INCH-POUND

MIL-E-1/188H
26 March 2003
SUPERSEDING
MIL-E-1/188G
6 January 1983

MILITARY SPECIFICATION SHEET

ELECTRON TUBE, RECEIVING
TYPE 6021W 1/ AND 6021WSPL 2/

This specification sheet is 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 unipotential
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	Meg	mA dc	mA dc	W	°C	ft
Maximum:	6.6	165	0	200	---	1.1	22	5.5	0.7	220	3/
Minimum:	6.0	---	-55	---	---	---	---	---	---	---	3/
Test conditions:	6.3	100	0	4/	150	---	---	---	---	---	---

GENERAL:

First Article test is required and shall consist of all tests in table I with a sample size of 2 for a lot size less than or equal to 150 units and a sample size of 4 for a lot size greater than or equal to 151 units. All samples shall pass conformance inspection, part 1, of table I before continuing. Half of the samples shall then be subjected to conformance inspection, part 2, and the remaining samples shall be subjected to part 3, with no test failures permitted during any testing.

After First Article approval, acceptance testing shall consist of conformance inspection, part 1, of table I with sample size in accordance with table III, category XVI of MIL-PRF-1.

1/ 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.

TABLE I. Testing and inspection.

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

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

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

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

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

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.

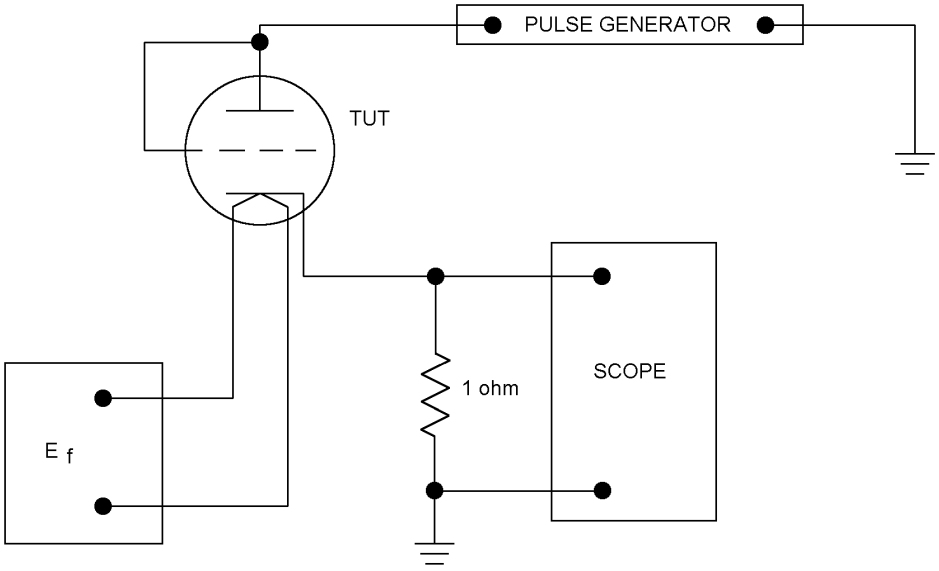
5/ The rejection level shall be set at the VU meter reading obtained during calibration.

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	Meg
7.5	0	150	500	1.0

TABLE I. Testing and inspection - Continued.

7/ The pulse is essentially a square wave with 1.0-μs rise time and 0.8-μs 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 tp, tp = 10 μs, 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 ± 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 tp shall not exceed the specified limits for Δik(tp). 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 megohm 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 (method 1226), will be satisfied if a TUT having bogey Ib (±5 percent) under normal test conditions, is determined to operate at or above minimum specified temperature at any position in the life-test rack.

Custodians:
Army - CR
Navy - EC
Air Force - 11
DLA - CC

Review activities:
Army - AR, AV, CR4, MI
Navy - AS, CG, MC, OS, SH
Air Force - 99

Preparing activity:
DLA - CC

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