

INCH-POUND

MIL-PRF-1/1405E  
 27 July 2009  
 SUPERSEDING  
 MIL-PRF-1/1405D  
 18 June 1999

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, TRAVELING WAVE

TYPE 7640

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: Forward-wave amplifier, frequency range 2.9 to 3.1 GHz, power output 1 kW, periodic permanent magnet focus, air cooled, coaxial rf connectors.

ABSOLUTE RATINGS: 2/

Parameter:	Ef	If (surge)	ek	ik	ia + iw	VSWR
Unit:	V	A	v	a	ma	---
Maximum:	8.5	10	-8,000	2.0	1,000	2.0:1.0
Minimum:	6.0	---	---	---	---	---

ABSOLUTE RATINGS: 2/

Parameter:	Pp	Du	tp	Pi(rf)	tk	TE
Unit:	W	---	$\mu$ s <u>3/</u>	W <u>9/</u>	sec	$^{\circ}$ C <u>4/</u>
Maximum:	100	0.006	6.0	2	---	150
Minimum:	---	---	---	---	120	---

PHYSICAL CHARACTERISTICS:

Dimensions:	See figure 1.	DC connectors:	See figure 1.
Mounting position:	Any.	Focusing circuit:	PPM, integral.
Cooling:	2 cfm minimum air through base.	Weight:	17.5 pounds, maximum.
RF connectors:	See figure 1.	Marking:	See <u>6/</u> and <u>7/</u>

TEST CONDITIONS:

Parameter:	Ef	Du	ek	tp	Pi (rf)	F
Unit:	V	---	v	$\mu$ s	W	GHz
Test condition 1:	6.3	0.0055	Adj	5.5	0.001	F1, F2, F3
Test condition 2:	6.3	0.0055	Adj	5.5	1.0	F1, F2, F3
Test condition 3:	6.3	0.0055	Adj	5.5	1.0	F2

Frequency		
F	GHz	$\pm$
1	2.9	2%
2	3.0	2%
3	3.1	2%

See footnotes at end of table I.

GENERAL:

Qualification: Not required.

Burn-in: 25 hours 17/

Service-life guarantee: 16/

AMSC N/A

FSC 5960

TABLE I. Testing and inspection.

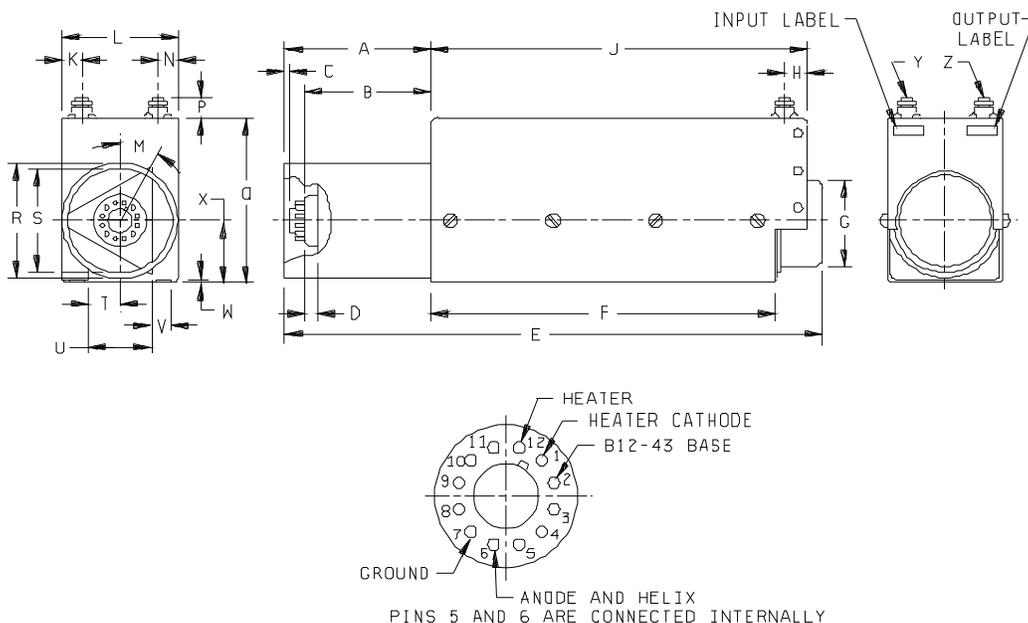
Inspection	Method MIL-STD-1311	Notes	Test	Conditions	Symbol	Limits		Unit
						Min	Max	
<u>Conformance inspection, part 1</u>		<u>5/</u>	---					
Heater current	1301	---	---		If	---	4.5	A
Cathode current	1256	---	2	Pi(rf) = 0	ik	0.75	1.75	a
Cathode warmup time	4303	---	2	tk1 = 250 sec; tk2 = 300 sec; Pi(rf) = 0	$\Delta ik$	---	0.1	a
Cathode voltage	1261	---	1		ek	-6.0	-7.0	kv
Cathode voltage	1261	---	2		ek	-6.5	-7.5	kv
Small-signal gain (1)	4253	<u>1/ 9/</u>	1	$\sigma' = 1.5$ (max)	Gss	33	43	dB
Small-signal gain (2)	4253	<u>1/ 9/</u>	1	$\sigma' = 1.5$ (max)	Gss	30	---	dB
Small-signal gain variation	4253	<u>1/ 9/ 10/</u>	1	$\sigma' = 1.5$ (max)	$\Delta Gss$	---	3.0	dB
Large-signal gain (1)	4253	<u>1/ 9/</u>	2	$\sigma' = 1.5$ (max)	Gls	30	40	dB
Large-signal gain (2)	4253	<u>1/ 9/</u>	2	$\sigma' = 1.5$ (max)	Gls	27	---	dB
Large-signal gain variation (1)	4253	<u>1/ 9/</u>	2	$\sigma' = 1.5$ (max)	$\Delta Gl_s$	---	2.0	dB
Large-signal gain variation (2)	4253	<u>1/ 9/ 14/</u>	3	$\sigma' = 1.5$ (max)	$\Delta Gl_s$	---	2.5	dB
Power output variation	4251	<u>8/ 9/ 12/</u>	2	$\sigma' = 1.5$ (max) F = F1; ek (1) = 1.02 ek; Pi(rf) (1) = 0.5 W; Pi(rf) (2) = 1.5 W; F = F3; ek(2) = 0.98 ek	$\Delta po$	---	1.0	dB
Spurious power output (1)	4261	<u>13/</u>	1	Pi(rf) = 0	spo	---	-10	dBm
Spurious power output (2)	4261	<u>13/</u>	2	Pi(rf) = 0	spo	---	-10	dBm
<u>Conformance inspection, part 2</u>								
Spectrum	---	<u>9/ 15/</u>	1	F = F2	$\Delta F$	---	30	MHz
Large-signal gain variation (3)	4253	<u>9/ 11/</u>	3	tk3 = 5 minutes; tk4 = 20 minutes	$\Delta Gl_s$	---	1.5	dB

See footnotes at top of next page.

TABLE I. Testing and inspection - Continued.

- 1/ A swept frequency from F1 through F3 may be used for this test.
- 2/ Cathode and one leg of heater shall be connected internally. Anode, helix, and collector shall be at ground potential. All voltages are referred to ground except heater potential, which is referred to cathode.
- 3/ The pulse shall comply with the requirements stated in method 4304, pulse characteristics, except that the rise and decay times shall not exceed 0.5  $\mu$ s and 0.6  $\mu$ s respectively. The peak-to-peak ripple shall not exceed 100 volts.
- 4/ TE is the temperature at the midpoint of the cylindrical surface of the bulb with the specified flow of cooling air.
- 5/ Unless otherwise specified, the acceptance level for all tests listed under conformance inspection, part 1, shall be 1.0, inspection level II.
- 6/ Each tube shall be marked with the following information:
  - a. Manufacturer's identification.
  - b. JAN 7640.
  - c. Serial number.
  - d. Acceptance date.
  - e. Cathode voltage for optimum small-signal gain.
  - f. Cathode voltage for optimum large-signal gain.
  - g. RF input and output connectors.
- 7/ One reproducible and two prints of data sheets for all tests performed under this specification shall be supplied to the contractor. One copy of the data sheet shall be packed with the tube.
- 8/ The rf output pulse shall evidence no more than 10 percent amplitude distortion from any source other than the applied dc pulse.
- 9/ The input power,  $P_i(\text{rf})$ , is defined as incident power from a 50-ohm source at the rf input connector of the tube.
- 10/  $\Delta G_{ss}$  and  $\Delta G_{Is}(1)$  shall be the difference between maximum gain and minimum gain within the frequency range.
- 11/  $\Delta G_{Is}(2)$  shall be the difference in GIs at tk3 and tk4.
- 12/  $\Delta p_o$  shall be the difference in power output for  $P_i(\text{rf}) (1)$  and  $P_i(\text{rf}) (2)$ .
- 13/ The input shall be terminated into a 50-ohm matched load. The output termination shall be a 3-dB attenuator in series with a variable-phase short circuit. The bandpass filter shall have a bandpass from 2.1 to 3.9 GHz.
- 14/ A variation of  $\pm 5$  percent in  $e_k$  from the test condition 2 value shall result in a gain variation,  $\Delta G_{Is}$ , from the measured value, GIs, of not greater than the value specified.
- 15/ Spectrum width shall be measured with a receiver having an IF bandwidth of 3.0 MHz, or less. In the frequency range 2.8 to 3.2 GHz, the range shall be the respective lowest and highest frequencies at which the signal power is at least 30 dB below the power of the center frequency.
- 16/ Service-life guarantee of 1,000 hours is applicable when specified in the contract.
- 17/ After completion of this test, all tubes shall meet the parameters listed on the data sheet (see 7/).

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Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	4.5625	4.6875	115.69	119.06
B	3.9687	4.0313	100.80	102.40
C	.0937	.1563	2.38	3.97
D	.375	.500	9.53	12.70
E	---	16.625	---	422.28
F	10.4687	10.5313	265.90	267.50
G	2.657	2.719	67.49	69.06
H	.7187	.7813	18.25	19.85
J	11.4687	11.5313	291.30	292.90
K	.7187	.7813	18.25	19.85
L	3.5679	3.6405	90.62	92.47
M	30° NOM		30° NOM	
N	.7187	.7813	18.25	19.85
P	.5937	.6563	15.08	16.67
Q	4.9687	5.0313	126.20	127.80
R	3.437	3.499	87.30	88.87
S	3.219	3.281	81.76	83.34
T	.9314	.9436	23.66	23.97
U	1.814	1.936	46.08	49.17
V	.5937	.6563	15.08	16.67
W	.059	.069	1.50	1.75
X	1.788	1.820	45.42	46.23
Y	Input UG -19 B/U connector			
Z	Output UG-19B/U connector			

NOTE: Pins 5 and 6 are connected internally.

FIGURE 1. Outline drawing of electron tube type 7640.

Referenced documents. In addition to MIL-PRF-1, this document references the following:  
MIL-STD-1311

Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodian:

Army - CR  
Navy - EC  
Air Force - 85  
DLA - CC

Preparing activity:

DLA - CC

(Project 5960-2009-020)

Review activities:

Army - AR  
Navy - AS, CG, MC, OS, SH  
Air Force - 99  
DLA - GS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil/>.