

Specification MOS(A)/CV.4011

incorporating MIL/E/1/6C.

Issue 2 dated 26-2-57.

To be read in conjunction with K.1006

SECURITY

Specification

UNCLASSIFIED

Valve

UNCLASSIFIED

→ indicates a change

TYPE OF VALVE - Reliable RF Pentode CATHODE - Indirectly-heated ENVELOPE - Glass PROTOTYPE - 5725/6AS6W		<u>MARKING</u> K1001/4 <u>Additional Marking</u> 5725/6AS6W	
<u>RATING</u> Heater Voltage (V) $6.3 \pm 10\%$ 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		<u>BASE</u> B7G BS.44B : B7G/1.1 (Miniature Button 7-pin, E7-1)	
		<u>CONNECTIONS</u>	
		Pin	Electrode
		1	Control Grid c1
		2	Cathode & Internal Shield k,s
		3	Heater h
		4	Heater h
		5	Anode a
		6	Screen Grid g2
		7	Suppressor Grid g3
<u>CAPACITANCES (pF) (Note C)</u> C _{GA} (max) 0.02 C in (nom) 4.0 C out(nom) 3.0		<u>DIMENSIONS</u> BS.44B : 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
		<u>MOUNTING POSITION</u> Any	
<u>NOTES</u> A. All limiting values are absolute. B. <u>Note to Electronic Equipment Design Engineers:</u> 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 valve 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-1/8C
25 July 1956
SUPERSEDED
MIL-E-1/8E
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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

Rating:	Ef	Eb	Ec1	Ec2	Ec3	Ehk	Eg1	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
Minimum:	5.7	—	- 55	—	- 55	—	—	—	—	—	—	—	—	—
Test Cond.:	6.3	120	-2.0	120	0	0	—	—	—	—	—	—	—	—

Note 1 Note 1 Note 2

Cathode: Coated Unipotential
Base: Miniature Button 7-Pin

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

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

Envelope: T-5 1/2

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	Acc. (%)	Insp. Level or Code	Sym.	LIMITS, NOTE 4						Units
						Min.	LM	Bogle	VAL	Max.	ABD	
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	—	uAdc
4.10.6.1	f Grid Current:	Eg1=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	f 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 (Inoperative)		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	—	—	—	—	—	Meg
4.10.4.1	Plate Current(2):	Ec1=3Vdc; Ec3=10Vdc	2.5	I	Ib:	—	—	—	—	200	—	uAdc

Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Sym.	LIMITS, NOTE 4					Units
						Min.	LAL	Spcl	UAL	Max.	
<u>Measurements Acceptance Tests, Part 2 (Contd)</u>											
4.10.4.1	Plate Current(3):	Eol=-3Vdc; EoF=-6Vdc	2.5	I	Ib:	5	---	---	---	---	uAde
4.10.4.1	Plate Current(4):	Eol=-6Vdc	2.5	I	Ib:	---	---	---	200	---	uAde
4.10.4.1	Plate Current(5):	Eol=-6Vdc	2.5	I	Ib:	5	---	---	---	---	uAde
4.10.4.3	Screen Grid Current:		2.5	I	Ic2:	1.5	---	---	---	5.5	uAde
4.10.9	Transconductance(2):	E _F =5.7V; Note 20	2.5	I	$\Delta \frac{S_{m, E_F}}{E_F}$	---	---	---	---	15	%
4.10.6.2	Grid Emission:	E _F =7.5V; Eol=-10Vdc; E _g =0.1mag; Note 19	2.5	I	I _{gc} :	0	---	---	---	-1.0	uAde
4.10.3.1	RF Noise:	E _{cal} =15.0mVac; Eol=0; E _h =200; C _h =0.2uF; Note 21	2.5	I		---	---	---	---	---	
4.10.3.5	Noise and Microphonics:	E _F =6.3Vac; E _{hb} =E _{oc} =200 Vdc; Eol=0; E _{cal} =175mVac; E _h =1000; E _p =0.1Mag; R _g = 0.5Mag; C _g =2uF; C _h =1000uF min; Note 22	2.5	I		---	---	---	---	---	
4.10.9	Transconductance(3):	E _F =5.7Vdc E _h =-3Vdc	6.5	IA	S(g3-p):	350	---	---	---	1050	umhos ←
4.10.9	Transconductance(4):	E _{oF} =-5Vdc	6.5	IA	S(g1-p):	700	---	---	---	1700	umhos
4.10.14	Capacitance:	Shield No. 316 Shield No. 316 Shield No. 316	6.5	Code E	{ C _{g1p} : C _{in} : C _{out} :	---	---	---	---	.02 4.5 3.4	uF uF uF
---	Low Pressure Breakdown Voltage:	Pressure=55.5mm Hg.; Voltage=500Vac; Note 6	6.5	Note 5		---	---	---	---	---	
4.9.19.1	Vibration(2):	E _p =10,000; Note 7	6.5	Code I	E _p :	---	---	---	---	150	mVac
<u>Degradation Rate Acceptance Tests, Note 8</u>											
4.9.20.5	Shocks:	Hammer angle=30°; E _{hk} =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) Heater-Cathode Leakage E _{hk} =100Vdc E _{hk} =100Vdc Transconductance(1) Grid Current	---	---	E _p : I _{hks} : I _{hks} : S _m (1): I _{cl} :	---	---	---	---	300 30 30 2200 0	mVac uAde uAde umhos uAde
4.9.6.1	Miniature Tube Base Strains:		---	---		---	---	---	---	---	
---	Glass Strains:	Note 10	2.5	I		---	---	---	---	---	
Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Allowable Defectives per Characteristic		Sym.	LIMITS		Units	
					1st Sample	Combined Samples		Min.	Max.		
<u>Acceptance Life Tests, Note 8</u>											
4.11.7	Heater Cycling Life Test:	E _F =7.5V; E _{hk} =1.35Vdc; Eol=E _{oc} =E _{oF} =E _h =0; Note 11	---	---		---	---	---	---	---	
4.11.4	Heater Cycling Life Test End Points:	Heater-Cathode Leakage E _{hk} =100Vdc E _{hk} =100Vdc	---	---				I _{hks} : I _{hks} :	---	80 80	uAde uAde

Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Allowable Defectives per Characteristic		Sym.	LIMITS		Units
					1st Sample	Combined Samples		Min.	Max.	
<u>Acceptance Life Tests, Note 5(Cont'd)</u>										
	Stability Life Test	$E_b=180Vdc; E_{c1}=0; E_{c2}=125Vdc; E_{h1}=1.35Vdc; E_{h2}=1.30; R_{g1}=0; I_{meg}; T_A=Room; Note 12$	1.0	Code I	---	---	---	---	---	
4.11.4	Stability Life Test End Points:	Change in Transconductance(1) of individual tubes	---	---	---	---	$\Delta S_{m,t}$	---	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) Transconductance(1)	0.65	---	---	---	---	---	---	
4.11.5	Intermittent Life Test:	Stability Life Test Conditions; T Envelope $\geq 165^\circ C$ min.; Notes 15,16	---	---	---	---	---	---	---	
4.11.4	Intermittent Life Test End Points: (500 hours)	Note 17 Inoperatives; Note 18 Grid Current Heater Current Change in Transconductance(1) of individual tubes Transconductance(2) Heater-Cathode Leakage $E_{h1}=100Vdc$ $E_{h2}=100Vdc$ Insulation of Electrodes g1-all g3-all p-all Transconductance(1) average change Total Defectives	---	---	1 1 1 1	3 3 3 3	$I_{cl}: 0$ $I_{f}: 160$ $\Delta S_{m,t}$	---	0 190 20	uAdc mA %
			---	---	2	5	$\Delta S_{m,t}$ I_{hk} I_{hk}	---	15 10 10	% uAdc uAdc
			---	---	2	5	$\left\{ \begin{matrix} R_s \\ R_s \\ R_s \end{matrix} \right.$ $\Delta S_{m,t}$	50 50 50	---	Neg Neg Neg
			---	---	4	8	---	---	---	%
4.11.4	Intermittent Life Test End Points: (1000 hours)	Note 17 Inoperatives; Note 18 Grid Current Heater Current Heater-Cathode Leakage $E_{h1}=100Vdc$ $E_{h2}=100Vdc$ Change in Transconductance(1) of individual tubes Total Defectives	---	---	2 2 2	5 5 5	$I_{cl}: 0$ $I_{f}: 160$ $\left\{ \begin{matrix} I_{hk} \\ I_{hk} \end{matrix} \right.$ $\Delta S_{m,t}$	---	0 190 10 10 25	uAdc mA uAdc uAdc %
			---	---	5	10	---	---	---	
<u>Packaging Requirements</u>										
4.9.18.1.1	Carton Drops	(4) 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 (E_f 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 manner under the conditions of pressure specified on the specification sheet. The specified voltages shall be applied between the base pins of elements carrying B₁ 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: R_g = 0.1 meg; R_g not to be used when thyratron-type short indicator is used.
- Note 10: Glass strain procedure - 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° for 15 seconds and immediately thereafter immersed in water at not more than 5° 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 submerison 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-10). 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 Test: Sampling and acceptance procedures for these tests shall be as defined in paragraphs 5.3.4.3(a) to 5.3.4.3(1), 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 preheat. Grid Emission shall be the last test performed on the sample selected for the Grid Emission test.
- | | | | | | | |
|-----|-----|-----|-----|-----|----------------|-----------------|
| Rf | Eo1 | Eo2 | Eo3 | Eo | E _k | E _{g1} |
| V | Vdc | Vdc | Vdc | Vdc | ohms | Neg |
| 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 Rf.
- 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.