

INCH-POUND

MIL-E-1/188J  
17 September 2013  
SUPERSEDING  
MIL-E-1/188H  
26 March 2003

MILITARY SPECIFICATION SHEET

ELECTRON TUBE, RECEIVING

TYPES 6021W 1/ AND 6021WSPL 2/

Inactive for new design  
after 7 March 1997.

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 MIL-PRF-1.

DESCRIPTION: Twin triode, subminiature, medium Mu.

Outline	---	3-1 (EIA)
Base	---	E8-10
Envelope	---	T3
Cathode	---	Coated uni-potential
Base connections:		
Pin no.	---	1 2 3 4 5 6 7 8
Element	---	2a 2g h 2k 1k h 1g 1a

ABSOLUTE RATINGS:

Parameter:	Ef	Eb	Ec	Ehk	Rk/k	Rg/g	Ib/b	Ic/c	Pp/p	TE	Alt
Unit:	V	V dc	V dc	v	Ohms	MegΩ	mA dc	mA dc	W	°C	ft
Maximum:	6.6	165	0	200	---	1.1	22	5.5	0.7	220	<u>3/</u>
Minimum:	6.0	---	-55	---	---	---	---	---	---	---	<u>3/</u>
Test conditions:	6.3	100	0	<u>4/</u>	150	---	---	---	---	---	---

GENERAL:

Qualification – Not required

**I** This specification sheet uses accept on zero defect sampling in accordance with MIL-PRF-1, table III.

1/ 6021W was formerly type 6021

2/ The additional test requirements specified for tube type 6021WSPL are intended to provide a tube that will consistently operate satisfactorily in the PRF circuit of the modulator unit of the AN/ARN-21 Tacan set.

3/ See "Reduced pressure (altitude) rating", and altitude, maximum peak voltage in the basic document.

4/ Unless otherwise specified, the reference point for heater-cathode potential shall be the positive terminal of the cathode resistor.

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TABLE I. Testing and inspection.

Requirement or test	MIL-STD-1311 Method	Notes	Conditions	Symbol	Limits		Units
					Min	Max	
<u>Conformance inspection, part 1</u>							
Electrode current (1) (anode)	1256			lb	4.5	8.5	mA dc
Electrode current (2) (anode)	1256	<u>2/</u>	Ec = -6.5 V dc; Rk = 0	lb	---	100	μA dc
Electrode current (3) (anode) type 6021WSPL	1256	<u>1/ 2/</u>	Ec = -5.5 V dc; Rk = 0	lb	---	50	μA dc
Total grid current	1266	<u>2/ 3/</u>	Eb = 150 V dc; Rk = 300 ohms; Rg = 2.0 MegΩ	lc	0	-0.3	μA dc
Heater current	1301			If	280	320	mA
Transconductance (1)	1306	<u>2/</u>		Sm	4,450	6,350	μmhos
Heater-cathode leakage	1336	<u>2/</u>		lhk	---	5.0	μA dc
Short and discontinuity detection	1201			---	---	---	---
<u>Conformance inspection, part 2</u>							
Insulation of electrodes	1211	<u>2/</u>		---	---	---	---
High-frequency vibration	1031	<u>2/</u>	Rp = 10,000 ohms;	Ep	---	50	mV ac
Audio frequency noise	1246	<u>4/ 5/</u>	Esig = 65 mV ac; Rg = 0.1 MegΩ; Rp = 0.01 MegΩ; Rk = 75 ohms	---	---	---	---
Electrode current (1) (anode) (difference between sections)	1256			lb	---	1.6	mA dc
Grid emission	1266	<u>2/ 6/</u>	Ef = 7.5 V; Ec = -7.5 V dc; Eb = 150 V dc; Rk = 0; Rg = 1.0 MegΩ	lc	0	-0.5	μA dc
Transconductance (2)	1306	<u>2/</u>	Ef = 5.7 V	$\frac{\Delta S_m}{E_f}$	---	15	%
Amplification factor	1316	<u>2/</u>		Mu	30	40	---
Direct-interelectrode capacitance	1331	<u>2/</u>	No shield	Cgp	1.2	1.8	pF
			No shield	Cin	1.8	3.0	pF
			No shield; section 1	Cout	0.20	0.36	pF
			No shield; section 2	Cout	0.22	0.42	pF
			No shield	Cgg	---	0.013	pF
No shield	Cpp	---	0.52	pF			

See footnotes at end of table.

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TABLE I. Testing and inspection - Continued.

Requirement or test	MIL-STD-1311 Method	Notes	Conditions	Symbol	Limits		Units
					Min	Max	
<u>Conformance inspection, part 2</u> - Continued							
Pulse emission	1231	<u>2/ 7/</u>	Ef = 6.0 V; e pulse = 50 v; tp = 25 μs; prf = 200 pps	is	300	---	ma
Pulse cathode current (1) Type 6021WSPL	---	<u>1/ 2/ 8/</u>	Ef = 6.3 V; eb = 150 v; Ec = -25 V dc; egk = +30 v	ik Δik(tp)	330 ---	---	mA %
Pulse cathode current (2) Type 6021WSPL	---	<u>1/ 2/ 8/</u>	Ef = 5.9 V; eb = 150 v; Ec = -25 V dc; egk = +30 v	ik	310	---	mA
Lead fatigue	1116			---	---	---	---
Envelope strain	2126			---	---	---	---
Shock	1041	<u>9/ 10/</u>	450 G; ehk = +100 V dc; Rg = 0.1 MegΩ	---	---	---	---
Vibration-fatigue	1031			---	---	---	---
Shock and vibration- fatigue-test end points:	---						
High-frequency vibration	1031	<u>2/</u>	Rp = 10,000 ohms	Ep	---	200	mV ac
Heater-cathode leakage	1336	<u>2/</u>		Ihk	---	20	μA dc
Change in transconductance (1) of individual tubes	1306	<u>2/</u>		$\frac{\Delta S_m}{t}$	---	20	%
Permanence of marking	1105			---	---	---	---
<u>Conformance inspection, part 3</u>							
Heater-cycling life	1506		Ef = 7.0 V; 1 min on, 4 min off; Ehk = 140 V ac; Ec = Eb = 0	---	---	---	---
Stability life	1516		Ehk = +200 V dc; Rg/g = 1.0 MegΩ; TA = room	---	---	---	---
Stability life-test end point: (2 and 20 hours)	---						
Change in transconductance (1) of individual tubes	1306	<u>2/</u>		$\frac{\Delta S_m}{t}$	---	15	%

See footnotes at end of table.

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TABLE I. Testing and inspection - Continued.

Requirement or test	MIL-STD-1311 Method	Notes	Conditions	Symbol	Limits		Units
					Min	Max	
<u>Conformance inspection, part 3</u> - Continued							
Intermittent life	1501	11/	Ehk = +200 V dc; Rg/g = 1.0 MegΩ	---	---	---	---
Intermittent life-test end point: (1,000 hours)	---						
Insulation of electrodes	1211			---	---	---	---
Intermittent life (high temperature)	1501	11/	Ehk = +200 V dc; Rg/g = 1.0 MegΩ; TE = 220°C (min)	---	---	---	---
Intermittent life (high temperature) - test end points: (1,000 hours)	---						
Total grid current	1266	2/	Eb = 150 V dc; Rk = 300 ohms; Rg = 1.0 MegΩ	Ic	0	-0.9	μA dc
Heater current	1301			If	276	328	mA
Change in transconductance (1) of individual tubes	1306	2/		$\frac{\Delta S_m}{T}$	---	25	%
Transconductance (2)	1306	2/	Ef = 5.7 V	$\frac{\Delta S_m}{E_f}$	---	20	%
Heater-cathode leakage	1336	2/		Ihk	---	10	μA dc
Insulation of electrodes	1211	2/		---	---	---	---

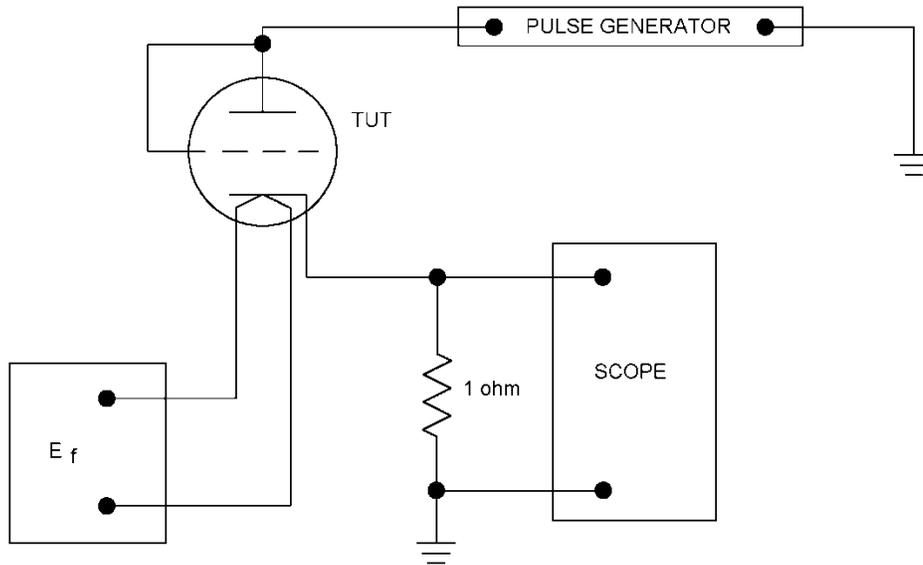
NOTES:

- 1/ The additional test requirements specified for tube type 6021WSPL are intended to provide a tube that will consistently operate satisfactorily in the PRF circuit of the modulator unit of the AN/ARN-21 Tacan set.
- 2/ Test each unit separately.
- 3/ This test shall be performed at the conclusion of the holding period.
- 4/ Tie 1k to 2k; 1g to 2g; and 1a to 2a.
- 5/ The rejection level shall be set at the VU meter reading obtained during calibration.
- 6/ Prior to this test, the TUT shall be preheated a minimum of 5 minutes with both sections operating at the conditions specified below. The 3-minute test shall not be permitted. Test at specified conditions within 3 seconds after preheating. Grid emission shall be the last test performed on the sample selected for the grid emission test.

Ef	Ec	Eb	Rk	Rg
V	V dc	V dc	Ohms	MegΩ
7.5	0	150	500	1.0

TABLE I. Testing and inspection - Continued.

- 7/ The pulse is essentially a square wave with 1.0- $\mu$ s rise time and 0.8- $\mu$ s fall. The pulse shall be applied to anode and grid tied together. Pulse emission shall be measured in terms of voltage, developed across a 1.0-ohm resistor in the cathode circuit. Limit shall be tested as measured by the leading edge of a calibrated oscilloscope trace, the amplitude of the trailing edge of which shall not vary by more than 20 percent from the value of the leading edge.



- 8/ The grid pulse shall be a square wave meeting the pulse shape requirements of method 1296, and in addition, the maximum amplitude shall occur within the first 20 percent of  $t_p$ ,  $t_p = 10 \mu$ s, and  $prr = 1,000$  pps. The pulse shall be applied to the grid by means of a driving circuit which produces the specified peak pulse voltage directly at the grid terminal with respect to the cathode. Grid resistance, not exceeding 50 ohms, may be inserted to prevent oscillation, provided readjustment of grid drive is made to maintain the specified pulse amplitude directly at the grid terminal.

Peak currents shall be measured by means of a high-impedance oscilloscope, or equivalent device, connected across a cathode resistor of  $1.0 \pm 0.01$  ohm. The specified limit refers to the maximum of the pulse amplitude. The variation of the output pulse amplitude between 20 and 80 percent  $t_p$  shall not exceed the specified limits for  $\Delta i_k(t_p)$ . Peak cathode current shall be read after 10 seconds or in the case of slumping peak cathode current, when a stable reading is obtained.

- 9/ Leads may be clipped for application of voltages during impact.

- 10/ A grid resistor of 0.1 Meg $\Omega$  shall be added to each section, except when a thyratron-type short indicator is used.

- 11/ Envelope temperature (TE) requirements, when measured in accordance with the temperature by conduction-band measurement (MIL-STD-1311 method 1226), will be satisfied if a TUT having bogey  $I_b$  ( $\pm 5$  percent) under normal test conditions, is determined to operate at or above minimum specified temperature at any position in the life-test rack.

Reference documents. In addition to MIL-PRF-1 this specification sheet references MIL-STD-1311.

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Preparing activity:  
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