ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION AD/CV4110 ISSUE 1. DATED 1.10.1962

AMENDMENT NO.2

(i) Page B. Following 'Noise Factor' in column headed 'Test' delete all reference to 'Note 1'.

(ii) Page B Notes. Renumber the note to read '26' in lieu of '1'

(iii) Page 4. 4.9.6.3. Glass Strain Following '2.5' in the column headed 'AQL (% Defective)' insert 'Note 27'.

(iv) Page 7. Insert additional 'Notes 26 and 27' as follows:-

(a) 26 See Page B.

(b) 27 In the case of valves with gold plated pins the AQL (% Defective) shall be 6.5.

July 1964. T.V.C. for A.S.W.E.

.222389

ELECTRONIC VALVE SPECIFICATIONS.
SPECIFICATION AD/CV.4110 ISSUE No. 1 DATED 1.10.62
AMENDMENT NO. 3

Page A DIMENSIONS.

(i) 'A' Seated Height, Max. Amend "55.6" to read "49.2".

(ii) 'C' Overall Length, Max. Amend "62.7" to read "55.6".

October, 1964. T.V.C. for A.S.W.E.

CV4110

VALVE ELECTRONIC

ADMIRALTY SURFACE WEAPONS ESTABLISHMENT

Specification AD/CV4110 incorporating MIL-E-1/1301B/NAVY Issue 1 dated 1.10.1962 To be read in conjunction with K1006 and BS.448	SECURITY Specification: Unclassified Valve: Unclassified

TYPE OF VALVE: Medium Mu Low Noise Double Triode
CATHODE: Indirectly heated
ENVELOPE: Glass
PROTOTYPE: 7308

MARKING
See K1001/4
Additional marking: 7308

BASE
BS448/B9A

RATING

(All limiting values are absolute)

			Note
Heater Voltage	(V)	6.3	
Heater Current	(A)	.335	
Max. Anode Voltage	(V)	~~400~~	~~A~~
Max. "~~No load~~" Anode Voltage D,E	(V)	250.	A
Max. Anode Dissipation	(W)	1.65	A
Max. Heater-Cathode Voltage	(V)	+ 70 -135	A
Max. Negative Grid Voltage	(V)	110	A
Amplification Factor		33	B
Mutual Conductance	(mA/V)	12.5	B
Max. Bulb Temperature	(°C)	165	
Max. Noise Factor	(dB)	2.2	D
* Peak Anode Voltage (I_a=0), (V)		440	

CONNECTIONS

Pin.	Electrode	
1.	Anode"	a"
2.	Grid"	g"
3.	Cathode"	k"
4.	Heater	h
5.	Heater	h
6.	Anode'	a'
7.	Grid'	g'
8.	Cathode'	k'
9.	Internal Shield	

DIMENSIONS

Dimensions (mm)	Min.	Max.
A. Seated Height	-	55.6
B. Diameter	19	22.2
C. Overall Length	-	62.7

CAPACITANCES (Nom.)

C ag	(pF)	1.4	A,C.
C in	(pF)	3.3	A,C
C out'	(pF)	1.8	C
C out"	(pF)	1.7	C
Cg' to g" (Max.)	(pF)	.008	C
Ca' to a" (Max.)	(pF)	.060	C

MOUNTING POSITION

Any

NOTES

A. Per section.

B. At Va(b) = 100V; Vg(b) =+9V; Rk = 680 ohm.

C. Without external shield.

D. See test on page B

E. The Joint Services Catalogue Number is:- 5960-99-037-2504

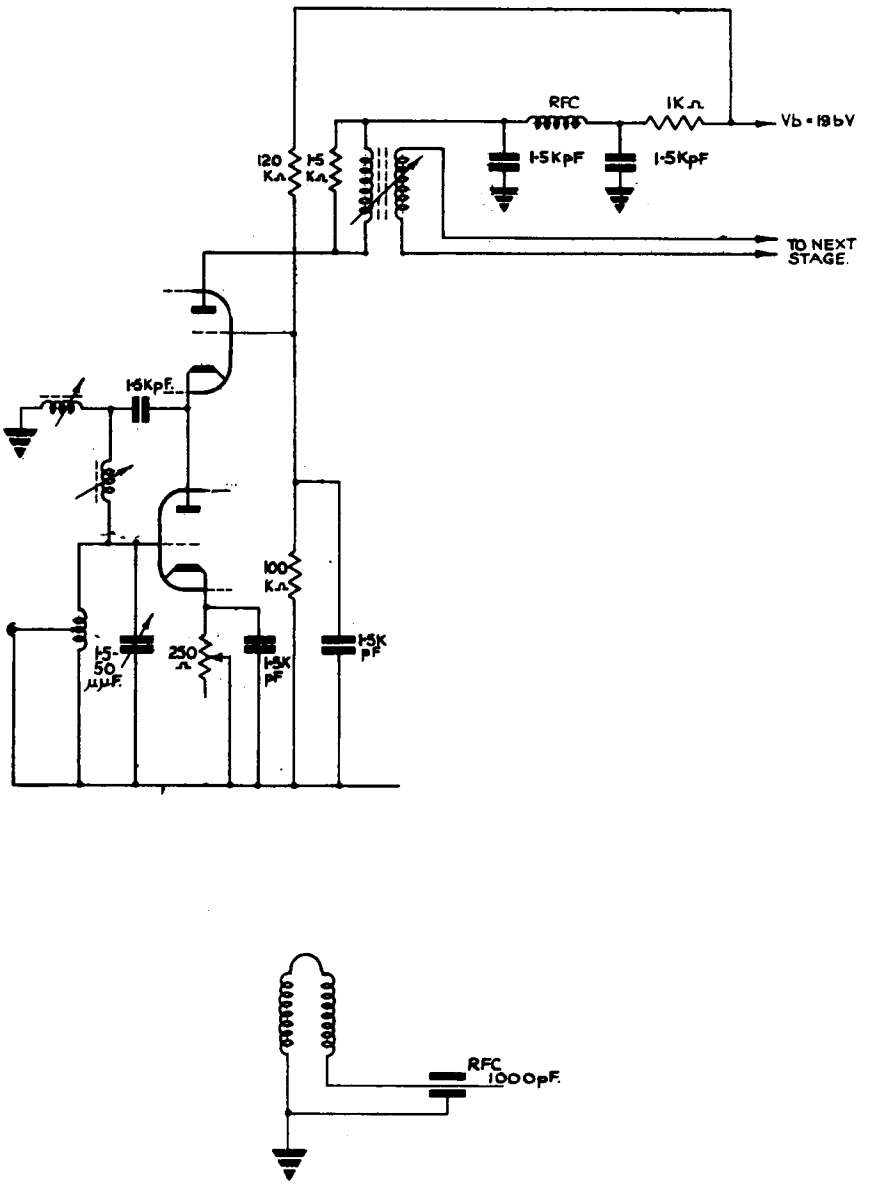
TESTS

Additional to and in place of 4.10.3.1 and 4.10.3.4 in MIL-E-1/1301B (NAVY) specification.

Ref.	Test	Conditions	AQL %	Insp. Level	Sym.	LIMITS						Units
						Min.	LAL	Bogie	UAL	Max.	ALD	
	Noise Factor Note 1	V_h = 6.3V V_a (b) = 196V I_a = 15 mA R_k = adj. R_a = 1000 ohm Note 26	4	I	N.F.		-	-	-	2.2	-	dB

NOTES

1. Valves shall be tested at a convenient frequency within the range 40-50 Mc/s in an approved head amplifier (see circuit diagram on page C). The noise factor of the complete unit shall be measured for a bandwidth not exceeding 1 Mc/s. The noise contributed by the second stage shall not exceed 3% of the total noise. The input circuit losses measured at the grid shall not exceed an equivalent conductance of 3 micro-mhos at the test frequency. The transformed source of resistance shall be such that a minimum value of noise factor is obtained for a representative value of this type (approx. 15,000 ohms).



CIRCUIT FOR CV4110 AND CV4111 NOISE FACTOR MEASUREMENTS.

MILITARY SPECIFICATION SHEET
ELECTRON TUBE, TYPE 7308

CV4110

The requirements and tests of the latest issue of Specification MIL-E-1 shall apply, except as otherwise required herein.

Description: Twin Triode. Medium mu

Ratings:	Ef V	Ebb Vdc	Eb Vdc	Ecc Vdc	Ec Vdc	Ehk v	Rk/k ohms
Absolute Maximum:	6.6	--	250	--	--	70	--
Minimum:	6.0	--	--	--	-110	-135	--
Test Cond:	6.3	100	Approx.90	+ 9	--	--	680

Ratings:	Rg/g Meg	Ik/k mAdc	Ic/g mAdc	Pp/p W	T envelope °C	Alt. ft.
Absolute Maximum:	0.5	22	--	1.65	165	60,000
Minimum	--	--	--	--	--	--
Test Cond.:	--	--	--	--	--	--

Note 1

Cathode: Coated unipotential
Base: Miniature Button, 9 pin,

Pin No:	1	2	3	4	5	6	7	8	9
Element:	2p	2g	2k	h	h	1p	1g	1k	sd

Diameter: 7/8 inch max.
Height: 2-3/16 in. max.
Envelope: T-6-1/2

For the purposes of acceptance inspection, use applicable reliable paragraphs of Specification MIL-E-1.

Ref.	Test	Conditions	AQL % Defective	Insp. Level or Code	Sym	Limits (See Note 3) Min.	LAL	Bogie	UAL	Max.	ALD	Units
3.1	General Qualification	Required Note 22	--	--	--	--	--	--	--	--	--	--
3.6	Performance		--	--	--	--	--	--	--	--	--	--
3.7	Marking	Note 21	--	--	--	--	--	--	--	--	--	--
	Qualification Tests (see Note 17)											
--	Cathode	Coated uni-potential	--	--	--	--	--	--	--	--	--	--
3.4.3	Base connections	Outline E9-1	--	--	--	--	--	--	--	--	--	--
4.9.19.9	Vibration:	Rp=2,000 Ck=1,000 uf Note 16	--	--	Ep	--	--	--	--	100		mVac

CV4110

Ref.	Test	Conditions	AQL (% Defective)	Insp. Level or Code	Sym.	Limits, Note 4 Min.	LAL	Bogie	UAL	Max	ALD	Units
	Measurements acceptance tests, part 1, Note 3											
4.10.8	Heater Current:		---	---	If:	---	320	335	350	---	28	mA
4.10.8	Heater Current		0.65	II	If:	305	---	---	---	365	---	mA
4.10.15	Heater Cathode Leakage:	Ehk= +100V dc	0.65	II	(Ihk:	---	---	---	---	10	---	µAdc
		Ehk=-100V dc Note 2			(Ihk:	---	---	---	---	10	---	µAdc
4.10.6.1	+ Grid Current (1)	Note 2	0.65	II	Io:	0	---	---	---	-0.1	---	µAdc
4.10.4.1	Plate Current (1)	Ebb= 90V dc: Ecc=0: Rk=80 Note 2	---	--	Ib:	---	13.3	15.0	16.7	---	5.4	mAdc
4.10.4.1	+Plate Current (1)	Ebb=90V dc: Ecc=0: Rk=80: Note 2	0.65	II	Ib:	11.3	---	---	---	18.7	---	mAdc
4.10.4.1	Plate Current (2)	Ec= -15 Eb= 150V Note 2 RK/K = 680 ohms	0.65	II	Ib:	---	---	---	---	5	---	µAdc
4.10.9	Trans-conductance (1):	Note 2	---	---	Sm:	---	11700	12500	13300	---	2500	µmhos
4.10.9	Trans-conductance (1):	Note 2	0.65	II	Sm:	10400	---	---	---	14600	---	µmhos
4.7.5	Continuity and Shorts (Inoperatives)		0.4	II		---	---	---	---	---		
4.9.1	Mechanical	Envelope Outline No. (6-7)	---	---		---	---	---	---	---		---
	Measurements acceptance tests, part 2											
4.8	Insulation of Electrodes	Note 2 g-all:10 meg p-all in series	2.5	I6	(R:	100	---	---	---	---	---	Meg
					(R:	100	---	---	---	---	---	Meg
4.10.9	Trans-conductance (2)	Ef=5.7 Vac; Note 2.	2.5	I	ΔSm: Ef:	---	---	---	---	15	---	%

Ref.	Test	Conditions	AQL (% Defec-tive)	Insp. Level or Code	Sym.	Limits, Note 4						Units
						Min.	LAL	Bogie	UAL	Max	ALD	
4.10.11.2	Amplification Factor		6.5	1	Mu	26.5	--		--	39.5	---	
4.10.6.1	Grid Current (2)	Notes 2 and 15	2.5	1	Ig	0	--	--	--	-0.5	---	µAdc
4.10.3.1	R.F.Noise	Ecal=30 mV Notes 16 and 18	2.5	1				--	--	--	---	
4.10.3.4	Noise and Micro-phonics This test may be carried out on alter-native approved test gear to that called up in Note 20	Ebb=250 Vdc: Rk=680 ohms Ecal = 5 mVac: Ck=100uf Rp=10,000 Notes 2 and 20	2.5	1		--	--	--	--	--	---	
4.10.14	Capacitance											
	No Shield	Note 2			Cgp:	1.2	--	--	--	1.6	---	pf
	No Shield	Note 2			Cin:	2.7	--	--	--	3.9	---	pf
	No Shield	Sect 1	6.5	Code E	Cout:	1.6	--	--	--	2.0	---	pf
	No Shield	Sect 2			Cout:	1.5	--	--	--	1.9	---	pf
	No Shield				Cgg:	--	--	--	--	.008	---	pf
	No Shield				Cpp:	--	--	--	--	.060	--	pf
4.9.12.1	Low Pres-sure Voltage Breakdown	Pressure = 55+ 5 mmHg: Voltage= 300 Vac	6.5	Note 19	--	--	--	--	--	--	--	--
4.9.19.1	Vibration (2)	Rp=2,000 Ck=1,000 Note 16	6.5	Code 1	Ep:	--	--	--	--	50	--	mVac
		Degradation Rate Acceptance Tests Note 6										
4.9.20.5	Shock	Hammer Angle = 30° Ebk = + 100V dc Note 5:		---		--	--	--	--	--	--	
4.9.20.6	Fatigue	G= 2.5 Fixed Frequency 50 c.p.s.	6.5	Note 19		--	--	--	--	--	--	
---	Post Shock and Fatigue Test End Points:	Vibration (2) Heater-Cathode Leakage	---	--	Ep:	--	--	--	--	75	--	mVac
		Ebk= +100	---	--	Ibk:	--	--	--	--	15	--	µAdc
		Ebk=-100	---	--	Ibk:	--	--	--	--	15	--	µAdc

Ref.	Test	Conditions	AQL (% Defective)	Insp. Level or Code	Sym.	Limits Note 4						Units
						Min.	LAL	Bogie	UAL	Max	ALD	
		Transconductance (1)	---	---	Sm:	9,000	--	---	---	16,500	---	µmhos
		Grid Current (1)	---	---	Ic:	0	--	---	---	-0.2		µAdc
4.9.6.1	Miniature Tube Base Strain:		---	---	--	--	--	---	---	---	---	---
4.9.6.3	Glass Strain		2.5	I								

Ref.	Test	Conditions	AQL (% Defective)	Insp. Level or Code	Allowable defectives per characteristics		Sym	Limits		Units
					1st sample	Combined samples		Min	Max	
	Acceptance Life Tests. Note 6									
4.11.7	Heater-Cycling Life Test:	Ef=7.5V Ehk:= +100Vdc Ec=Eb=0: 1 min. on, 4 min. off. Note 7	---	---	---	---		--	--	
4.11.4	Heater Cycling Life Test End Points	Heater Cathode Leakage								
		Ehk=+100V dc	---	---	---	---	Ihk:	--	20	µAdc
		Ehk=-100V dc	---	---	---	---	Ihk:	--	20	µAdc
4.11.3.1 (a)	Stability Life Test	Ehk=+135V dc Rg=47,000 TA=Room Notes 2 and 8	1.0	Code I	---	---		--	--	
4.11.4	Stability Life Test End Points (2 and 20 hours)	Change in Transconductance (1) of individual tubes	---	---	---	---	ΔSm: t	--	10	%
4.11.3.1 (b)	Survival Rate Life Tests	Stability Life Test Conditions or Equivalent Notes 2, 9 and 10.	---	II	---	---		--	--	
4.11.4	Survival Rate Life Test End Points (100 hours)	Continuity and Shorts (Inoperatives)	0.65	---	---	---		--	--	
		Transconductance (1)	1.0	---	---	---	Sm:	9000	--	µmhos

Ref.	Test	Conditions	AQL (% Defective)	Insp. Level or Code	Allowable defectives per characteristics		Sym.	Limits		Units
					1st sample	Combined samples		Min	Max	
		Acceptance Life Tests Note 6 (Cont'd)								
4.11.3.1	Intermittent Life Test	Stability Life Test Conditions: T Bulb=165°C Min. Notes 2, 11 and 12	---	---	---	---		---	---	---
4.11.4	Intermittent Life Test End Points: (500 hours)	Note 13 Inoperatives (Note 14)	---	---	1	3		---	---	
		Grid Current (1)	---	---	1	3	Ic:	0	-0.9	µAdc
		Heater Current	---	---	1	3	If	305	365	mA
		Change in Transconductance (1) of individual tubes	---	---	1	3	ΔSmt	--	15	%
4.11.4		Transconductance (2)	---	---	2	5	ΔSmRf	--	15	%
		Heater Cathode Leakage								
		Ehk=+100V dc	---	---	1	3	(Ihk:	--	20	µAdc
		Ehk=-100V dc					(Ihk:	--	20	µAdc
		Insulation of Electrodes								
		g-all	---	---	2	5	(R:	50	--	Meg
		p-all					(R:	50	--	Meg
		Transconductance (1) average change	---	---	---	---	Avg ΔSmt	--	15	%
		Total Defectives	---	---	4	8		--	--	
4.11.4	Intermittent Life Test End Points (1000 hours)	Note 13 Inoperatives								
		Note 14	---	---	2	5		--	--	
		Grid Current (1)	---	---	2	5	Ic:	0	-0.9	µAdc
		Heater Current	---	---	2	5	If:	305	365	mA
		Change in Transconductance (1) of individual tubes	---	---	2	5	ΔSmt	--	25	%
4.11.4.		Heater-Cathode Leakage								
		Ehk=+100V dc	---	---	2	5	(Ihk	--	20	µAdc
		Ehk=-100V dc					(Ihk	--	20	µAdc
		Insulation of Electrodes								
		g-all	---	---	3	6	(R:	50	--	Meg
		p-all					(R:	50	--	Meg
		Total Defectives	---	---	5	10		--	--	
4.9.18.1.1	Container Drop:	Notes 23 & 24								
5.1	Preparation for delivery	Note 25								

Note 1: This value is for operation under fixed bias conditions. With cathode bias, Rg may be 1 megohm maximum.

Note 2: Test each unit separately.

Note 3: The AQL for the combined defectives for attributes in measurements acceptance tests, part 1, excluding inoperatives and mechanical shall be 1.0 per cent. A tube having one or more defects shall be counted as one defective. Standard MIL-STD-105, inspection level II shall apply.

Note 4: Variables sampling procedures: (See 4.1.1.7).

Note 5: A grid resistor of 0.1 megohm shall be added; however, this resistor will not be used when a thyratron type short indicator is employed.

Note 6: Destructive tests: Tubes subjected to the following destructive tests are not to be accepted under this specification:

4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.7	Heater-Cycling Life Test
4.11.5	Intermittent Life Test

Note 7: The no load to steady full load regulation of the heater voltage supply shall be not more than 3.0 per cent. This test shall be made on a lot by lot basis. A failure or defect shall consist of an open heater, open cathode circuit, heater cathode short, or heater cathode leakage current in excess of the heater cycling life test end point limit specified herein.

Note 8: The sampling and testing procedure for the Stability life test shall be in accordance with paragraph 20.2.5.1 of Appendix C of Specification MIL-E-1.

Note 9: The sampling and testing procedure for the Survival rate life test shall be in accordance with paragraphs 20.2.5.2 through 20.2.5.2.4 of Appendix C of Specification MIL-E-1.

Note 10: The equivalent stability life test conditions for Survival rate life test shall be in accordance with paragraph 20.2.5.2.5 of Appendix C of Specification MIL-E-1.

Note 11: Sampling and acceptance procedures for Intermittent life tests shall be in accordance with paragraph 20.2.5.3 of Appendix C of Specification MIL-E-1.

Note 12: Envelope temperature is defined as the highest temperature indicated when using a thermocouple of ⌗ 40BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze in contact with the envelope. Envelope temperature requirements will be satiafied if tube, having bogie lb (± 5%) under normal test conditions, is determined to operate at minimum specified temperature at any point in the life test rack.

Note 13: For order for evaluation of life test defects, see paragraph 4.11.3.1.2 of Specification MIL-E-1.

Note 14: An inoperative as referenced in life test is defined as a tube having one or more of the following defects: discontinuity (ref. Specification MIL-E-1 par. 4.7.1), shorts (ref. Specification MIL-E-1, par. 4.7.2), air leaks (ref. Specification MIL-E-1, par. 4.7.6).

Note 15: Prior to this test, tubes shall be preheated a minimum of 5 minutes with all sections operating at the conditions indicated below. A 3 minute test is not permitted. Test at preheat conditions within 3 seconds after preheating. Grid current (2) shall be the last test performed on the sample selected for the grid current (2) test.

Ef	Ecc	Ebb	Rk	Rg
V	Vdc	Vdc	ohms	Meg
(7.0)	(+9)	(100)	(680)	(0.047)

Note 16: Tie 1k to 2k; 1g to 2g and 1p to 2p. Parasitic suppressors of 50 ohms permitted.

Note 17: All tests listed hereon shall be performed during qualification; however, these three tests are normally performed for qualification inspection only.

Note 18: In addition to the rejection criteria of paragraph 4.10.3.1 of Specification MIL-E-1, the output shall be read on a VU meter using a rejection limit of 5 VU. Five VU is the meter deflection obtained with a steady state output of 3 Mw from the amplifier.

Note 19: This test shall be conducted on the initial lot and thereafter on a lot approximately every 30 days. Once a lot has passed, the 30-day rule shall apply. In the event of lot failures the lot shall be rejected and the succeeding lots shall be subjected to this test until a lot passes. Standard MIL-STD-105, sample size code letter F, shall apply.

Note 20: The rejection level shall be set at the VU meter reading obtained during calibration. Test Gear other than the VU meter may be used if approved by the Specification Authorities.

Note 21: Omitted.

Note 22: Omitted.

Note 23: Not required during qualification of tube.

Note 24: Rough handling (container drop) test (d) and container size B shall apply.

Note 25: Preservation, packaging and packing - Unless otherwise specified in the contract or order, preservation, packaging and packing shall be as follows:-

(a) Preservation and packaging shall be sufficient to afford adequate protection against corrosion and deterioration during shipment from the supply source to the using activity and until installation.

(b) Packing shall be accomplished in a manner which will insure acceptance and protection against physical or mechanical damage during direct shipment from the supply source to the using activity.

7308