

Thereafter, where previous results have proved satisfactory, shipment of valves may be permitted without awaiting the results of current tests.

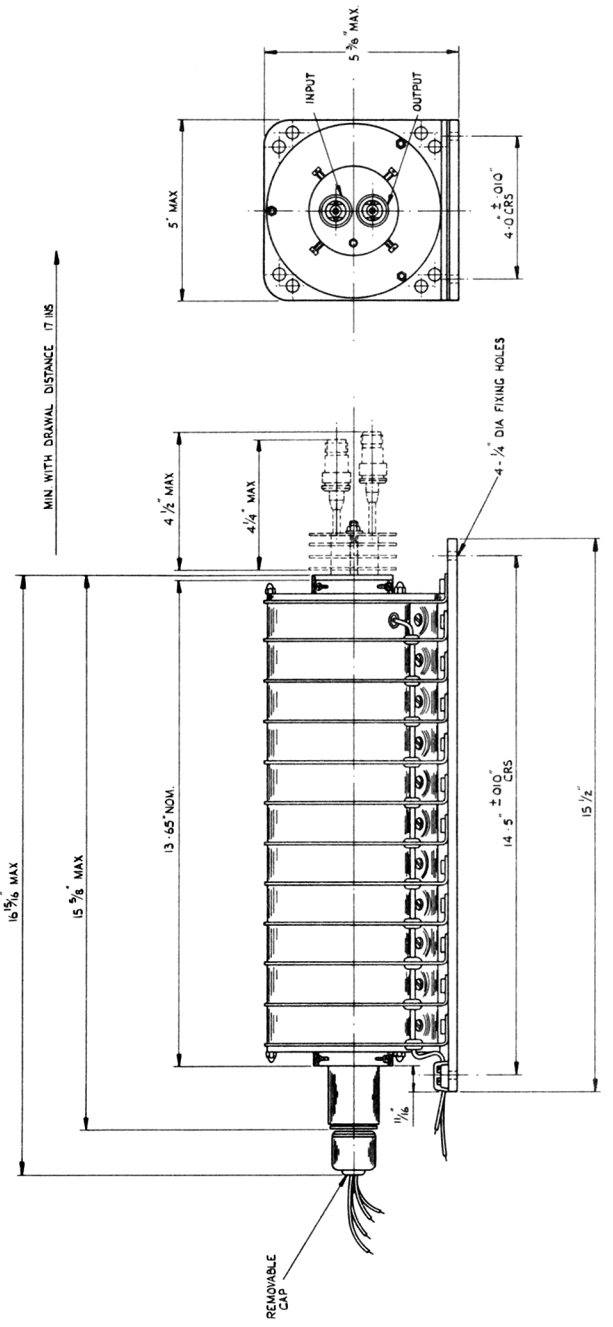
(c) The criterion of acceptance shall be that the average life of the sample shall be at least 1,000 hours.

(d) In the event of a failure, the Qualification Approval Authority shall be informed.

(e) The end of life is reached when, after adjustment of the voltages within the specified limits, the valve fails to meet the Specification except that the levels of r.f. power output, noise and gain may deteriorate by 3 dB.

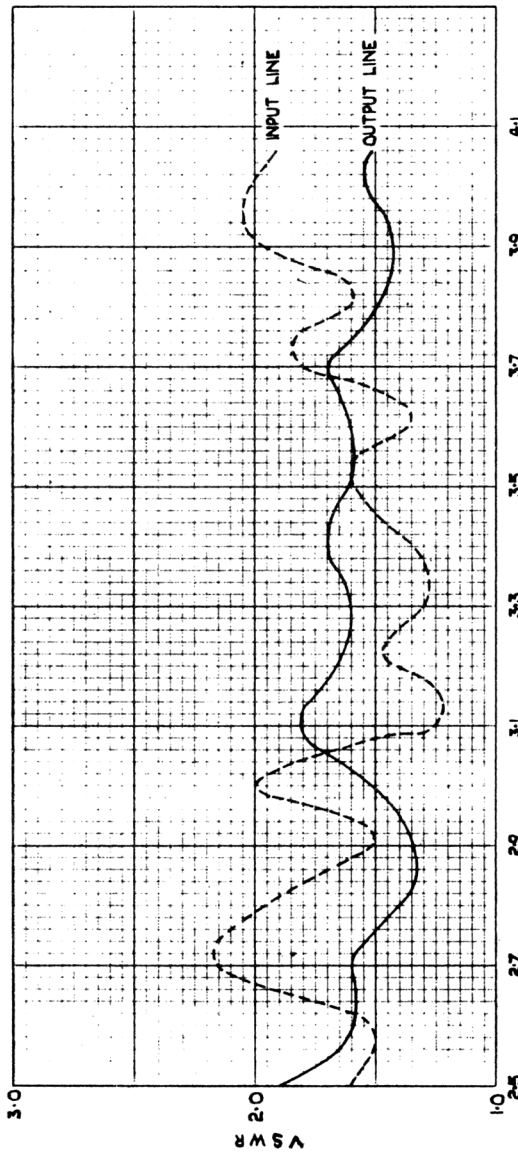


DIMENSIONAL DRAWING OF VALVE



OUTLINE DRAWING OF VALVE IN SOLENOID MOUNT ASSEMBLY

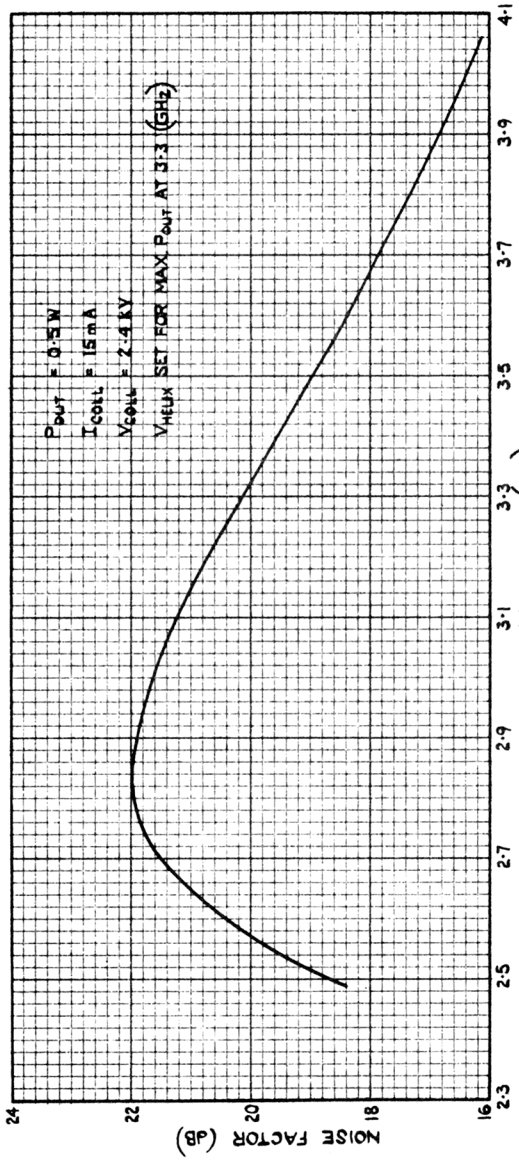
(FOR THE INFORMATION OF EQUIPMENT DESIGNERS)



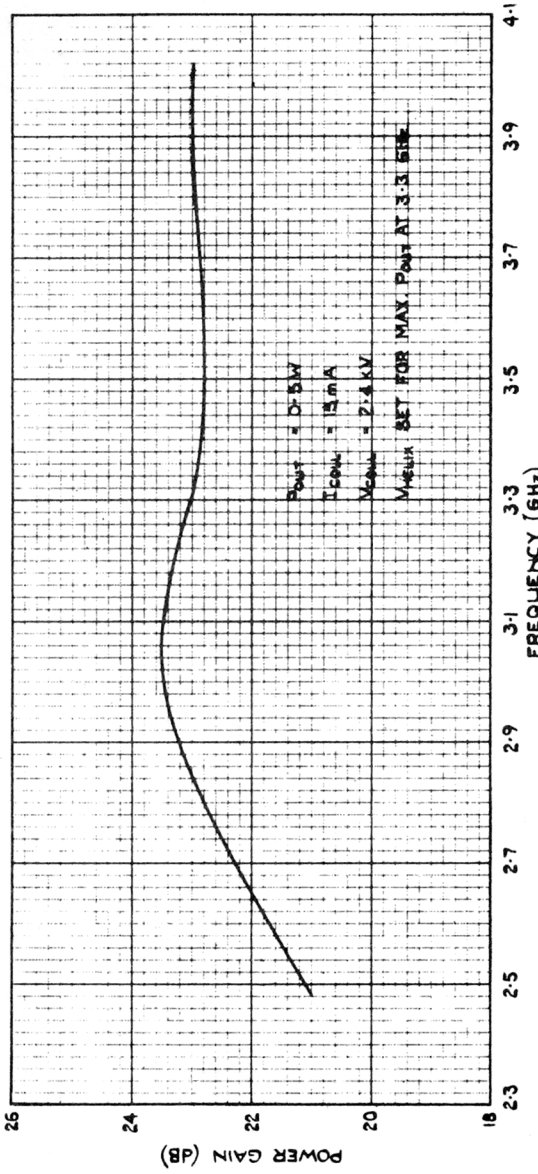
VARIATION OF MATCH WITH FREQUENCY
(MEASURED COLD)

DATA SHEET

CV6157

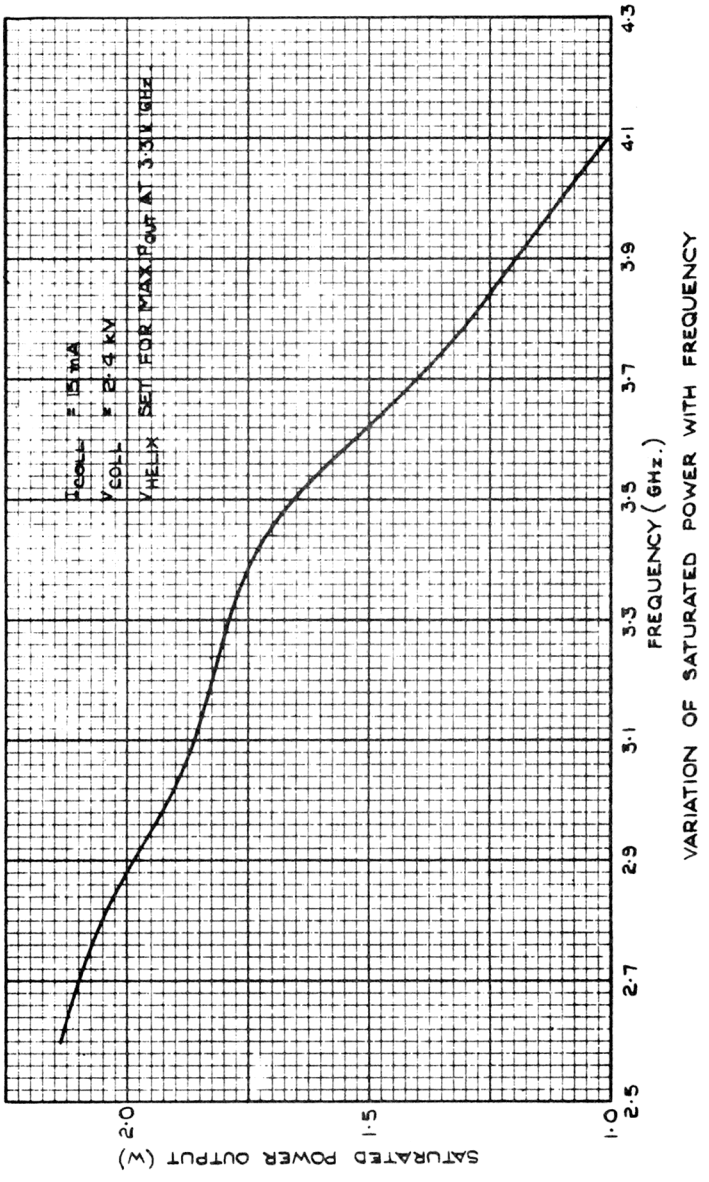


VARIATION OF NOISE FACTOR WITH FREQUENCY



VARIATION OF POWER GAIN WITH FREQUENCY

DATA SHEET CV 6157



VARIATION OF SATURATED POWER WITH FREQUENCY