ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION MOA/CV.5311
ISSUE No. 1 DATED 1.10.60

AMENDMENT No. 1

Page A Dimensions

Delete BS448/B7G/2.1 Size Ref. No. 2
'A' Seated Height Amend 47.5 m.m. to read 46.0 m.m.
'D' Overall length Amend 54.5 m.m. to read 53.0 m.m.

Page I

Height

Delete $2\frac{1}{8}$ inch max.
Insert 2.1/16 " "

Director
Royal Aircraft Establishment

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N 72395

CV5311

MINISTRY OF AVIATION - DLRD/RAE

Specification MOA/CV5311

Issue No. 1 Dated 1.10.60

To be read in conjunction with K1006. BS448 and BS1409.

SECURITY	
SPECIFICATION	VALVE
Unclassified	Unclassified

TYPE OF VALVE: Reliable, Grounded Grid R.F. Amplifier Triode.

CATHODE: Indirectly Heated.

ENVELOPE: Glass

PROTOTYPE: VX8248 (Similar to JAN 6J4WA)

MARKING

See K.1001/4

BASE

BS 448/B7G

RATINGS

All limiting values are absolute

			Notes
Heater Volts	(V)	6.3	
Heater Current	(mA)	400	
Max. Operating Anode Voltage	(V)	165	
Max. Anode Dissipation	(W)	2.7	
Max. Negative Grid Voltage	(V)	55	
Max. Cathode Current	(mA)	20	
Max. Heater-Cathode Voltage	(V)	90	
Max. Bulb Temperature	(°C)	120	
TYPICAL OPERATING CONDITIONS			
Anode Voltage	(V)	150	
Anode Current	(mA)	13.5	
Mutual Conductance	(mA/V)	13.5	
Amplification Factor	-	50	

CAPACITANCES (pF) Note A

Ca-k	(Max)	0.15
Ca-g+h	(max)	5.0
Ck-g+h	(nom)	9.5
Ch-k	(nom)	3.8
Ca-g	(nom)	2.8

CONNECTIONS

PIN	ELECTRODE	
1	Grid	g
2	Cathode	k
3	Heater	h
4	Heater	h
5	Grid	g
6	Grid	g
7	Anode	a

DIMENSIONS

BS448/B7G/2.1 Size Ref. No. 2

Dimensions (mms)	Min.	Max.
"A" Seated height	-	47.5
"C" Diameter	16	19
"D" Overall length	-	54.5

MOUNTING POSITION

Any

NOTES

A. Measured on an R.F. bridge in a fully shielded socket, the valve screened.

B. The Joint Services Catalogue Number is 5960-99-037-2264

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INDIVIDUAL MILITARY SPECIFICATION SHEET

ELECTRON TUBE RECEIVING TRIODE MINIATURE

CV5311

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

DESCRIPTION:	Ef	Eb	Ec	Ehk	Rk	Rg	Ik	Pp	T.Envelope	Alt.
RATINGS:	V	Vdc	Vdc	V	Ohms	M.Ohms	mAdc	W	°C	ft.
ABSOLUTE:	6.6	150	0	90	-	0.25	20	-	120	60,000
DESIGN:										
Maximum	-	-	-	-	-	-	-	2.25	-	-
Minimum	6.0	-	-55	-	-	-	-	-	-	-
TEST CONDITIONS:	6.3	150	-	-	100	-	-	-	-	-

CATHODE: COATED UNIPOTENTIAL

BASE: MINIATURE BUTTON 7 PIN

PIN NO.	1	2	3	4	5	6	7
ELEMENT:	g	k	h	h	g	g	p

DIAMETER: $\frac{3}{4}$ inch max.

HEIGHT: $2\frac{1}{8}$ inch max.

ENVELOPE: T $5\frac{1}{2}$

The following tests shall be performed:

For the purpose of inspection, use applicable reliable paragraphs of MIL-E-I 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	Symbol	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	-	-								
4.9.203	Vibration (1): Rp 2000 Ck 1000uF	-	-	Ep	-	-	-	-	300	-	mVac
	MEASUREMENTS ACCEPTANCE TESTS Part 1, Note 3										
4.10.8	Heater Current	0.65	II	If	375	-	400	-	425	-	mAdc
4.10.15	Heater Cathode Leakage: Ehk = +100Vdc	0.65	II	Ihk	-	-	-	-	10	-	µAdc
	Ehk = -100Vdc			Ihk	-	-	-	-	10	-	µAdc
4.10.6.1	Grid Current Rg = 0.25MΩ Eb = 175Vdc Rk = 150 Ohms	0.65	II	-Ic	-	-	-	-	0.5		µAdc
4.10.4.1	Plate Current (1)	0.65	II	Ib	9	-	-	-	18	-	mAdc
				Ib	-	11.8	13.5	15.2	-	3.7	mAdc
4.10.4.1	Plate Current (2) Ec =-15Vdc	0.65	II	Ib	-	-	-	-	60	-	µAdc
4.10.9	Transconductance (1)	0.65	II	Sm	11.0	-	-	-	16.0	-	mA/V
				Sm	-	12.6	13.5	14.4	-	2.1	mA/V
4.7.5	Continuity and Shorts (Inoperatives) Note 17	0.4	II		-	-	-	-	-	-	-
4.9.1	Mechanical Envelope Outline No. 6 - 2	-	-	-	-	-	-	-	-	-	-

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REF	TEST CONDITIONS		AQL %	Insp Level or Code	Sym-bol	LIMITS: NOTE 4 Min	LAL	Bogie	UAL	Max	ALD	Units
	MEASUREMENTS ACCEPTANCE TESTS Part 2											
4.8	Insulation of Electrodes:	g-all p-all	2.5	I	R R	200 200		- -		- -		Meg Meg
4.10.9	Transconductance (2)	Ef = 5.7V Note 2	2.5	I	Sm Ef	-		-		15		%
4.10.3.1	R.F. Noise	Ecal = 20mVac Note 16	2.5	I								
4.10.11.1	Amplification Factor		6.5	Code G	Mu	40		-		65		
4.10.14	Capacitance:	Shield 316 tied to ground	6.5	Code E	Ck-p	-		-		0.15		µµ F
		Shield 316 tied to grid			Ck-g+h	8		-		11		µµ F
		Shield 316 tied to grid			Cp-g+h	-		-		5.0		µµ F
		Shield 316 tied to ground			Ch-k	2.5		-		5.0		µµ F
		Shield 316 tied to ground			Cg-p	2.3		-		3.3		µµ F
4.9.12.1	Low Pressure Voltage Breakdown:	Pressure = 55 ± 5mm Hg Voltage = 500 Vac	6.5	Note 5		-		-		-		
4.9.19.1	Vibration (2)	Rp = 2000 Ohms	6.5	Code G	Ep	-		-		200		mVac
	DEGRADATION RATE ACCEPTANCE TESTS. Note 6											
4.9.20.5	Shock:	Hammer angle = 30° Ehk = +100Vdc Ec = 1.5Vdc Note 1.				-		-		-		
4.9.20.6	Fatigue:	G = 2.5 F = 25 - 60c/s	6.5	Note 5		-		-		-		
	POST SHOCK AND POST FATIGUE END POINTS:											
	Vibration (2)				Ep					300		mVac
	Heater-Cathode Leakage	Ehk = +100Vdc			Ihk	-		-		20		uAdc
		Ehk = -100Vdc			Ihk	-		-		20		µAdc
	Change in Trans-conductance (1) of individual tubes:				$\frac{Sm}{t}$	-		-		20		%
	Grid Current				Ic	0		-		1.0		µAdc
4.9.6.1	Miniature Tube Base Strain					-		-		-		
	Glass Strain:	Note 7	2.5	I		-		-		-		

REF.	TEST CONDITIONS	AQL %	Insp. Level or Code	Allowable Defectives Per Characteristic 1st Sample	Allowable Defectives Per Characteristic Comb. Sample	Sym.	LIMITS Min	LIMITS Max	UNITS
	ACCEPTANCE LIFE TESTS Note 6.								
4.11.7	Heater Cycling Life Test: Ef = 7.0V, Ehk = +100Vdc, Eb = Ec = 0, 1 min. on, 4 mins. off, Note 8								
4.11.4	Heater Cycling Life Test end Points: Heater-Cathode Leakage: Ehk = +100Vdc	1.0	Code 1			Ihk	-	20	µAdc
	Ehk = -100Vdc					Ihk	-	20	µAdc
	Insulation of Electrodes: g-all	2.5	Code 1			R	30	-	Meg
	p-all					R	30	-	Meg
4.11.3.1	Stability Life Test (1 hour): Ehk = +100Vdc, Rg = 0.25M Ω, TA = Room, Note 9	1.0	Code 1						
4.11.4	Stability Life Test End Points: Change in Transconductance (1) of individual tubes					$\Delta \frac{Sm}{t}$		10	%
4.11.3.1	Survival Rate Life Test (100 hours) Stability Life Test Conditions or Equivalent. Notes 10, 11		II						
4.11.4	Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)	0.65							
	Transconductance (1)	1.0				Sm	10		mA/V
4.11.5	Intermittent Life Test: Stability Life Test Conditions or Equivalent: T Envelope = 120°C Notes 12, 13								
4.11.4	Intermittent Life Test End Points (500 hours): Note 14								
	Inoperatives: Note 15			1	3				
	Grid Current			1	3	Ic	0	2.0	µ Adc
	Heater Current			1	3	If	370	460	mAdc
	Change in Transconductance (1) Of individual tubes			1	3	$\Delta \frac{Sm}{t}$	-	20	%
	Transconductance (2)			2	5	$\Delta \frac{Sm}{Ef}$	-	15	%

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REF.	TEST CONDITIONS	AQL %	Insp Level or Code	Allowable Defectives Per Characteristic 1st Sample	Allowable Defectives Per Characteristic Comb. Samples	Sym.	Limits Min	Limits Max	UNIT
	ACCEPTANCE LIFE TESTS, Note 6, (Continued)								
4.11.4	Heater-Cathode Leakage Ehk = +100Vdc			1	3	(Ihk	-	20	μ Adc
	Ehk = -100Vdc					(Ihk	-	20	μ Adc
	Insulation of Electrodes: g-all			1	3	(R	100	-	Meg
	p-all					(R	100	-	Meg
	Transconductance (1) Average Change					Avg $\Delta \frac{Sm}{t}$		10	%
	Total Defectives			4	8				
4.11.4	Intermittent Life Test End Points (1000 hours) Note 14								
	Inoperatives: Note 15			2	5				
	Grid Current			2	5	Ic	0	2.0	μ Adc
	Heater Current			2	5	If	370	460	m Adc
	Change in Transconductance (1) of individual tubes			2	5	$\Delta \frac{Sm}{t}$		25	%
	Heater-Cathode Leakage Ehk = +100Vdc			2	5	(Ihk		20	μ Adc
	Ehk = -100Vdc					(Ihk		20	μ Adc
	Insulation of Electrodes: g-all			2	5	(R	100	-	Meg
	p-all					(R	100	-	Meg
	Transconductance (1) Average Change					$\Delta \frac{Sm}{t}$	-	15	%
	Total Defectives			5	10		-	-	

Ref.	Package Requirements
4.9.18.1.1	Container Drop: - (d) Package Group (1) Container Size(B)

Note 1: 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 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 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:-

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

Note 7: 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 50°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-I, par. 3.2.4.3.). Electrical rejects, other than inoperatives, may be used in the performance of this test.

Note 8: 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 limits.

Note 9: Stability Life Test: The sampling and testing procedures 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 procedures for this test shall be as defined in paragraphs 5.3.4 to 5.3.4.2.4 inclusive of the Inspection Instructions for Electron Tubes.

Note 11: For survival Rate Life Test, the equivalent Stability Life Test conditions shall be as defined in paragraph 5.3.4.2 of the Inspection Instructions for Electron Tubes.

Note 12: 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 sub-paragraph 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 the loss of eligibility for reduced hours testing.

Note 13: Envelope Temperature is defined as the highest temperature indicated when using a thermocouple of #40 BS or small diameter elements welded to a ring of 0.025 inch diameter phosphor bronze in contact with the envelope. Envelope Temperature requirements will be satisfied if tube, having bogie Ib (±5%) under normal conditions, is determined to operate at minimum specified temperature at any position in the life test rack.

Note 14: Order for Evaluation of Life Test Defects: See paragraph 5.3.4.4 of the Inspection Instructions for Electron Tubes.

Note 15: 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-I, par. 4.7.1), shorts (ref. MIL-E-I par. 4.7.2) air leaks (ref. MIL-E-I, par. 3.2.4.3).

Note 16: In addition to the rejection criteria of par. 4.10.3.1, MIL-E-I, 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 3mW from the amplifier.

Note 17: Short and Continuity Tests: Because of close grid to cathode spacing in this tube, the following conditions shall apply during test:- The maximum voltage applied during short test must not exceed 90 volts, dc plus peak. The test circuit must contain sufficient impedance that the instantaneous peak current cannot exceed 20 milliamperes under any condition.

Note 18: Referenced specification shall be of the issue in effect on the date of invitation for bid.