

INCH-POUND

MIL-PRF-1/1587D(USAF)
9 July 1999
SUPERSEDING
MIL-E-1/1587C(USAF)
10 July 1981

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, POWER
TYPE 8596

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the electron tube described herein shall consist of this document and the latest issue of MIL-PRF-1.

DESCRIPTION: Tetrode, ceramic-metal, F1 = 400 MHz.

Outline: See figure 1.

Mounting position: Any.

ABSOLUTE RATINGS:

Parameter:	Ef	Eb	Ec1	Ec2	Ib	Ic1
Unit:	V <u>1</u>	V dc	V dc	V dc	mA dc	mA dc
AB Audio	6.3 ± 10%	1,000	---	300	180	30
AB SSBC:	6.3 ± 10%	1,000	-100	300	250	30
C Teleg:	6.3 ± 10%	800	-100	300	150	30
C Teleg:	6.3 ± 10%	1,000	-100	300	180	30
Test conditions:	6.3	1,000	Adj	300	---	---

ABSOLUTE RATINGS:

Parameter:	P(g2)	Pi	Pp	Seal temp	tk	Barometric pressure, reduced
Unit:	W	W	W	°C	sec	mmHg
AB Audio:	4.5	180	115	250	60	140.7
AB SSBC:	4.5	180	115	250	60	140.7
C Teleg:	3.0	120	75	250	60	140.7
C Teleg:	4.5	180	115	250	60	140.7
Test conditions: <u>2</u>	---	---	---	250 max	---	---

See footnotes at end of table I.

GENERAL:

Qualification: Required.

MIL-PRF-1/1587D(USAF)

TABLE I. Testing and inspection.

Inspection	Method	Notes	Conditions	Symbol	Limits		Unit
					Min	Max	
<u>Conformance inspection, part 1</u>		<u>3/</u>					
Heater current	1301	---		If	2.90	3.55	A
Total grid current	1266	<u>4/</u>	Ec1/lb = 115 mA dc	Ic1	---	-20	μA dc
Electrode current (screen)	1256	---	Ec1/lb = 115 mA dc	Ic2	-8.0	+2.0	mA dc
Electrode voltage (1) (grid)	1261	---	Ec1/lb = 115 mA dc	Ec1	-6.0	-13.5	V dc
Electrode voltage (2) (grid)	1261	---	Ec1/lb = 1 mA dc	Ec1	---	-47	V dc
Pulsing emission	1231	<u>5/</u>	etd/ik = 10 a	etd	---	400	v
Current division (anode)	1372	---	Eb = 350 V dc; Ec1 = -100 V dc procedure (b)	ib	390	---	ma
<u>Conformance inspection, part 2</u>		<u>6/</u>					
Primary grid emission (control)	1266	---	Ec1/g1 input = 2 W; t = 30; a and g2 grounded	Isg1	---	-12	μA dc
Primary grid emission (screen)	1266	---	Ec2/g2 input = 4.5 W; a and g1 grounded; t = 30	Isg2	---	-25	μA dc
Interelement leakage resistance, cold	1366	<u>7/</u>		R	1.0	---	Meg
RF useful power output	2214	<u>8/</u>	Ef = 5.7 V; t = 120; Class C amplifier, F = 400 ± 20 MHz; Ib = 180 mA dc; Ic1 = 30 mA dc (max); Pd = 3.3 W (max)	Po	80	---	W (useful)
Power oscillation	1236	---	F = 15 MHz; Eb = 850 V dc; Ec2 = Adjust; Ib = 150 mA dc; Rg1 = 2,000 ohms; Ic1 = 30 mA dc; t = 120	Po	80	---	W (useful)
Direct-interelectrode Capacitance	1331	---	Capacitance fixture in accordance with 289-JAN; all unused electrodes grounded	Cg1k	11.8	15.2	pF
				Cg1g2	17.3	21.9	pF
				Cg2p	4.0	5.1	pF
				Cg1p	---	.065	pF
				Cpk	---	.019	pF
Cg2k	---	1.30	pF				

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method	Notes	Conditions	Symbol	Limits		Unit
					Min	Max	
<u>Conformance inspection, part 3</u>		<u>9/</u>					
Life test	---	<u>9/</u>	Group C; Ef = 5.7 V; Class C amplifier; F = 400 ± 20 MHz; Ib = 180 mA dc; Ic1 = 30 mA dc max; Ec1 = value obtained in Ec1 test in accordance with part 1 herein.	t	500	---	hrs
Life-test end points:	---						
Pulsing emission	1231	---	etd/ik = 7.5 a	etd	---	400	v
Primary grid emission (control)	1266	---	Ec1/g1 input = 2 W; t = 30; a and g2 grounded	Isg1	---	-12	μA dc
Primary grid emission (screen)	1266	---	Ec2/g2 input = 4.5 W; t = 30; a and g1 grounded	Isg2	---	-25	μA dc
Heater-cycling life	1506	---	Group C; Ef = 8.5 V; t = 150 "on", 300 "off"	---	384	---	cycles
Heater-cycling life test end point:	---						
Heater current	1301	---		If	2.32	4.26	A
Shock, specified pulse (1)	1042	<u>10/</u>	Test condition A; Ef only	---	---	---	---
Shock (2)	1041	<u>10/</u>	500 G, 0.75 ms	---	---	---	---
Vibration (1)	---	<u>10/ 11/</u>	Eb = 300 V dc; Ec2 = 250 V dc; Ec1/Ib = 10 mA dc; Rp = 2,000 ohms	Ep	---	15	Vrms
Vibration (2)	---	<u>10/ 12/</u>	Eb = 300 V dc; Ec2 = 250 V dc; Ec1/Ib = 10 mA dc; Rp = 2,000 ohms; Rg2 = 1,000 ohms	---	---	---	---
Shock (1), shock (2) and vibration (2) end points:	---	---					
Total grid current	1266	---	Ec1/Ib = 115 mA dc	Ic1	---	-20	μA dc
Electrode voltage (1) (grid)	1261	---	Ec1/Ib = 115 mA dc	Ec1	-6.0	-18	V dc
Barometric pressure, reduced	1002	<u>10/</u>	Pressure = 140.7 mm Hg; 1,300 V dc applied to anode with g1 and g2 tied to k	---	---	---	---

See footnotes at top of next page.

MIL-PRF-1/1587D(USAF)

TABLE I. Testing and inspection - Continued.

- 1/ The tube under test (TUT) cathode will be subjected to considerable back bombardment as the frequency is increased, due to transit-time effects which raise the temperature of the cathode. Depending upon operating conditions and frequency, the heater voltage should be reduced to prevent overheating of the cathode and resultant short life.
- 2/ Pertinent to the specified test conditions and performance of all electrical tests, a dummy 7457 radiator may be attached to the anode of type 8596 when under test.
- 3/ The acceptance level for all tests listed under conformance inspection, part 1, shall be 0.65, inspection level II.
- 4/ Airflow shall be supplied to limit the TUT anode seal temperature to 225°C minimum.
- 5/ The applied voltage source shall meet the following requirements: Pulse duration = 2 μs minimum and not greater than 10 μs at the base line of the pulse, prr = 60 Hz minimum. Adjust the pulse amplitude until the specified peak cathode current is obtained. Measurement shall be made at end of one minute or when stability is reached, whichever occurs first.
- 6/ Conformance inspection, part 2 and part 3 tests may be performed on any of the types of the same basic 8596 construction manufactured during any one month's production period.
- 7/ Prior to performing this test, the TUT shall be cooled at room ambient temperature for 30 minutes. Using the test circuit shown on figure 1366-1 of test method 1366, measure the resistance in both directions, between any two adjacent electrodes, except across the heater terminals. If the resistance value measured is below that required, repeat this test after a 10-minute interval. The TUT shall be rejected if it fails again.
- 8/ This test shall be performed using a grid-driven tuned amplifier. Adjust Ec1 bias supply, and tune circuit for maximum useful power output. The specified driver power output shall be measured using a Bird Thru-line Wattmeter, or equivalent. Driving power output = forward power minus reflected power. Ec1 supply shall have an effective impedance of 500 ohms maximum.
- 9/ The TUT shall operate in a grid-driven tuned amplifier; drive shall be varied and output circuit tuned for maximum power output with specified Ib; Ec1 supply shall have an effective impedance of 500 ohms maximum.
- 10/ This test shall be performed (or dimensions shall be checked) during the initial production and once each succeeding 12-calendar months in which there is production. A regular double sampling plan shall be used, with the first sample of three tubes with an acceptance number of zero, and a second sample of three tubes with a combined acceptance number of one. In the event of failure, the test will be made as a part of conformance inspection, part 2, code level D, with an acceptance level of 6.5. The regular "12-calendar month" double sampling plan shall be reinstated after three consecutive samples have been accepted.
- 11/ The TUT shall be vibrated in axes X, Y, and Z under the following conditions:

<u>Frequency</u> (Hz)	<u>Double amplitude</u> (inches)	<u>Acceleration</u> (G)	<u>Approximate sweep duration</u> (minutes)
5-10	.080 ± 10 percent	---	1
10-15	---	0.41 ± 10 percent	0.5
15-75	.036 ± 10 percent	---	0.5
75-2,000	---	10 ± 10 percent	6

Cycling test: The frequency shall be swept from 5 to 2,000 to 5 Hz with approximately logarithmic progression, and shall require approximately 8 minutes to traverse the range. This constitutes one cycle. The TUT shall be vibrated for one such cycle in each of the three axes.

Record maximum vibrational noise output from 5-75 Hz using the Bruel and Kjaer type 2409 true rms meter, or equivalent. Record vibrational noise output response curve from 75-2,000 Hz using the Bruel and Kjaer automatic recorder, or equivalent.

MIL-PRF-1/1587D(USAF)

TABLE I. Testing and inspection - Continued.

12/ The TUT shall be vibrated in axes X, Y, and Z under the following conditions:

<u>Frequency</u> (Hz)	<u>Double amplitude</u> (inches)	<u>Acceleration</u> (G)
5-15	.170 ± 10 percent	---
15-75	.030 ± 10 percent	---
75-1,500	---	3 ± 10 percent

Cycling test: The frequency shall vary from 5 to 1,500 to 5 Hz with approximately logarithmic progression, and shall require approximately 6 minutes to traverse the range. This constitutes one cycle. The TUT shall be vibrated for one such cycle in each of the three axes.

An oscilloscope having a vertical amplifier with a minimum bandpass of DC to 10 MHz shall be used to monitor the signal across the 2K series plate resistor. The horizontal scope sweep frequency shall be approximately 1 centimeter per second. The signal shall be DC coupled to the oscilloscope. If a signal greater than 150 volts occurs during the vibration sweep, the sweep shall be reversed (first rescan) as soon as possible to pass through and below the frequency where this signal was noted. At this point the sweep shall be reversed to the normal direction (second rescan). If a signal greater than 150 volts recurs (within approximately ± 20 percent of the noted frequency) during the first or second rescans the tube shall be considered a failure. If no signal greater than 150 volts occurs during either of the two rescans, the tube is not a failure and the normal vibration sweep shall be continued. If additional signals occur greater than 150 volts, the above procedure shall be repeated.

A signal greater than 25 volts for a duration greater than 2 seconds is cause for rejection.

The 150 volts and the 25 volts referred to above are deflection only and does not include the oscilloscope signal resulting from the 10 ma plate current flowing through Rp.

(NOTE: An equivalent method for measuring the signal across the plate resistor may be used.)

13/ Revision letters are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

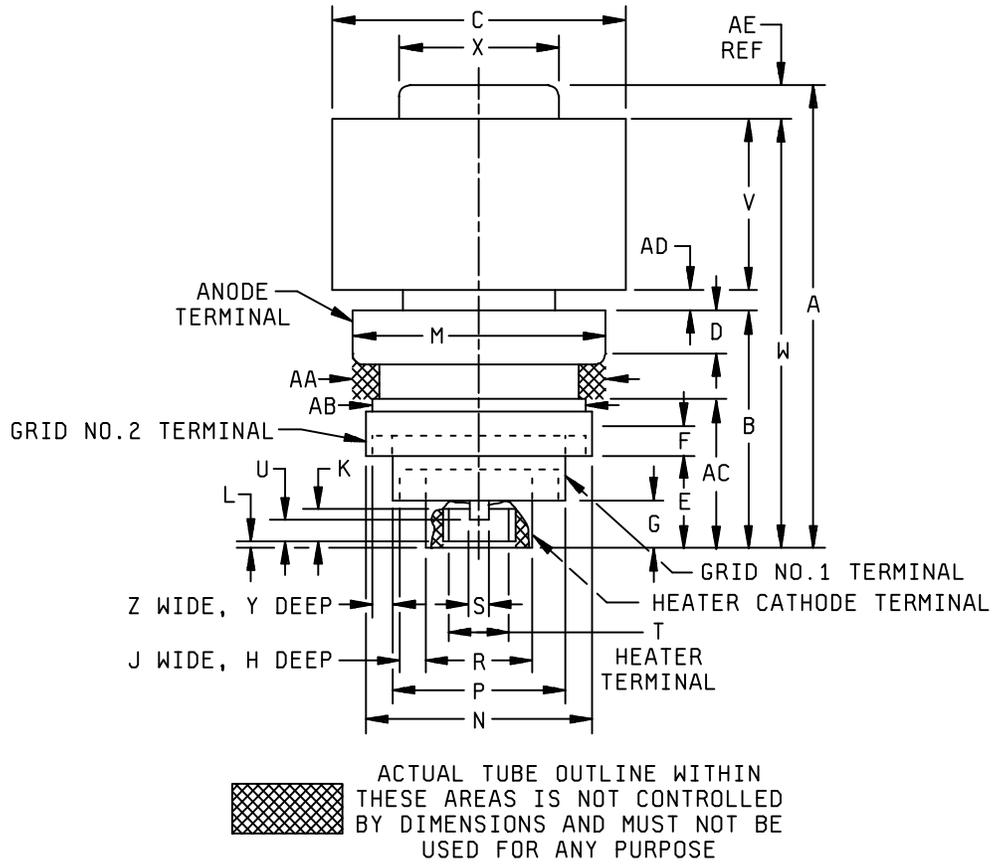


FIGURE 1. Outline drawing of electron tube type 8596.

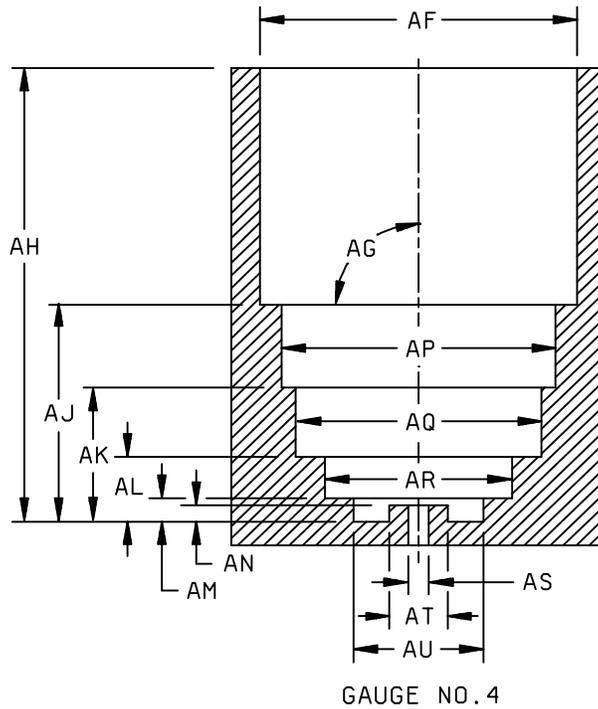
MIL-PRF-1/1587D(USAF)

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
Conformance inspection, part 2				
A	1.894	2.036	48.11	51.71
B	1.000	1.060	25.40	26.92
C	1.297	1.327	32.94	33.71
E	.350	.390	8.89	9.91
G	.160	.190	4.06	4.83
M	1.085	---	27.56	---
N	.985	---	25.02	---
P	.735	---	18.67	---
R	.480	---	12.19	---
T	.240	.260	6.10	6.60
V	.735	.765	18.67	19.43
W	1.785	1.895	45.34	48.13
Conformance inspection, part 3 (see 10/ in table I)				
D	.165	---	4.19	---
F	.140	---	3.56	---
H	.120	---	3.05	---
J	.095	---	2.41	---
K	.100	---	2.54	---
L	---	.050	---	1.27
U	.054	---	1.37	---
Y	.060	---	1.52	---
Z	.090	---	2.29	---
AC	.600	---	15.24	---
AD	.050	---	1.27	---
Reference dimensions				
S	---	---	---	---
X	.690 nominal		17.53 nominal	
AA	---	---	---	---
AB	---	---	---	---
AE	.125 nominal		3.18 nominal	

NOTES:

1. Dimension are in inches.
2. Metric equivalentents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. Unless otherwise specified, tolerances are $\pm .001$ inch (0.03 mm).

FIGURE 1. Outline drawing of electron tube type 8596 - Continued.



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
AF	1.374	1.376	34.90	34.96
	DIA (H ₁)			
AG	89°58'	90°02'	89°58'	90°02'
AH	2.035	2.037	51.69	51.74
AJ	.959	.961	24.36	24.41
AK	.599	.601	15.21	15.27
AL	.339	.341	8.61	8.66
AM	.159	.161	4.04	4.09
AN	.098	.100	2.49	2.54
AP	1.117	1.119	28.37	28.42
	DIA (H ₂)			
AQ	1.017	1.019	25.83	25.88
	DIA (H ₃)			
AR	.762	.764	19.35	19.41
	DIA (H ₄)			
AS	.069	.071	1.75	1.80
	DIA (H ₆)			
AT	.238	.240	6.05	6.10
	DIA (P)	DIA (P)	DIA (P)	DIA (P)
AU	.517	.519	13.13	13.18
	DIA (H ₅)			

NOTES:

1. Dimension are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. Unless otherwise specified, tolerances are ± .001 inch (0.03 mm).

FIGURE 1. Outline drawing of electron tube type 8596 - Continued.

MIL-PRF-1/1587D(USAF)

Custodian:
Air Force - 11
DLA - CC

Preparing activity:
DLA - CC

Review activities: (Project 5960-3550)
Air Force - 99