

SPECIFICATION M.O.S./CV.477 incorporating MIL-E-1/97D		<u>SECURITY</u>	
ISSUE 2	DATED 4.12.58	<u>SPECIFICATION</u>	<u>VALVE</u>
To be read in conjunction with K.1006 and BS.448		Unclassified	Unclassified



Indicates a change

TYPE OF VALVE: Subminiature Pentode, Semi-remote cut-off with flying leads.			<u>MARKING</u>																			
CATHODE: Indirectly heated.			See K.1001/4 Additional marking: 5899																			
ENVELOPE: Glass.			<u>BASE</u>																			
PROTOTYPE: 5899.			B8D/F. (Subminiature 8 pin with long leads.)																			
<u>RATING</u>			<u>CONNECTIONS</u>																			
			<table><tr><th>Lead</th><th>Electrode</th></tr><tr><td>1</td><td>g¹</td></tr><tr><td>2</td><td>k + g³</td></tr><tr><td>3</td><td>h</td></tr><tr><td>4</td><td>k + g³</td></tr><tr><td>5</td><td>a</td></tr><tr><td>6</td><td>h</td></tr><tr><td>7</td><td>g²</td></tr><tr><td>8</td><td>k + g³</td></tr></table>		Lead	Electrode	1	g ¹	2	k + g ³	3	h	4	k + g ³	5	a	6	h	7	g ²	8	k + g ³
Lead	Electrode																					
1	g ¹																					
2	k + g ³																					
3	h																					
4	k + g ³																					
5	a																					
6	h																					
7	g ²																					
8	k + g ³																					
			<u>DIMENSIONS</u>																			
			See BS.448/B8D/F/2.1 Size Ref. No.1																			
			<table><tr><th>DIMENSIONS (mm)</th><th>MIN.</th><th>MAX.</th></tr><tr><td>A</td><td>25.8</td><td>28.8</td></tr><tr><td>B</td><td>-</td><td>34.9</td></tr><tr><td>C (dia.)</td><td>9.3</td><td>10.16</td></tr></table>		DIMENSIONS (mm)	MIN.	MAX.	A	25.8	28.8	B	-	34.9	C (dia.)	9.3	10.16						
DIMENSIONS (mm)	MIN.	MAX.																				
A	25.8	28.8																				
B	-	34.9																				
C (dia.)	9.3	10.16																				
			<u>MOUNTING POSITION</u>																			
			Any.																			

		<u>NOTES</u>	
Heater Voltage	(V)	6.3	
Heater Current	(mA)	150	
Max. Operating Anode Voltage	(V)	165	A
Max. Operating Screen Voltage	(V)	155	A
Max. Anode Dissipation	(W)	0.75	A
Max. Screen Dissipation	(W)	0.35	A
Max. Cathode Current	(mA)	16.5	A
Max. Heater Cathode Current	(V)	200	A
Mutual Conductance	(mA/V)	4.5	C
Anode Impedance	(kΩ)	175	C
<u>CAPACITANCES</u> (pF)			
C in (nom.)		4.3	B
C out (nom.)		3.4	B
Ca, g ¹ (max.)		0.015	B

NOTES

- A. Absolute value.
- B. Measured with close fitting metal screen.
- C. At $V_a = V_{g2} = 100V$, $V_{g1} = -10V$ ($I_a = 7.2$ mA approx. $I_{g2} = 2.0$ mA approx.)

NOTES

The data and tests for Valve Type JAN-5899 shall apply.

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MIL-E-1/87D
22 October 1957
SUPERSEDING
MIL-E-1/87C
23 June 1955

INDIVIDUAL MILITARY SPECIFICATION SHEET ELECTRON TUBE, RECEIVING PENTODE, SUBMINIATURE

JAN-5899, 6206

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

Description: Pentode, Semi-remote Cutoff, Reliable

Ratings:	Ef	Eb	Ecl	Ec2	Ec3	Ehk	Rk	Rgl	Lk	Pp	Pg2	T Envelope	Alt
Absolute	V	Vdc	Vdc	Vdc	Vdc	v	ohms	Meg	mAdc	W	W	°C	ft
Maximum:	6.6	165	0	155	22	200	---	1.1	16.5	---	0.25	220	60,000
*Design Maximum:	---	---	---	---	---	---	---	---	---	---	---	---	---
Minimum:	6.0	---	-55	---	---	---	---	---	---	---	---	---	---
Test Cond.:	6.3	100	0	100	0	0	120	---	---	---	---	---	---

Note 1

Cathode: Coated Unipotential
Base: Subminiature - 8 Pin with long leads

Diameter: 0.400 in. max.
Height: 1.375 in. max.

Pin No.: 1 2 3 4 5 6 7 8
Element: g1 k h k p h g2 k Type 5899
 g3 g3 g3 g3
Element: g1 k h g3 p h g2 k Type 6206
 sd sd sd sd

Envelope: T-3

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						Units
						Min.	LAL	Bogle	UAL	Max.	ALD	
<u>Qualification Approval Tests</u>												
3.1	Qualification Approval:	Required for JAN Marking	—	—								
—	Cathode:	Coated Unipotential	—	—								
3.4.3	Base Connections:	ES-10	—	—								
<u>Measurements Acceptance Tests, Part 1, Note 3</u>												
4.10.8	Heater Current:		—	—	If:	—	144	150	156	—	12	mA
4.10.8	Heater Current:		0.65	II	If:	140	—	—	—	160	—	mA
4.10.15	Heater-Cathode Leakage:	Ehk=+100Vdc Ehk=-100Vdc	0.65	II	{Ihk: Ihk:	— —	— —	— —	— —	5.0 5.0	— —	uAdc uAdc
4.10.6.1	Grid Current:	Rgl=1.0Meg	0.65	II	Icl:	0	—	—	—	-0.3	—	uAdc
4.10.4.1	Plate Current(1):		—	—	Ib:	—	6.4	7.2	8.0	—	2.3	mAde
4.10.4.1	Plate Current(1):		0.65	II	Ib:	5.2	—	—	—	9.2	—	mAde
4.10.4.3	Screen Grid Current:		0.65	II	Ic2:	1.0	—	—	—	3.0	—	mAde
4.10.9	Transconductance(1):		—	—	Sm:	—	4200	4500	4800	—	800	umhos
4.10.9	Transconductance(1):		0.65	II	Sm:	3800	—	—	—	5200	—	umhos
4.7.5	Continuity and Shorts	(Inoperatives):	0.4	II	—	—	—	—	—	—	—	
—	Suppressor:	Note 22	0.4	II	—	—	—	—	—	—	—	
4.9.1	Mechanical:	Envelope (8-1)										
<u>Measurements Acceptance Tests Part 2</u>												
4.8.2	Insulation of Electrodes:	gl-all p-all	2.5	I	{R: R:	100 100	— —	— —	— —	— —	— —	Meg Meg
4.10.9	Transconductance(2):	Ef=5.7V; Note 2	2.5	I	ΔSm Er:	—	—	—	—	10	—	%
4.10.9	Transconductance(3):	Ecl=14Vdc; Rk=0	2.5	I	Sm:	1.0	—	25	—	75	—	umhos

JAN-5899, 6206

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Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Sym.	LIMITS						Units
						Min.	LAL	Bogie	UAL	Max.	ALD	
<u>Measurements Acceptance Tests Part 2(Contd)</u>												
4.10.6.2	Grid Emission:	Ef=7.5V; Ec1=-14Vdc; Rg1=1.0Meg; Rk=0; Note 21	2.5	I	Ic1:	0	—	—	—	-0.5	—	uAdc
4.10.3.2	AF Noise:	Esig=70mVac; Ec2=19Vdc; Rg1=0.1Meg; Rg2=1000; Rp=0.2Meg; Ck=1000uf	2.5	I	EB:	—	—	—	—	17	—	VU
4.10.10	Plate Resistance:		6.5	L6	rp:	0.175	—	—	—	—	—	Meg
4.10.14	Capacitance:	0.405 in. dia. Shield 0.405 in. dia. Shield 0.405 in. dia. Shield	6.5	Code F	{ Cglp: — Cin: 3.5 Cout: 2.9	—	—	—	—	0.015	—	unf
						—	—	—	—	4.5	—	unf
						—	—	—	—	3.9	—	unf
4.9.12.1	Low Pressure Voltage Breakdown:	Pressure=55+5mm Hg.; Voltage=300Vac	6.5	Note 5	—	—	—	—	—	—	—	
4.9.20.3	Vibration(1):	No Voltages; Post Shock and Fatigue Test End Points apply	10.0	Note 5	—	—	—	—	—	—	—	
4.9.19.1	Vibration(2):	F=40cps; G=15; Rp=10,000; Ck=1000uf	2.5	I	Ep:	—	—	—	—	60	—	mVac
<u>Degradation Rate Acceptance Tests Note 6</u>												
4.9.5.3	Subminiature Lead Fatigue:	Note 7	2.5	Code F		4	—	—	—	—	—	arcs
4.9.20.5	Shock:	Hammer angle=30°; Ehk=+100Vdc; Notes 8,9	—	—		—	—	—	—	—	—	
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 Ehk=+100Vdc Ehk=-100Vdc Change in Transconductance(1) of individual tubes	—	—	Ep:	—	—	—	—	200	—	mVac
			—	—	Ihk:	—	—	—	—	20	—	uAdc
			—	—	Ihk:	—	—	—	—	20	—	uAdc
			—	—	ΔS_m :	—	—	—	—	20	—	%
—	Glass Strain:	Note 10	6.5	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 6</u>												
4.11.7	Heater Cycling Life Test:	Ef=7.0V; 1 min. on, 4 min. off; Ehk=140Vac; Ec1=Ec2=Eb=Ec3=0; Note 11	2.5	Code H	—	—		—	—			
—	Stability Life Test: (1 Hour)	Ehk=200Vdc; Rg1=1.0Meg; TA=Room; Note 12	1.0	Code I	—	—		—	—			
4.11.4	Stability Life Test End Points:	Change in Transconductance(1) of individual tubes	—	—	—	—	ΔS_m :	—	10	%		
—	Survival Rate Life Test:	Stability Life Test Conditions or equivalent; TA=Room; Notes 13,14	—	II	—	—		—	—			
4.11.4	Survival Rate Life Test End Points:	Continuity and Shorts (Inoperatives) Transconductance(1)	0.65	—	—	—		—	—			
			1.0	—	—	—	S _m :	3350	—	umhos		

Ref.	Test	Conditions	AQL(%)	Insp. Level or Code	Allowable Defectives per Characteristic		Sym.	LIMITS		Units
					1st Sample	Combined Samples		Min.	Max.	
4.11.4	Intermittent Life Test:	Stability Life Test Conditions;T Envelope=+220°C min;Notes 15,16; 1000 Hour Requirements do not apply	---	---	---	---		---	---	
4.11.4	Intermittent Life Test End Points: (500 Hours) Note 16	Note 17 Inoperatives;Note 18 Grid Current Heater Current Change in Transconductance(1) of individual tubes Transconductance(2) Heater-Cathode Leakage Ehk=+100Vdc Ehk=-100Vdc Insulation of Electrodes g1-all p-all Transconductance(1) average change Total Defectives	---	---	1 1 2 1 2 2 2 2 ---	3 3 5 3 5 5 5 5 ---	Ic1: 0 If: 138 Δ Sm t: --- Δ Sm Ef: --- {Ihk: --- Ihk: --- {R: 50 R: 50 AvgΔ Sm t: ---	0 164 20 15 10 10 50 50 15	--- -0.8 164 20 15 10 10 --- --- ---	uAdc mA % % uAdc uAdc Meg Meg %
4.11.5	Information Life Test: (1000 Hours)	Intermittent Life Test Conditions;Notes 16,19, 20								
4.9.18.1.1	Container Drop:	(d) Package Group 1; Container Size C								

- Note 1: Types 5899 and 6206 are the same except for suppressor grid and cathode connections. The Ec3 column in the heading applies only to type 6206. Type 6206 has not been designed for control or gating purposes using the number 3 grid.
- Note 2: Transconductance (2) is the percent change in Transconductance (1) of an individual tube resulting from the change in Ef.
- 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 paragraphs 5.3.3 to 5.3.3.4, inclusive, of the 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. When one lot has passed, the 30-day rule shall apply. In the event of lot failure, the lot shall be rejected and the succeeding lots shall be subjected to this test until a lot passes. MIL-STD-105, sample size code letter F shall apply.
- Note 6: Destructive tests:
Tubes subjected to the following destructive tests are not to be accepted under this specification.
4.9.5.3 Subminiature Lead Fatigue
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: When a manufacturer submits tubes for qualification approval, five extra tubes shall be submitted for lead fatigue testing. These may be electrical rejects.

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- Note 8: 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 9: Leads may be clipped for application of voltages during impact.
- 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 85°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 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 (Ref. MIL-E-1, par. 3.2.4.3). 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 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 is defined as the highest temperature indicated when using a thermocouple of #40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze in contact with the envelope. Envelope Temperature requirement will be satisfied if tube, having bogie Ib ($\pm 5\%$) under normal test conditions, is determined to operate at minimum specified temperature at any position in the life test rack.
- Note 17: Order for Evaluation of Life Test Defects: See Paragraph 5.3.4.4 of the Inspection Instructions for Electron Tubes.
- Note 18: An inoperative as referenced in Life Test is 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. MIL-E-1, par. 3.2.4.3).
- Note 19: On Information Life Tests, read same characteristics as Intermittent Life Test. Limits do not apply. Six (6) copies of these data shall be forwarded to the Armed Services Electron Tube Committee for review.
- Note 20: This life test shall be conducted on a minimum of one sample of ten tubes each month of production. This sample shall be selected as the first ten serially marked, noninoperative tubes from a completed Intermittent Life Test sample. This life test shall be classified as a destructive test. Read at 1000 hours.
- Note 21: Prior to this test tubes shall be preheated 5 minutes at conditions indicated below. Test within three (3) seconds after preheating. Three-minute test is not permitted. Grid Emission shall be the last test performed on the sample selected for the Grid Emission test.
- | | | | | | | |
|-----|-----|-----|-----|-----|------|-----|
| Ef | Ec1 | Ec2 | Ec3 | Eb | Rk | Rgl |
| V | Vdc | Vdc | Vdc | Vdc | ohms | Meg |
| 7.5 | 0 | 100 | 0 | 100 | 120 | 1.0 |
- Note 22: Reject for open suppressor if plate current does not decrease by a minimum of 10% when Ec3 is changed from 0 to -100Vdc. This test is applicable only to tube type 6206.
- Note 23: Referenced specification shall be of the issue in effect on the date of invitation for bid.
- * Design maximum ratings, in general, are limiting values, based on bogie tubes, at which satisfactory tube life can be expected under the types of service for which the tube is rated. The design maximum rating for plate dissipation is defined as 120 percent of the product of the plate voltage applied during Intermittent Life test and the plate current of an average (bogie) tube during the life test, expressed in watts.