WARNING : THIS VALVE MAY BE RADIOACTIVE

MINISTRY OF AVIATION - DLRD/RRE

VALVE ELECTRONIC

CV4100

	SECURITY	
Specification MOA/CV4100 Incorporating MIL-E-1/290B Issue 1 dated 17.5.60 To be used in conjunction with K1006	**Specification** Unclassified	**Valve** Unclassified

indicates a change

TYPE OF VALVE - Reliable Miniature Voltage Regulator
CATHODE - Cold
ENVELOPE - Glass Unmetallised
PROTOTYPE - OA2WA

RATING

All limiting values are absolute

			Note
Min. Total Darkness Starting Voltage	(V)	165	
Min. Ambient light Starting Voltage	(V)	165	
Approx. Operating Voltage	(V)	149	
Min. Operating Current	(mA)	5	
Max. Operating Current	(mA)	30	
Max. Altitude	(ft)	120K	
Min. Ambient Temperature	(°C)	-55	
Max. Bulb Temperature	(°C)	150	

MARKING

See K1001/4 and
also Note B

Additional Marking

OA2WA

BASE

B7G
BS448: B7G/2.1/4

CONNECTIONS

Pin	Electrode	
1	Anode	a
2	Cathode	k
3	Int: Con:	I.C.
4	Cathode	k
5	Anode	a
6	Int: Con:	I.C.
7	Cathode	k

DIMENSIONS

BS448: B7G/2.1/4

Dimensions	Min	Max.
D mm	-	67.5
C mm	-	19.0

MOUNTING POSITION

Any

NOTES

A. JOINT SERVICE CATALOGUE NUMBER. 5960 - 99 - 037 - 2254

B. If valves contain Radioactive Material the requirements of K1001/4.4 shall apply.

MIL-E-1/290B
18 June 1957
SUPERSEDING
MIL-E-1/290A
16 July 1954

CV4100

INDIVIDUAL MILITARY SPECIFICATION SHEET

ELECTRON TUBE, RECEIVING, VOLTAGE REGULATOR TYPE

JAN-0A2WA

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

Description: Reliable Miniature Voltage Regulator

Ratings:	Total Darkness Ionization Voltage Vdc	Ambient Light Ionization Voltage Vdc	Operating Voltage Vdc	Operating Current mAdc	Ambient Temperature °C	Envelope Temperature °C	Altitude ft
Design: Maximum:	---	---	158	30	---	150	120,000
Minimum:	165	165	140	5	-55	---	---
Test Conditions:	---	---	---	---	---	---	---

Cathode: Glow Discharge
Base: Miniature glass button 7-Pin (E7-1)

Height: Max. 2-5/8 in.
Diameter: Max. 3/4 in.

Envelope: T-5-1/2

Pin No.:	1	2	3	4	5	6	7
	a	k	int con	k	a	int con	k

The following tests shall be performed:

For the purpose 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 Min.	LAL	Bogie	UAL	Max.	ALD	Units
	<u>Qualification Approval Tests</u>											
3.1	Qualification Approval:	Required for JAN Marking	---	---								
---	Cathode:	Glow Discharge	---	---								
3.4.3	Base Connections:		---	---								
4.9.20.3	Vibration(1):	Rp=10,000;Ebb/Ib=20mAdc	---	---	Ep:	---	---	---	---	100	---	mVac
	<u>Measurements Acceptance Tests, Part 1, Note 1</u>											
4.13.1	Ionization Voltage(1):	Ebb/Ib=5-30mAdc; Illumination=5-50ft. candles	0.4	II	Ez:	---	---	---	---	165	---	Vdc
4.13.2	Tube Voltage Drop(1):	Ebb/Ib=30mAdc	0.4	II	Etd:	144	---	---	---	153	---	Vdc
4.13.2	Tube Voltage Drop(2):	Ebb/Ib=5mAdc	0.4	II	Etd:	144	---	---	---	153	---	Vdc
4.13.2.1	Regulation:	(1)Etd - (2)Etd	0.4	II	Reg:	---	---	---	---	≮ 5	---	Vdc
4.7.5	Continuity and Shorts: (Inoperatives)		0.4	II		---	---	---	---	---	---	
4.9.1	Mechanical:	Envelope Outline No. 6-5				---	---	---	---	---	---	
	<u>Measurements Acceptance Tests, Part 2</u>											
4.13.4.3	Noise:	Ebb/Ib=30mAdc	1.0	I	Eb:	---	---	---	---	5	---	mVac
4.13.4.2	Oscillation:	Esig=100mVac; Ebb/Ib=5-30mAdc	1.0	I		---	---	---	---	---	---	
---	Voltage Jump:	Ebb/Ib=5-30mAdc;Note 2	2.5	Code G	Jump:	---	---	---	---	600	---	mVdc
4.13.1	Ionization Voltage(2):	Note 3	2.5	Code G	Ez:	---	---	---	---	165	---	Vdc

Ref.	Test	Conditions	AQL (%)	Insp. Level or Code	Sym.	LIMITS						Units
						Min.	LAL	Bogie	UAL	Max.	ALD	
	Measurements Acceptance Tests, Part 2(Contd)											
4.13.3	Leakage:	Eb=50Vdc; Rp=3000	2.5	Code G	LIb:	---	---	---	---	5	---	uAdc
4.13.2	Tube Voltage Drop(3):	Ebb/Ib=20mAdc	2.5	Code G	Etd:	144	---	---	---	153	---	Vdc
---	Repeatability	Ebb/Ib=10mAdc; Note 4	2.5	Code G	Etd:	---	---	---	---	600	---	mVdc
---	Low Pressure Voltage Breakdown:	Note 5	6.5	Note 6	---	---	---	---	---	---	---	
4.9.19.1	Vibration(2):	Rp=10,000; Ebb/Ib=20mAdc	2.5	Code G	Ep:	---	---	---	---	100	---	mVac
	Degradation Rate Acceptance Tests, Note 7											
4.9.20.5	Shock:	Hammer Angle=60°	---	---		---	---	---	---	---	---	
4.9.20.6	Fatigue:	G=2.5; Fixed Frequency; F=25min., 60 max.	2.5	Note 6		---	---	---	---	---	---	
---	Post Shock and Fatigue Test End Points:	Vibration(2)	---	---	Ep:	---	---	---	---	100	---	mVac
		Ionization Voltage(1)	---	---	Ez:	---	---	---	---	165	---	Vdc
		Tube Voltage Drop(1)	---	---	Etd:	142	---	---	---	155	---	Vdc
		Tube Voltage Drop(2)	---	---	Etd:	142	---	---	---	155	---	Vdc
		Regulation	---	---	Reg:	---	---	---	---	≮ 5	---	Vdc
4.9.6.1	Miniature Tube Base Strain:		---	---		---	---	---	---	---	---	
---	Glass Strain:	Note 8	2.5	I		---	---	---	---	---	---	

Ref.	Test	Conditions	AQL (%)	Insp. Level or Code	Allowable Defectives per Characteristics		Sym.	LIMITS		Units
					1st Sample	Combined Samples		Min.	Max.	
	Acceptance Life Tests, Note 7									
---	Stability Life Test: (1 hour)	Ebb/Ib=20mAdc; TA=Room; Note 9	1.0	Code I	---	---		---	---	
4.11.4	Stability Life Test End Points:	Change in Tube Voltage Drop(3) of individual tubes	---	---	---	---	Δ Etd: t	---	2.0	Vdc
---	Survival Rate Life Test: (100 hours)	Stability Life Test Conditions or equivalent; Note 10	---	II	---	---		---	---	
4.11.4	Survival Rate Life Test End Points:	Continuity and Shorts (Inoperatives)	0.65	--	---	---		---	---	
		Change in Tube Voltage Drop(3) of individual tubes	1.0	---	---	---	Δ Etd: t	---	5.0	Vdc
4.11.5	Intermittent Life Test:	Stability Life Test Conditions or equivalent; T Envelope=150°C min.; Notes 11,12	---	---	---	---		---	---	
4.11.4	Intermittent Life Test End Points (500 hours)	Note 13								
		Inoperatives; Note 14	---	---	1	3		---	---	
		Regulation	---	---	1	3	Reg:	---	≮ 6	Vdc
		Tube Voltage Drop(1)	---	---	1	3	Etd:	142	155	Vdc
		Tube Voltage Drop(2)	---	---	1	3	Etd:	142	155	Vdc
		Tube Voltage Drop(3)	---	---	1	3	Etd:	142	155	Vdc
		Change in Tube Voltage Drop(3) of individual tubes	---	---	1	3	Etd:	---	6	Vdc
		Ionization Voltage (1)	---	---	1	3	Ez:	---	165	Vdc
		Total Defectives	---	---	4	8		---	---	

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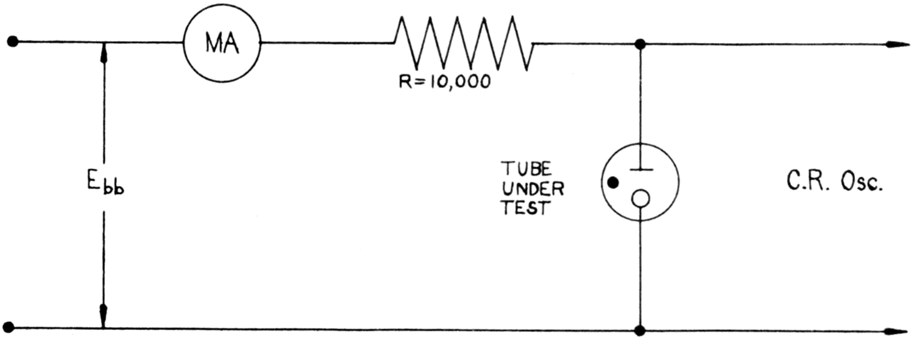
Ref.	Test	Conditions	AQL (%)	Insp. Level or Code	Allowable Defectives per Characteristic		Sym.	LIMITS		Units
					1st Sample	Combined Samples		Min.	Max.	
	Acceptance Life Tests, Note 7(Contd)									
4.11.4	Intermittent Life Test End Points: (1000 hours)	Note 13								
		Inoperatives:Note 14	---	---	2	5		---	---	
		Regulation	---	---	2	5	Reg:	---	8	Vdc
		Tube Voltage Drop(1)	---	---	2	5	Etd:	140	158	Vdc
		Tube Voltage Drop(2)	---	---	2	5	Etd:	140	158	Vdc
		Tube Voltage Drop(3)	---	---	2	5	Etd:	140	158	Vdc
		Change in Tube Voltage Drop(3) of individual tubes	---	---	2	5	Etd:	---	8	Vdc
		Ionization Voltage(1)	---	---	2	5	Ez:	---	165	Vdc
		Total Defectives	---	---	5	10		---	---	
	Packaging Requirements									
4.9.18.1.4	Carton Drop:	(d) Package Group 1; Carton Size C								

Note 1: 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 2:



Vary current from 5mAdc to 30mAdc and back to 5mAdc(by adjusting Ebb slowly). Sudden voltage jumps registered on the oscilloscope shall be not greater than the specified value.

Note 3: Conditions for this test shall be those of Ionization Voltage(1) except testing shall be done in total darkness and the tube shall not have conducted or been exposed to light for at least 24 hours prior to testing. The tube shall fire within 20 seconds maximum.

Note 4: The tube shall be tested in the following manner.

a. The voltage drop shall be read at 10 mAdc drain.

b. The tube shall be turned off for one (1) minute.

c. The tube shall be re-started and operated at the same current.

d. Etd shall be read after one (1) minute of operation.

e. The on-off cycle shall be repeated a minimum of five (5) times. The maximum difference in tube voltage drop shall be taken as the measure of repeatability.

Note 5: Place tube under test in a Bell jar with pressure maintained at 3.1±0.2mm Hg. Apply a potential of 200 Vdc to the K and A terminals through a variable series resistor. Adjust resistor to give a current of 20.0 mAdc. There shall be no evidence of flashover or corona at the pins of the tube.

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Note 6: 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 7 Destructive Tests:

Tubes subject to the following destructive tests are not to be accepted under this specification.

4.9.20.5	Shock
4.9.20.6	Fatigue
4.11.5	Intermittent Life Test

Note 8: 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 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 9: 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 10: 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 11: 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, except that the following subparagraph shall be added to 5.3.4.3(e): (4) The life test sample from the first lot accepted each month shall continue on life test for an additional 500 hours (1000 hours total life test time). Failure of this sample to meet the 1000-hour life test end points shall result in loss of eligibility for reduced hours testing.

Note 12: 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.

Note 13: Order for Evaluation of Life Test Defects: See paragraph 5.3.4.4 of the Inspection Instructions for Electron Tubes.

Note 14: 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 15: Referenced specification shall be of the issue in effect on the date of invitation for bid.