

SPECIFICATION M.O.A./CV.3991 Incorporating MIL-E-1/160H ISSUE 2A Dated 1.2.63 To be read in conjunction with K.1006		<u>SECURITY</u> <u>SPECIFICATION</u> <u>VALVE</u> Unclassified Unclassified																							
TYPE OF VALVE: Power Tetrode - External Anode CATHODE: Indirectly Heated ENVELOPE: Glass Metal Construction PROTOTYPE: 4X150D		<u>MARKING</u> See K1001/4																							
<u>RATINGS AND CHARACTERISTICS</u> (All limiting values are absolute)		<u>BASE</u> BS.418/BSF See drawing on Page 7 of Specification MOA/CV.2519 Issue 4A Dated 1.2.63																							
<u>NOTES</u>		<u>CONNECTIONS</u>																							
Heater Voltage (V) 26.5 Heater Current (A) 0.56 Max. Negative Control Grid Volts (V) 250 Max. Input Control Grid (W) 2 Max. Heater Cath. Voltage (V) +150 Max. Anode Core Temp. (°C) 250 Max. Anode Seal Temp. (°C) 200 Max. Base Seal Temp. (°C) 175 Max. Altitude (ft) 10,000 Min. Cathode Heating Period (Secs) 30	A A A	<table border="1"> <thead> <tr> <th>Pin</th> <th>Electrode</th> </tr> </thead> <tbody> <tr><td>1</td><td>Screen g2</td></tr> <tr><td>2</td><td>Cathode k</td></tr> <tr><td>3</td><td>Heater h</td></tr> <tr><td>4</td><td>Cathode k</td></tr> <tr><td>5</td><td>Int. Con. IC</td></tr> <tr><td>6</td><td>Cathode k</td></tr> <tr><td>7</td><td>Heater h</td></tr> <tr><td>8</td><td>Cathode k</td></tr> <tr><td>Centre Pin</td><td>Con. Grid g1</td></tr> <tr><td>Cooling Pin</td><td>Anode a</td></tr> </tbody> </table>	Pin	Electrode	1	Screen g2	2	Cathode k	3	Heater h	4	Cathode k	5	Int. Con. IC	6	Cathode k	7	Heater h	8	Cathode k	Centre Pin	Con. Grid g1	Cooling Pin	Anode a	
Pin	Electrode																								
1	Screen g2																								
2	Cathode k																								
3	Heater h																								
4	Cathode k																								
5	Int. Con. IC																								
6	Cathode k																								
7	Heater h																								
8	Cathode k																								
Centre Pin	Con. Grid g1																								
Cooling Pin	Anode a																								
<u>Class A B Audio</u> Max. Anode Voltage (kV) 2 Max. Anode Dissipation (W) 250 Max. Anode Input (W) 500 Max. Anode Current (mA) 250 Max. Voltage Screen Grid (V) 400 Max. Screen Dissipation (W) 12																									
<u>Class C Telephony</u> Max. Anode Voltage (Up to 150 Mc/s) (kV) 1.6 Max. Anode Input (Up to 150 Mc/s) (W) 320 Max. Anode Volts (Between 150 and 500 Mc/s) (kV) 1 Max. Anode Input (Between 150 and 500 Mc/s) (W) 200 Max. Anode Dissipation (W) 165 Max. Voltage Screen Grid (V) 300 Max. Screen Dissipation (W) 10 Max. Anode Current (mA) 200																									
		<u>DIMENSIONS</u> See Drawing on Page 7 of Specification MOA/CV.2519 Issue 4A Dated 1.2.63																							

(163727)

CV.3991/2A/A

RATINGS AND CHARACTERISTICS (Contd.)

<u>Class C Telegraphy</u>		
Max. Anode Voltage (Up to 150 Mc/s)	(kV)	2
Max. Anode Input (Up to 150 Mc/s)	(W)	500
Max. Anode Volts (Between 150 and 500 Mc/s)	(kV)	1.25
Max. Anode Input (Between 150 and 500 Mc/s)	(W)	312
Max. Anode Dissipation	(W)	250
Max. Voltage Screen	(V)	300
Max. Screen Dissipation	(W)	12
Max. Anode Current	(mA)	250
<u>CAPACITANCES pf</u>		
C in (Nom.)		15.25
C out (Nom.)		4.4
Cagl (Max.)		0.05
<u>NOTES</u>		
A. See Note 1 on Page 4		
B. The Joint Services Catalogue is 5960-99-000-3991		
<u>TESTS</u>		
The tests for Valve Type CV.3991 specified on Pages 1 to 9 of Specification CV.2519 Issue 4A dated 1.2.63 shall apply.		

CV3991

MIL-E-1/160C
5 December 1955
SUPERSEDING
MIL-E-1/160B
17 December 1954

INDIVIDUAL MILITARY SPECIFICATION SHEET
ELECTRON TUBE, TRANSMITTING TETRODE, EXTERNAL ANODE

JAN-4X150A, 4X150D

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

F1= 500Mc
F2=1000Mc

Ratings:	Tube Type	Ef Vac	Eb Vdc	Ec1 Vdc	Ec2 Vdc	Ib mAdc	Pg1 W	Pg2 W	Pp W	Pi W	Base Seal T		Anode T °C	tk sec	Alt ft
											°C	Note 1			
Maximum:	Notes 1, 2	---	---	---	---	---	---	---	---	---	---	---	---	---	---
C Teleg :	A	6±10%	1000	-250	300	200	2	12	100	130	150	150	150	30	10,000
C Teleg :	A	6±10%	1250	-250	300	250	2	12	150	200	150	150	150	30	10,000
AB Audio:	A	6±10%	1250	-250	300	250	2	12	150	200	150	150	150	30	10,000
C Teleg :	D	26.5±10%	1000	-250	300	200	2	12	100	130	150	150	150	30	10,000
C Teleg :	D	26.5±10%	1250	-250	300	250	2	12	150	200	150	150	150	30	10,000
AB Audio:	D	26.5±10%	1250	-250	300	250	2	12	150	200	150	150	150	30	10,000
Test Cond :	A	6.0	1000	Adjust	300	150	---	---	---	---	---	---	---	120	---
	D	26.5	1000	Adjust	300	150	---	---	---	---	---	---	---	120	---

Cathode: Each: Oxide-Coated Unipotential
Base: Each: Per outline

Height: 2.468 in. max Note 3
Diameter: 1.610 in. min; 1.640 in. max.

Pin No.: Each: 1 2 3 4 5 6 7 8 Center pin
Element: Each: g2 k h k int. con. k h k g1

Envelope: Per outline

Note: Each: Pack in sealed, water-vapor-proof bag. if opaque bag is used the tube type number shall be stamped thereon.

For miscellaneous requirements, see Paragraph 3.3, Inspection Instructions for Electron Tubes.

Ref.	Test	Tube Type	Conditions	AQL(%)	Insp. Level or Code	Sym.	LIMITS						Units
							Min.	LAL	Bogie	UAL	Max.	ALD	
<u>Qualification Approval Tests</u>													
3.1	Qualification Approval:	Each:	Required for JAN Marking	---	---								
---	Cathode:	Each:	Oxide-Coated Unipotential	---	---								
3.4.3	Base Connections:	Each:		---	---								
<u>Measurements Acceptance Tests, Part 1: Note 4</u>													
4.5	Holding Period:	Each:	t=72 hours			---	---	---	---	---	---	---	
4.10.8	Heater Current:	A		0.65	II	If:	2.30	---	---	---	2.90	Aac	
		D		0.65	II	If:	0.50	---	---	---	0.62	Aac	
4.10.5.2	Grid Voltage:	Each:		0.65	II	Ec1:	-30	---	---	---	-46	Vdc	
4.10.6.1	Grid Current:	Each:		0.65	II	Ic1:	---	---	---	---	-25	uAdc	
4.10.4.3	Screen Current:	Each:		0.65	II	Ic2:	-7.0	---	---	---	3.0	mAdc	
4.10.6.6	Primary Control-Grid Emission:	Each:	Ic1=70mAdc;t=15; Note 5	0.65	II	Isg1:	---	---	---	---	-250	uAdc	
4.10.6.6	Primary Screen - Grid Emission:	Each:	Ec1=0Vdc;Ic2=100mAdc;t=15; Note 6	0.65	II	Isg2:	---	---	---	---	-250	uAdc	
4.10.1.5	Pulse Emission:	Each:	eb=ec1=ec2=850v; Note 7	0.65	II	is:	22	---	---	---	---	a	
4.9.1	Mechanical:	Each:		---	---								
<u>Measurements Acceptance Tests, Part 2</u>													
4.9.19.1	Vibration:	Each:	No Voltages	6.5	IA								
4.9.19.3	Bump:	Each:	Angle=20 degrees	6.5	IA								
4.10.11.1	Amplification Factor:	Each:	g1-g2;Ec2=300Vdc;Ic2=50mAdc; Note 6	6.5	IA	Mu:	4.0	---	---	---	6.0		
4.10.14	Capacitance:	Each:		6.5	IA	Cgp:	---	---	---	---	0.06	uuf	
						Cin:	14.2	---	---	---	17.2	uuf	
						Cout:	3.80	---	---	---	4.80	uuf	
4.10.2.2	Power Output:	Each:	Class-C=Amplifier; F=460-490Mc;Eb=1000Vdc; Ec1=-90Vdc;Ec2=250Vdc; Ic1=20mAdc max;Eg1/Ib=200mAdc; Notes 1, 8	6.5	IA	Po:	100	---	---	---	---	W	

CV3991

MIL-E-1/160C

Ref.	Test	Tube Type	Conditions	AQL(%)	Insp. Level or Code	Sym.	LIMITS						Units
							Min.	LAL	Bogie	UAL	Max.	ALD	
<u>Acceptance Life Tests</u>													
4.11	Life Test:	Each:	Group C; Power Output			t:	500	---	---	---	---	hours	
4.11.4	Life Test End Points:	Each:	Pulse Emission Primary Control - Grid Emission Primary Screen - Grid Emission			is:	17	---	---	---	---	a	
						Isq1:	---	---	---	-250	---	uAdc	
						Isq2:	---	---	---	-250	---	uAdc	
<u>Packaging Requirements</u>													
4.9.18.1.7	Carton Drop:	Each:	(d) Package Group 1; Carton Size L										

Note 1: Forced-air cooling of the base and anode must be provided to limit the temperature of the seals and anode to 150°C. At a Pp of 150W, a minimum air flow of 5.6 cu ft per minute must be passed through the plate cooler. The pressure drop across the cooler at this flow equals 0.26 inches of water.

Note 2: To obtain maximum life, it is necessary to adjust heater voltage to values indicated below at the indicated frequency of operation. These figures are for straight-through amplifier operation. In no case shall the heater be operated at less than 5.4 volts.

F, Mc	Ef, Vac	Ef, Vac
A, D	A	D
300 or lower	6.00	26.5
301 - 400	5.75	25.5
401 - 500	5.50	24.5

Note 3: See the 168-JAN Drawing for the Contact Surface Alinement Gage, and the 246-JAN Drawing for the Grid-Pin Gages.

Note 4: The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding Mechanical, shall be one percent. A tube having one or more defects shall be counted as one defective. MIL-STD-105, Inspection Level II, shall apply.

Note 5: Plate and Screen grid floating.

Note 6: Plate floating.

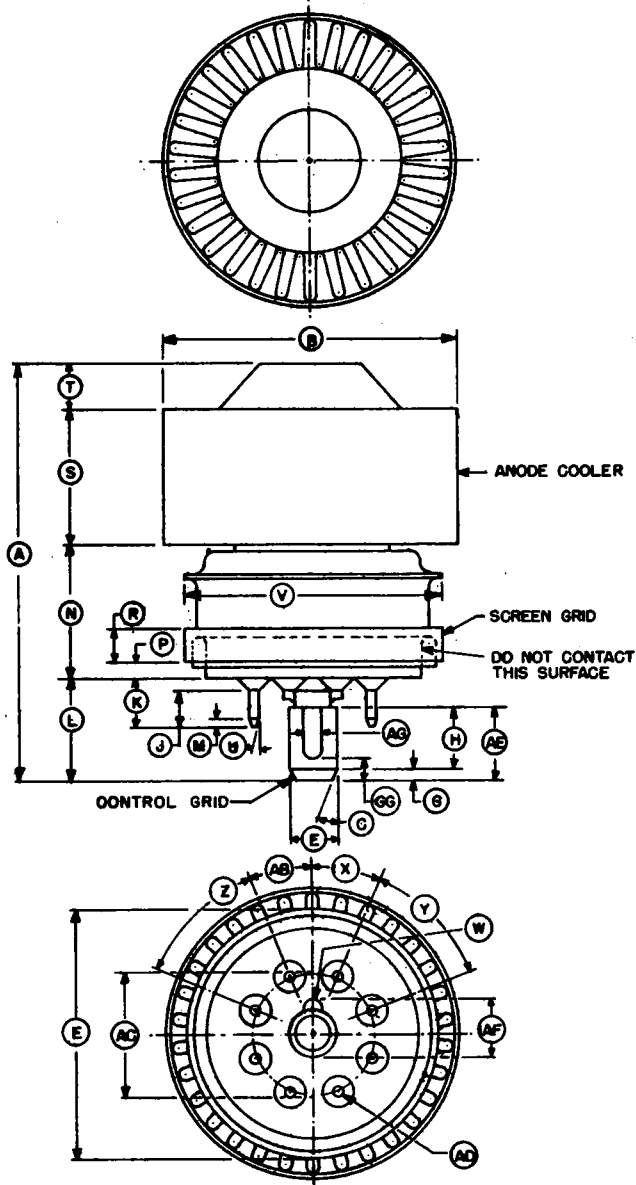
Note 7: The maximum value of the voltage applied to the plate and grids shall not exceed 900 volts. The pulse duration measured at 5% of the maximum value shall not be less than 3 microseconds. At 50% amplitude the duration shall be less than 2 microseconds. The applied voltage shall have a maximum repetition rate such that the duty cycles, based on the pulse length measured at 50% amplitude, shall not exceed 0.0002 (0.02%).

Note 8: See the 223-JAN Drawing for circuit and cavity, 4X150A, D.

Note 9: Reference specification shall be of the issue in effect on the date of invitation for bid.

CV3991

MIL-E-1.180C



REF	DIMENSIONS		
	MIN	NOM	MAX
*A			2.468
**B	1.610		1.640
**C		30°	
*E	1.417		1.433
*F	.255	NOTES 1,3	.265
**G		$\frac{1}{32}$	
**H	.360		
**J	.187		
*K			.250
*L	.523		.563
**M		.035	
**N	.750		.810
**P		.080	
**R	.187		
**S	.710		.790
**T			.312
**U		22 $\frac{1}{2}$ °	
**V			1.406 DIA
*W		.043 R NOTES 1,2	
*X		22-1/2° NOTE 1	
*Y		45° NOTE 1	
*Z		45° NOTE 1	
*AB		22-1/2° NOTE 1	
*AC		.687 DIA NOTE 1	
*AD	.045 DIA		.083 DIA 8 PINS NOTE 1
**GG	.068		.108
**AE			.456
*AF	.298		.308 NOTES 1,4
*AG		NOTE 2	

Note 1: Max. dimensions and angular tolerances on the base are such that the tube will enter, to a distance of 0.1875, Pin Gage I, 246-JAN.

Note 2: See 246-JAN drawing of Grid Pin Gage -- I.

Note 3: Min. Dimension may be determined by Grid Pin Gage II-1, 246-JAN.

Note 4: Dimensions may be determined by Grid Pin Gage II-2, 3, 246-JAN.

JAN-4X150A, 4X150D