VALVE ELECTRONIC **CV6179**

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

Specification AD/CV6179 Issue 1 Dated 13th June, 1967 To be read in conjunction with K1001, K1005, K1006, MIL-E-IE and MIL-T-5422E. Paragraph numbers in reference column refer to MIL-E-IE unless otherwise stated.	SECURITY	
	Specification	Valve
	Unclassified	Unclassified

PROTOTYPE:	M5315
DESCRIPTION:	Travelling-wave signal amplifier for operation from 2.5 to 4.1 GHz.
CATHODE:	Indirectly heated
ENVELOPE:	Packaged in a periodic permanent magnet focusing system
CONNECTIONS & DIMENSIONS:	See Drawing Page 9
WEIGHT:	5.5 lb max.
NOMINAL R.F. INPUT & OUTPUT IMPEDANCE:	50 ohms
MOUNTING POSITION:	Any
COOLING:	Free Convection
NATO STOCK NO.	5960-99-037-4621

Parameter:	Ef	If	Ec1	Ic1	Ec2	Ic2	Ec3	Ic3	Ec4	Ic4
Unit:	V	A	Vd.c.	/uAd.c.	Vd.c.	/uAd.c.	Vd.c.	/uAd.c.	Vd.c.	/uAd.c.
Absolute maximum ratings (Note 1)										
Maximum:	6.6	-	0	50	100	50	200	50	400	50
Minimum:	6.0	-	-250	-	-	-	-	-	-	-
Test Condition:										
(1)	0	0	0	0	0	0	0	0	0	0
(2)	6.3	-	Note 2,3	-	Note 2,3	-	Note 2,3	-	Note 2,3	-

Parameter:	Ec5	Ic5	Ew	Iw	Eb	Ib	Ik	Pi(rf)	Amb. Temp.	tk	If (surge)
Unit:	Vd.c.	/uAd.c.	Vd.c.	mAd.c.	Vd.c.	mAd.c.	mAd.c.	dBm	Deg. C	sec	A
Absolute maximum ratings (Note 1)											
Maximum:	500	50	600	1.0	Ew+250	1.7	1.7	30	100	-	1.5
Minimum:	-	-	300	-	Ew	-	-	-	-65	120	-
Test Condition:											
(1)	0	0	0	0	0	0	0	as reqd.	-	0	0
(2)	Note 2,3	-	Note 2,3 4,5	-	Note 2,3,4	-	Note 33	as reqd.	-	Note 33	-

GENERAL

Marking - Note 2, 9, K1001, Section 4

Dimensions - Per Outline Drawing

Preparation for Delivery - Note 31

TEST	METHOD OR PARA.	REQUIREMENT OR TEST	CONDITIONS	SYMBOL	LIMITS MIN.	LIMITS MAX.	UNITS
		Qualification Inspection (Qualification Approval)					
1.	-	Humidity - Temperature	Test Condition (1) Note 11	-	-	-	-
2.	-	Container Drop	Notes 6, 16	-	-	-	-
3.	-	Shock	Test Condition (2) Notes 16, 17	-	-	-	-
		Quality Conformance Inspection, Part 1 (100%)	After 48 hours Holding Period				
4.	E-50.2	Post Holding Period Tests					
4.1	-	Grid Current	Test Condition (2)	Ic1	-10	+20	uAd.c.
				Ic2	-10	+20	uAd.c.
				Ic3	-10	+20	uAd.c.
				Ic4	-10	+20	uAd.c.
				Ic5	-10	+20	uAd.c.
4.2	-	Helix Current	Test Condition (2)	Iw	-10	100	uAd.c.
4.3	E-1301	Heater Current	Test Condition (1) Ef = 6.3	If	0.19	0.26	A
4.4	-	Cathode Current	Test Condition (2)	Ik	0.4	1.5	mA
4.5	-	Collector Current	Test Condition (2)	Ib	0.3	1.5	mA
4.6	-	Noise Figure	Test Condition (2) Notes 10, 18, 20 F = F1, F2, F3, F4	NF	-	11	dB
4.7	-	Gain	Test Condition (2) Notes 10, 18, 21 F = F1, F2, F3, F4	Gss	35	42 ~~45~~	dB
4.8	-	Frequency Gain Variation	Test Condition (2) Notes 19, 21	ΔGss	-	5	dB
4.9	-	Saturation Power Output	Test Condition (2) Notes 10, 18, 22 F = F1, F2, F3, F4	Po	7	18	dBm
4.10	-	Power Gain	Test Condition (2) Notes 10, 18, 23 F = F1, F2, F3, F4	Gp	Note 24	-	-
4.11	-	Input Match	Test Condition (2) Note 26	VSWR	-	2.5	ratio

CV6179

TEST	METHOD OR PARA.	REQUIREMENT OR TEST	CONDITIONS	SYMBOL	LIMITS MIN.	LIMITS MAX.	UNITS
4.12	-	Output Match	Test Condition (2) Note 26	VSWR	-	2.5	ratio
4.13	-	Stability	Test Condition (2) No r.f. input Note 32	Po	No osc.		
		Quality Conformance Inspection, Part 3					
5.	-	Magnetic Shielding	Test Condition (2) Notes 7, 8	-	-	-	-
6.	-	Temperature	Test Condition (2) Notes 10, 12, 13, 29 F = F1, F2, F3, F4	-	-	-	-
7.	-	Vibration	Test Condition (2) Notes 7, 14, 15, 16	-	-	-	-
8.	-	Insertion Loss	Test Condition (1) Notes 7, 25	L	55	-	dB
9.	-	Life Test	Test Condition (2) Notes 10, 27, 28, 29, 30 F = F1, F2, F3, F4	t	1000	-	hours
10.	-	Life Test End Points	Test Condition (2) Note 10 F = F1, F2, F3, F4	-	Note 30		-

NOTES

NOTE 1. The absolute maximum ratings define the upper limits of electrical inputs which may be applied to the tube without danger of permanent damage. (MIL-E-1, Para. 6.5). The electrical input ratings necessary to provide the required tube performance are specified elsewhere.

NOTE 2. The tube operating voltages and currents shall be listed on a label affixed to the tube. The voltages shall fall within the following limits:-

Element	Minimum Voltage	Maximum Voltage
Heater	6.24	6.36
Grid 1	-50	5
Grid 2	5	50
Grid 3	5	100
Grid 4	5	200
Grid 5	100	365
Helix	370	500
Collector	Ew+5	Ew+210

All voltages are measured with respect to cathode.

NOTE 3. In order to maintain the specified performance over the specified temperature range, the following power supply requirements must be met:-

Element	Installation Accuracy (+%)	Stability (+%) (Long term variation)	Ripple (Volts p-p short term variation)
Heater	1.0	1.0	
Grid 1	0.15	1.0	0.020
Grid 2	-	1.0	0.020
Grid 3	0.15	1.0	0.020
Grid 4	0.15	1.0	0.050
Grid 5	0.15	1.0	0.050
Helix	0.15	0.25	0.050
Collector	0.15	5.0	10.0

(a) Installation accuracy is set on accuracy at 20°C.

(b) Stability includes power supply variations from all causes including temperature.

NOTE 4. Tube may be operated with any one of the following elements at capsule potential:-

Cathode
Helix
Collector

NOTE 5. The symbols and abbreviations used are defined in MIL-E-IE, except as follows:-

Iw	Helix Current
Ew	Helix Voltage
GHz	10^9 Hz
Gss	Small Signal Gain
Gp	Power Gain
L	Insertion Loss
dBm	dB relative to 1 milliwatt

NOTE 6. The tube shall be packed in its regular shipping container and the packaged tube subjected to the drop tests specified in K1005. There shall be no mechanical damage following the drop tests.

NOTE 7. These tests shall be performed on one tube every 6 months when the tube is in continuous production or one tube per 100 tubes, whichever comes sooner. In the event of a failure, corrective action shall be taken by the manufacturer and the Approval Authority informed.

NOTE 8. The tube under test shall be mounted parallel with, and at a distance not greater than 3" between centres from another CV6179, on a steel plate which is 18" square by $\frac{1}{2}$" thick. The tube under test shall operate within the limits specified for each test listed under Quality Conformance Inspection Part 1. (Tests 4.1 through 4.13)

NOTE 9. A label shall be fixed to the body of each tube. The label shall be indelibly marked "Magnetised Materials".

NOTE 10. The test frequencies Fn are defined as follows:-

Designation	Frequency (GHz)
F1	2.5
F2	3.0
F3	3.5
F4	4.1

NOTE 11. Follow procedure of MIL-T-5422E.

NOTE 12. The results of all performance measurements shall be recorded. These measurements shall be of the Grid and Helix Currents, Gain, Saturation Power Output and Noise Figure as specified in Quality Conformance Part 1. The temperature test shall be performed as follows:-

Affix a temperature indicating device to the capsule outside diameter at a point approximately bisecting the tube length.

Step	Condition	Time at Indicated Capsule Temperature Prior to measurements	Measurements
1	Room ambient temp. Normal test rig outside chamber	-	Required Record ambient temp.
2	Room temp. as in Step 1 but with tube in chamber	-	Required
3	Adjust chamber to -10°C	40 minutes	Required
4	" " " -62°C	1 hour	Not required
5	" " " 45°C	2 hours 10 min.	Required
6	" " " 70°C	30 minutes	Required
7	" " " 90°C	25 minutes	Required
8	Room ambient temp. Normal test rig outside chamber	1 hour 25 min.	Required Record ambient temp.

NOTE 13. Where measured, the performance at the operating temperatures shall be compared with the performance at Step 2 (Note 12) and the differences shall not exceed the following limits:-

Performance	Limits
Gain	± 3 dB
Saturation Power Output	± 1.5 dB
Noise Figure	± 2 dB

The Grid and helix currents shall not exceed the following limits:-

Grid Currents	As specified in test 4.1
Max. Helix Current	150 μA d.c. for Steps 3 and 5 in Note 12
	350 μA d.c. for Steps 6 and 7 in Note 12.

There shall be no change greater than Measurement Error (Note 34) in performance between Steps1 and 8 (Note 12). In the event of a failure the Approval Authority shall be informed immediately.

NOTE 14. Measure gain using a swept frequency technique. Gain variation due to resonances during the test shall be less than 0.5 dB at any frequency between 2.1 and 4.1 GHz.

NOTE 15. The tube shall be vibrated in three mutually perpendicular directions successively, one of which shall be the major axis.

(a) Resonance search: 5 to 55 Hz at ± 0.010" amplitude, 1 Hz steps, 15 secs each. Record resonant frequencies.

(b) 5 to 15 Hz at ± 0.030" amplitude, 1 Hz steps, 2 minutes/step.
16 to 25 Hz at ± 0.020" amplitude, 1 Hz steps, 2 minutes /step.
26 to 55 Hz at ± 0.010" amplitude, 1 Hz steps, 2 minutes/step.
Record resonant frequencies.

(c) 2 hours at resonances.

NOTE 16. Before and after this test, perform Quality Conformance Inspection tests 4.6, 4.7 and 4.9. There shall be no change greater than the limits of Measurement Error (Note 34).

NOTE 17. Following the procedure of MIL-T-5422E subject the operating tube, with no r.f. input and at the prevailing room temperature, to 18 impact shocks of 30g and a time duration of 11 ± 1 ms. Three impact shocks shall be applied in each direction to the tube in each of three mutually perpendicular axes.

NOTE 18. At the discretion of the manufacturer, a swept frequency signal source may be employed and the performance recorded continuously over the frequency band.

NOTE 19. Frequency Gain Variation shall be measured using a swept frequency source over the operating band.

NOTE 20. Noise mounts of A.I.L. manufacture having part nos. 07012, 07049 shall be assumed to have a relative excess noise temperature of 15.3 dB.

NOTE 21. Gain tests shall be performed with input power adjusted to give an output power level of 1 milliwatt.

NOTE 22. The Saturation Power Output test shall be performed as follows:-

At each frequency, increase the power input until the first power output peak is reached, measure the power output at this value of power input.

NOTE 23. Power Gain is defined as the gain measured with the input power adjusted to give the power output obtained using the setting procedure specified in Note 22.

NOTE 24. Power Gain shall be not less than the value of Gss -8 dB.

NOTE 25. The Insertion Loss shall be measured across the frequency band using a swept frequency technique.

NOTE 26. The V.S.W.R. at the relevant connector shall be measured across the frequency band using a swept frequency technique, the other connector being terminated in a matched load.

NOTE 27. The tube selected for this test shall have passed the acceptance tests (Quality Conformance Inspection, Part 1), or have the approval of the Inspecting Officer.

NOTE 28. Before the life tests and at 50, 100, 200, 500 and 1000 hours, the electrode currents, the gain, saturated power output and noise figure shall be measured.

NOTE 29. This test shall be one tube per lot where lot size shall consist of 25 tubes or 1 month's production, whichever is the greater.

NOTE 30. The End of Life is defined as the time at which any of the following changes occurs:-

Helix current exceeds the specified limits
Grid current exceeds the specified limits
Gain changes by more than 2 dB
Saturation Power Output changes by more than 2 dB
Noise Figure changes by more than 1 dB

In the event of a failure the Approval Authority shall be informed.

NOTE 31. Preservation, packaging and packing. Unless otherwise specified in the contract or order, preservation, packaging and packing shall be according to J.S. Specification K1005.

NOTE 32. With the tube input and output separately terminated in a short, the phase of the mismatch shall be varied by 360 electrical degrees and helix voltage swept plus and minus 2 per cent from its optimum value at a 50 to 400 cycle rate. The detected tube output shall be viewed as the vertical deflection on an oscilloscope and the helix voltage as the horizontal deflection. The sensitivity of the test circuit shall be that necessary to indicate the tube noise output. The onset of oscillation is observed as a discontinuity in the oscilloscope trace.

NOTE 33. Installation and alignment shall be as follows:-

(a) Connect power supply and r.f. lines to the T.W.T.

(b) Apply rated heater voltage for a period of two minutes. The full rated heater voltage may be applied instantaneously.

(c) Set Grid 2 to zero volts and set all other elements to voltages shown on the tube label.

(d) Turn up the voltage on Grid 2 until the collector current reaches the value shown on the tube label. Grid 2 voltage shall then be approximately that shown on the label. Collector current shall be set to an accuracy of 1%.

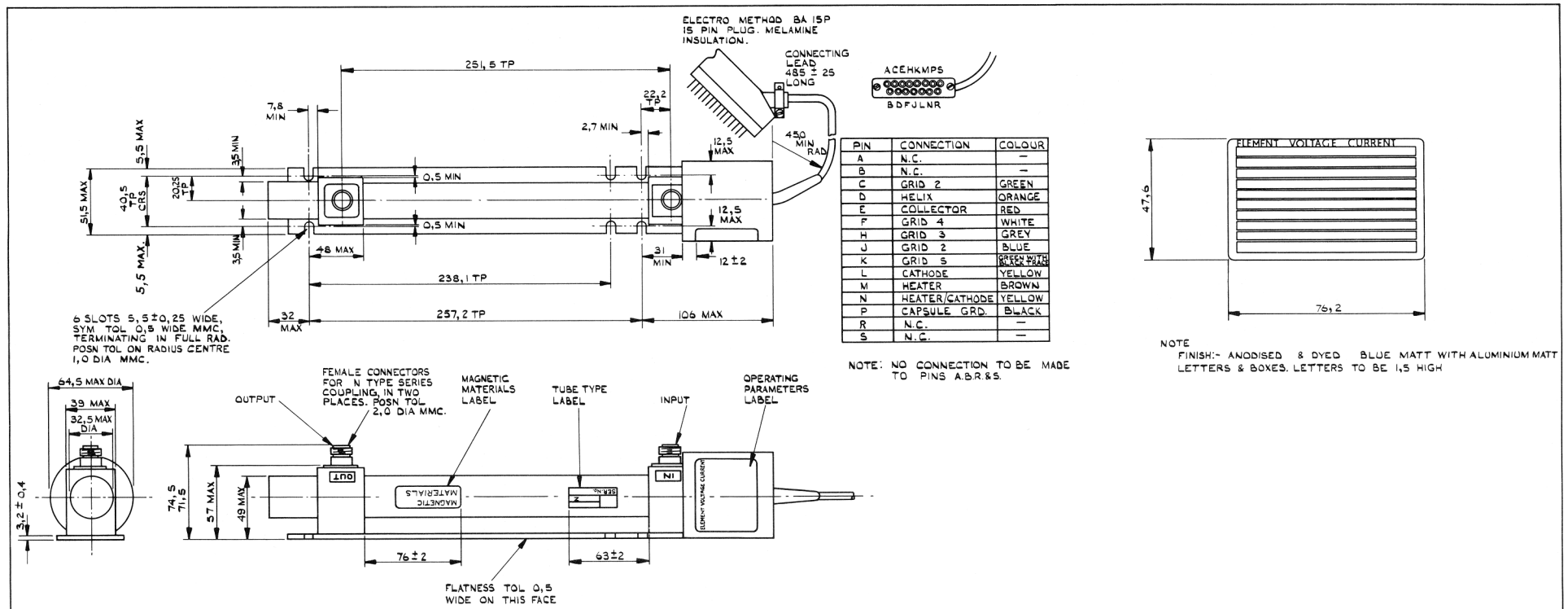
(e) After initial installation and setting of voltages, subsequent turn-on procedure may be as follows:-

1. Same as (b).

2. All other voltages may then be immediately turned on to the preset values with the proviso that the Grid 2 voltage is not achieved before the helix voltage.

NOTE 34. Measurement Error shall be defined as:-

Gain	± 1 dB
Sat. Power output	± 1 dB
Noise	± 0.5 dB

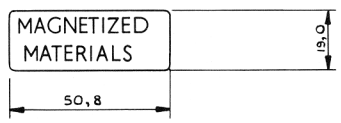


PIN	CONNECTION	COLOUR
A	N.C.	—
B	N.C.	—
C	GRID 2	GREEN
D	HELIX	ORANGE
E	COLLECTOR	RED
F	GRID 4	WHITE
H	GRID 3	GREY
J	GRID 2	BLUE
K	GRID 5	GREEN WITH BLACK TRACE
L	CATHODE	YELLOW
M	HEATER	BROWN
N	HEATER/CATHODE	YELLOW
P	CAPSULE GRD.	BLACK
R	N.C.	—
S	N.C.	—

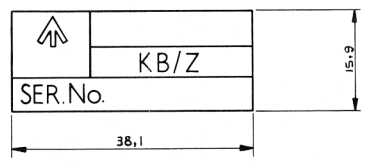
NOTE: NO CONNECTION TO BE MADE TO PINS A.B.R.&S.

NOTE
FINISH:- ANODISED & DYED BLUE MATT WITH ALUMINIUM MATT LETTERS & BOXES. LETTERS TO BE 1,5 HIGH

FINISH
FERROUS COMPONENTS BLACKENED AND PRIMED WITH PAINT TO CS 2307A IN ACCORDANCE WITH DEF 5000, PART 7, SECTION 5, PARA 2b. TOP COAT LIGHT GREY EGG SHELL PAINT TO CS 2508A IN ACCORDANCE WITH DEF 5000, PART 7.
R.F. CONNECTORS BRIGHT SILVER PLATED.



NOTE
BLACK LETTERS 5,5 HIGH TO BE ON CANARY YELLOW BACKGROUND.



NOTES:
1. BROAD ARROW 4,8 HIGH. CHARACTERS TO BE 2,5 HIGH.
2. COLOUR:- WHITE CHARACTERS ON BLACK BACKGROUND

OUTLINE DRAWING OF TUBE

DIMENSIONS IN mm

CV6179/1/9

ELECTRONIC VALVE SPECIFICATION
SPECIFICATION AD/CV 6179 ISSUE 1
DATED 13TH JUNE 1967

AMENDMENT 1

Page 2 Test 4.7 - Gain

Limits column:- amend the maximum value to 42 dB.

August, 1968.

TVC for ASWE

ELECTRONIC VALVE SPECIFICATION

SPECIFICATION AD/CV 6179

ISSUE 1 DATED 13 JUNE 1967

AMENDMENT NO 3

OUTLINE DRAWING OF TUBE

FINISH - FIRST SENTENCE, AFTER "..... Section 5, Paragraph 2b".

ADD - , or commercial equivalent.

FINISH - SECOND SENTENCE, AFTER "..... DEF 5000, PART 7".

ADD - , or commercial equivalent.

SLR 23 PSV2/P14481/76

October 1976