MINISTRY OF SUPPLY - R.R.E. (South)

VALVE ELECTRONIC **CV4011**

Specification MOS(A)/CV.4011
incorporating MII/E/1/6C.
Issue 2 dated 26-2-57.
To be read in conjunction with K.1006

SECURITY	
Specification	Valve
UNCLASSIFIED	UNCLASSIFIED

→ indicates a change

TYPE OF VALVE - Reliable RF Pentode

CATHODE - Indirectly-heated

ENVELOPE - Glass

PROTOTYPE - 5725/6AS6W

MARKING

K1001/4

Additional Marking

5725/6AS6W

RATING

			Note
Heater Voltage	(V)	6.3±10%	
Heater Current	(A)	0.175	
Max Anode Voltage	(V)	200	
Max Screen Grid Voltage	(V)	155	
Max Suppressor Grid Voltage	(V)	30	
Max Anode Dissipation	(W)	1.65	
Max Screen Grid Dissipation	(W)	0.55	
Max Heater-cathode Voltage	(V)	±100	
Max Cathode Current	(mA)	20	
Max Bulb Temperature	(°C)	140	B

CAPACITANCES (pF) (Note C)

Cga (max)	0.02
C in (nom)	4.0
C out(nom)	3.0

BASE

B7G

BS.448 : B7G/1.1
(Miniature Button 7-pin, E7-1)

CONNECTIONS

Pin	Electrode	
1	Control Grid	g1
2	Cathode & Internal Shield	k,s
3	Heater	h
4	Heater	h
5	Anode	a
6	Screen Grid	g2
7	Suppressor Grid	g3

DIMENSIONS

BS.448 : B7G/2.1

Dimension (ins.)	Min.	Max.
A. Seated height	-	1 1/2
C. Diameter	5/8	3/4
D. Overall length	-	1 25/32

MOUNTING POSITION

Any

NOTES

A. All limiting values are absolute.

B. Note to Electronic Equipment Design Engineers: Special attention should be given to the temperature of valves to be operated in aircraft. Reliability will be seriously impaired if the maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the value and will be reduced appreciably if absolute maximum ratings are exceeded. Both reliability and performance will be jeopardised if heater voltage ratings are exceeded: life and reliability performance are directly related to the degree that regulation of the heater voltage is maintained at its centre-rated value.

C. Measured with a metal screen or skirted holder.

CV4011

MIL-E-1/6C
25 July 1956
SUPERSEDING
MIL-E-1/6B
5 December 1955

INDIVIDUAL MILITARY SPECIFICATION SHEET

ELECTRON TUBE, RECEIVING, PENTODE, MINIATURE

JAN-5725/6AS6W

This specification sheet forms a part of the latest issue of Military Specification MIL-E-1.

Description: Pentode, Dual Control, RF Sharp Cut-off

Ratings:	Ef	Eb	Ec1	Ec2	Ec3	Ehk	Rg1	Ik	Pp	Ic1	Pg2	Ic3	T Envelope	Alt.
Absolute	V	Vdc	Vdc	Vdc	Vdc	v	Meg	mAdc	W	mAdc	W	mAdc	°C	ft
Maximum:	6.9	200	0	155	30	100	0.1	20	1.65	1.0	0.55	0.2	+165	60,000 Note 2
Minimum:	5.7	—	- 55	—	- 55	—	—	—	—	—	—	—	—	—
Test Cond.:	6.3	120	-2.0	120	0 Note 1	0 Note 1	—	—	—	—	—	—	—	—

Cathode: Coated Unipotential
Base: Miniature Button 7-Pin

Diameter: 3/4 in. max.
Height: 1-3/4 in. max.

Envelope: T-5 1/2

Pin No.:	1	2	3	4	5	6	7
Element:	g1	k sd	h	h	p	g2	g3

The following tests shall be performed:
For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.
For miscellaneous requirements, see Paragraph 3.3, Inspection Instructions for Electron Tubes.

Ref.	Test	Conditions	AQL (%)	Insp. Level or Code	Sym.	LIMITS, NOTE 4 Min.	LAL	Bogie	UAL	Max.	ALD	Units
	Qualification Approval Tests											
3.1	Qualification Approval:	Required for JAN Marking	—	—								
—	Cathode:	Coated Unipotential	—	—								
3.4.3	Base Connections:	E7-1	—	—								
4.9.20.3	Vibration(1):	Rp=10,000;Note 7	—	—	Ep:	—	—	—	—	200	—	mVac
	Measurements Acceptance Tests Part 1 Note 3											
4.10.8	Heater Current:		—	—	If:	—	168	175	182	—	14	mA
4.10.8	Heater Current:		0.65	II	If:	160	—	—	—	190	—	mA
4.10.15	Heater-Cathode Leakage:	Ehk=+100Vdc Ehk=-100Vdc	0.65	II	{Ihk: {Ihk:	— —	— —	— —	— —	10 10	— —	uAdc uAdc
4.10.6.1	Grid Current:	Rg1=0.1Meg	0.65	II	Ic1:	0	—	—	—	-0.1	—	uAdc
4.10.4.1	Plate Current(1):		—	—	Ib:	—	4.2	5.2	6.2	—	2.3	mAdc
4.10.4.1	Plate Current(1):		0.65	II	Ib:	2.5	—	—	—	9.0	—	mAdc
4.10.9	Transconductance(1):		—	—	Sm:	—	2900	3200	3500	—	750	umhos
4.10.9	Transconductance(1):		0.65	II	Sm:	2500	—	—	—	4500	—	umhos
4.7.5	Continuity and Shorts: (Inoperatives)		0.4	II		—	—	—	—	—	—	
4.9.1	Mechanical:	Envelope Outline No. (6-1)	—	—		—	—	—	—	—	—	
	Measurements Acceptance Tests, Part 2											
4.8	Insulation of Electrodes:	g1-all g3-all p-all	2.5	IA	{R: {R: {R:	100 100 100	— — —	— — —	— — —	— — —	— — —	Meg Meg Meg
4.10.4.1	Plate Current(2):	Ec1=-3Vdc; Ec3=-10Vdc	2.5	I	Ib:	—	—	—	—	200	—	uAdc

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Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Sym.	LIMITS, NOTE 4 Min.	LAL	Bogie	UAL	Max.	ALD	Units
	Measurements Acceptance Tests, Part 2(Contd)											
4.10.4.1	Plate Current(3):	Ec1=-3Vdc; Ec3=-6Vdc	2.5	I	Ib:	5	---	---	---	---	---	uAdc
4.10.4.1	Plate Current(4):	Ec1=-8Vdc	2.5	I	Ib:	---	---	---	---	200	---	uAdc
4.10.4.1	Plate Current(5):	Ec1=-6Vdc	2.5	I	Ib:	5	---	---	---	---	---	uAdc
4.10.4.3	Screen Grid Current:		2.5	I	Ic2:	1.5	---	---	---	5.5	---	mAdc
4.10.9	Transconductance(2):	Ef=5.7V;Note 20	2.5	I	$\triangle Sm_{Rf}$:	---	---	---	---	15	---	%
4.10.6.2	Grid Emission:	Ef=7.5V;Ec1=-10Vdc; Rg1=0.1meg;Note 19	2.5	I	Isc:	0	---	---	---	-1.0	---	uAdc
4.10.3.1	RF Noise:	Ecal=15.0mVac;Ec1=0; Rk=200;Ck=0.2uf;Note 21	2.5	I		---	---	---	---	---	---	
4.10.3.5	Noise and Microphonics:	Ef=6.3Vac;Eb=Ec2=200 Vdc;Ec1=0;Ecal=175mVac; Rk=1000;Rp=0.1Meg;Rg2= 0.5Meg;Cg2=2uf;Ck=1000uf min;Note 22	2.5	I		---	---	---	---	---	---	
4.10.9	Transconductance(3):	Ec1=-3Vdc (12.5) Ec3	6.5	IA	S(g3-p):	350	---	[illegible]	---	1050	---	umhos
4.10.9	Transconductance(4):	Ec3=-5Vdc	6.5	IA	S(g1-p):	700	---	---	---	1700	---	umhos
4.10.14	Capacitance:	Shield No. 316	6.5	Code E	Cg1p:	---	---	---	---	.02	---	uuf
		Shield No. 316			Cin:	3.5	---	---	---	4.5	---	uuf
		Shield No. 316			Cout:	2.6	---	---	---	3.4	---	uuf
---	Low Pressure Breakdown Voltage:	Pressure=55±5mm Hg.; Voltage=500Vac;Note 6	6.5	Note 5		---	---	---	---	---	---	
4.9.19.1	Vibration(2):	Rp=10,000;Note 7	6.5	Code I	Ep:	---	---	---	---	150	---	mVac
	Degradation Rate Acceptance Tests, Note 8											
4.9.20.5	Shock:	Hammer angle=30°; Ehk=-100Vdc;Note 9	---	---		---	---	---	---	---	---	
4.9.20.6	Fatigue:	G=2.5;Fixed frequency; F=25 min., 60 max.	6.5	Note 5		---	---	---	---	---	---	
---	Post Shock and Fatigue Test End Points:	Vibration(2)	---	---	Ep:	---	---	---	---	300	---	mVac
		Heater-Cathode Leakage										
		Ehk=-100Vdc	---	---	Ihk:	---	---	---	---	30	---	uAdc
		Ehk=-100Vdc	---	---	Ihk:	---	---	---	---	30	---	uAdc
		Transconductance(1)	---	---	Sm(1):	2200	---	---	---	---	---	umhos
		Grid Current	---	---	Ic1:	0	---	---	---	-0.4	---	uAdc
4.9.6.1	Miniature Tube Base Strain:		---	---		---	---	---	---	---	---	
---	Glass Strain:	Note 10	2.5	I		---	---	---	---	---	---	

Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Allowable Defectives per Characteristic 1st Sample	Allowable Defectives per Characteristic Combined Samples	Sym.	LIMITS Min.	LIMITS Max.	Units
	Acceptance Life Tests, Note 8									
4.11.7	Heater Cycling Life Test:	Ef=7.5V;Ehk=-135Vdc; Ec1=Ec2=Ec3=Eb=0; Note 11	---	---	---	---		---	---	
4.11.4	Heater Cycling Life Test End Points:	Heater-Cathode Leakage								
		Ehk=-100Vdc	---	---	---	---	Ihk:	---	20	uAdc
		Ehk=-100Vdc	---	---	---	---	Ihk:	---	20	uAdc

Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Allowable Defectives per Characteristic		Sym.	LIMITS		Units
					1st Sample	Combined Samples		Min.	Max.	
	Acceptance Life Tests, Note 8(Contd)									
—	Stability Life Test	Eb=180Vdc; Ec1=0; Ec2=125Vdc; Ehk=135Vdc; Rk=130; Rg1=0.1meg; TA=Room; Note 12	1.0	Code I	—	—	—	—	—	
4.11.4	Stability Life Test End Points:	Change in Transconductance(1) of individual tubes	—	—	—	—	Δ_{t}^{Sm}:	—	10	%
—	Survival Rate Life Test: (100 hours)	Stability Life Test Conditions or equivalent; Notes 13,14	—	II	—	—		—	—	
4.11.4	Survival Rate Life Test End Points:	Continuity and Shorts (Inoperatives)	0.65	—	—	—		—	—	
		Transconductance(1)	1.0	—	—	—	Sm:	2200	—	umhos
4.11.5	Intermittent Life Test:	Stability Life Test Conditions; T Envelope=165°C min.; Notes 15,16	—	—	—	—		—	—	
4.11.4	Intermittent Life Test End Points: (500 hours)	**Note 17**								
		Inoperatives; Note 18	—	—	1	3		—	—	
		Grid Current	—	—	1	3	Icl:	0	-0.1	uAdc
		Heater Current	—	—	1	3	If:	160	190	mA
		Change in Transconductance(1) of individual tubes	—	—	1	3	Δ_{t}^{Sm}:	—	20	%
		Transconductance(2)	—	—	2	5	Δ_{Ef}^{Sm}:	—	15	%
		Heater-Cathode Leakage								
		Ehk=+100Vdc	—	—	1	3	Ihk:	—	10	uAdc
		Ehk=-100Vdc					Ihk:	—	10	uAdc
		Insulation of Electrodes								
		g1-all					R:	50	—	Meg
		g3-all	—	—	2	5	R:	50	—	Meg
		p-all					R:	50	—	Meg
		Transconductance(1) average change	—	—	—	—	Avg Δ_{t}^{Sm}:	—	15	%
		Total Defectives	—	—	4	8		—	—	
4.11.4	Intermittent Life Test End Points: (1000 hours)	**Note 17**								
		Inoperatives; Note 18	—	—	2	5		—	—	
		Grid Current	—	—	2	5	Icl:	0	-0.1	uAdc
		Heater Current	—	—	2	5	If:	160	190	mA
		Heater-Cathode Leakage								
		Ehk=+100Vdc	—	—	2	5	Ihk:	—	10	uAdc
		Ehk=-100Vdc					Ihk:	—	10	uAdc
		Change in Transconductance(1) of individual tubes	—	—	2	5	Δ_{t}^{Sm}:	—	25	%
		Total Defectives	—	—	5	10		—	—	
	Packaging Requirements									
4.9.18.1.1	Carton Drop:	(d) Package Group 1; Carton Size B								

Note 1: The reference point for heater-cathode (suppressor when applicable) potential shall be the positive terminal of the cathode resistor, unless otherwise specified.

Note 2: If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.

Note 3: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Inoperatives and Mechanical shall be one (1) percent. A tube having one (1) or more defects shall be counted as one (1) defective. MIL-STD-105, Inspection Level II shall apply.

Note 4: Variables Sampling Procedure:

See Appendix B of Inspection Instructions for Electron Tubes.

Note 5: 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 failure, the lot shall be rejected and the succeeding lot shall be subjected to this test. MIL-STD-105, sample size code letter F shall apply.

Note 6: Tubes shall be tested in a chamber under the conditions of pressure specified on the specification sheet. The specified voltages shall be applied between the base pins of elements carrying B+ voltage and their adjacent pins. Voltage shall be of sinusoidal wave form with F = 60 cycles. Tubes showing evidence of corona or arcing shall be considered defective.

Note 7: The impedance of the plate and screen voltage supplies shall not exceed that of a 40 uf capacitor at 10 cps.

Note 8: 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 9: Rg = 0.1 meg; Rg not to be used when thyratron-type short indicator is used.

Note 10: Glass strain procedures - All tubes subjected to this test shall have been sealed a minimum of 48 hours prior to conducting this test. All tubes shall be at room temperature. The entire tube shall be immersed in water at not less than 97°C for 15 seconds and immediately thereafter immersed in water at not more than 5°C for 5 seconds. The volume of water shall be large enough so that the water temperature will not be appreciably affected by the test. The holder shall be in accordance with Drawing #245-JAN, and the tubes shall be immersed quickly. The tubes shall be so placed in the water that no contact is made with the containing vessel, nor shall the tubes contact each other. After the 5-second submersion period, the tubes shall be removed and allowed to return to room temperature on a wooden surface. After drying at room temperature for a period of 48 hours, the tubes shall be inspected and rejected for evidence of air leaks. (Paragraph 3.2.4.3 of MIL-E-1C). Electrical rejects, other than inoperatives, may be used in the performance of this test.

Note 11: The no-load to steady state full load regulation of the heater voltage supply shall be not more than 3.0 percent. 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 specified Heater-Cycling Life Test End Point Limit.

Note 12: Stability Life Test: The sampling and testing procedure for this test shall be in accordance with paragraphs 5.3.4.1(a) to 5.3.4.1(g), inclusive, of the Inspection Instructions for Electron Tubes.

Note 13: SURVIVAL RATE LIFE TEST: The sampling and testing procedure for this test shall be as defined in paragraphs 5.3.4.2 to 5.3.4.2.4, inclusive, of the Inspection Instructions for Electron Tubes.

Note 14: For Survival Rate Life test, the equivalent Stability Life test conditions shall be as defined in paragraph 5.3.4.2.5 of the Inspection Instructions for Electron Tubes.

Note 15: Intermittent Life Tests: Sampling and acceptance procedures for these tests shall be as defined in paragraphs 5.3.4.3(a) to 5.3.4.3(i), inclusive, of the Inspection Instructions for Electron Tubes.

Note 16: Envelope Temperature shall be defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of .025 inch diameter phosphor bronze placed in contact with the envelope. Envelope Temperature requirement will be satisfied if tube, having bogie Ib (±5%) under normal test conditions, is determined to operate at minimum specified temperature at any position on the life test rack.

Note 17: Order for evaluation of life test defects:- If a tube is defective for more than one attribute characteristic, the characteristic appearing first in the Life Test End Points shall constitute the failure.

Note 18: An inoperative as referenced in Life Test shall be defined as a tube having one (1) or more of the following defects: discontinuity (Ref. MIL-E-1, par. 4.7.1), shorts (Ref. MIL-E-1, par. 4.7.2), air leaks. (Ref. Par. 3.2.4.3, MIL-E-10).

Note 19: Prior to this test the tube shall be preheated a minimum of five (5) minutes at the conditions indicated below. Three minute test is not permitted. Test within 3 seconds after preheating. Grid Emission shall be the last test performed on the sample selected for the Grid Emission test.

Ef	Ec1	Ec2	Ec3	Eb	Rk	Rg1
V	Vdc	Vdc	Vdc	Vdc	ohms	Meg
7.5	0	125	0	180	130	0.1

Note 20: Transconductance (2) is the percent change in Transconductance (1) of an individual tube resulting from the change in Ef.

Note 21: In addition to the rejection criteria of Par. 4.10.3.1, MIL-E-1, the output shall be read on a VU meter using a rejection limit of five (5) VU. Five (5) VU is the meter deflection obtained with a steady state output of 3 mW from the amplifier.

Note 22: The rejection limit shall be set at the VU meter reading obtained during calibration.

Note 23: Reference specification shall be of the issue in effect on the date of invitation for bid.

SPECIFICATION MOS(A)/CV4011

ISSUE 2 DATED 16.2.57

AMENDMENT No. 1

Page 2

In clause 4.10.9 Transconductance (3)
amend Ec1 = -3Vdc to read Ec3 = -3Vdc.

R.R.E.

December, 1958.

N.44748/D