INCH-POUND

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SUPERSEDING
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PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, POWER
TYPES 7580W AND 8930 *

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. 9/

See figure 1.

Mounting position: Any.

Weight: 4 ounces (113.4 grams) nominal (7580W).
6 ounces (170.1 grams) nominal (8930).

ABSOLUTE RATINGS:

Parameter:	F1	Ef	Eb	Ec1	Ec2	Ehk	Ib	Pg1	Pg2
Unit:	MHz	V ac 1/	V dc	V dc	V dc	V dc	mA dc	W	W
Maximum:									
Class C Telep:	500	6.0 ± 10%	1,500	-250	300	±150	200	2	12
Class C Teleg:	500	6.0 ± 10%	2,000	-250	300	±150	250	2	12
Class AB1:	500	6.0 ± 10%	2,000	-250	500	±150	250	2	12
Class AB1 (8930):	500	6.0 ± 10%	2,400	-250	500	±150	250	2	12
Test conditions:	---	6.0	1,000	Adj	300	0	150	---	---

ABSOLUTE RATINGS:

Parameter:	Pp	Pi	T(seal)	T(anode core)	tk	Cooling	Barometric pressure, reduced
Unit:	W	W	°C	°C	sec (min)	2/	mmHg
Maximum:							
Class C Telep:	165	300	250	250	30	---	349
Class C Teleg:	250	500	250	250	30	---	349
Class AB1:	250	500	250	250	30	---	349
Class AB1 (8930):	350	500	250	250	30	---	349
Test conditions:	---	---	---	---	120	3/	---

GENERAL:

Qualification: Required.

* Type 8930 replaces tube types:
EIMAC 8930 and X651Z
Amperex DX393
ITT 504809-1

TABLE I. Testing and inspection.

Inspection	Method MIL-STD-1311	Type	Conditions	Acceptance level 15/	Symbol	Limits		Unit
						Min	Max	
Conformance inspection, part 1								
Electrode current (screen)	1256	Both		0.65	Ic2	-7.0	+3.0	mA dc
Electrode voltage (grid)	1261	Both	Eb = 2,000 V dc; Ec2 = 400 V dc; Ec1/Ib = 67 mA dc	0.65	Ec1	-70	-100	V dc
Total grid current	1266	7580W	Eb = 2,000 V dc; Ib = 125 mA dc 14/	0.65	Ic1	---	-15	µA dc
		8930	Eb = 2,500 V dc; Ec1/Ib = 140 mA dc 14/	0.65	Ic1	---	-15	µA dc
Primary-grid emission (control)	1266	Both	Ic1 = 70 mA dc; t = 120; anode and screen-grid floating	0.65	Isg1	---	-250	µA dc
Primary-grid emission (screen)	1266	Both	Ec1 = 0; t = 120; Ic2 = 100 mA dc; anode floating	0.65	Isg2	---	-250	µA dc
Heater current	1301	Both		0.65	If	2.30	2.90	A ac

Pulse emission	2212	Both	Eb = Ec2 = 250 V dc;
			Ec1 = -100 V dc;
			egk/ik = 1.5 a;
			prr = 11 ± 1;
			tp = 4,500 µs (min);
			Ef = 5.4 V ac;
			tr = tf = 25 µs;
			slope = 0.5 percent;
			ripple = 0.1 percent
				0.65	∆ik	---	200	ma

Current division (long pulse method A)	1372	Both	Eb = Ec2 = 250 V dc; Ec1 = -100 V dc; egk/ib = 1.0 a; prr = 11 ± 1; tp = 4,500 µs (min)	0.65 0.65 0.65	egk ic1 ic2	2.0 --- ---	9.0 150 260	v ma ma
Interelement leakage (1)	---	8930	Grid-cathode; C = 0.25 µF; E = ± 400 V dc 8/	0.65 0.65	I I	--- ---	+1.5 -1.5	µA dc µA dc
Interelement leakage (2)	---	8930	Grid-screen; C = 0.25 µF; E = ± 1,000 V dc 8/	0.65 0.65	I I	--- ---	+1.5 -1.5	µA dc µA dc
Interelement leakage (3)	---	8930	Anode-screen; C = 0.001 µF; E = 8.0 kV dc 8/	0.65	I	---	5.5	µA dc

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Type	Conditions	Acceptance level 15/	Symbol	Limits Min	Limits Max	Unit
Conformance inspection, part 2								
Direct-interelectrode capacitance	1331	Both		---	Cgp	---	0.06	pF
					Cin	16.0	18.5	pF
					Cout	4.2	5.2	pF
Heater-cathode leakage	1336	Both	Ehk = +150 V dc;	---	Ihk	---	+150	µA dc
			Ehk = -150 V dc 10/	---	Ihk	---	-150	µA dc
RF useful output power	2214	7580W	Class C amplifier; F = 470 to 500 MHz; Eb = 2,000 V dc; Ec1 = -90 V dc; Ec2 = 250 to 300 V dc; Ic1 = 25 mA dc (max); Eg1/Ib = 250 mA dc; Ef = 5.5 V ac 11/	---	Po	225	---	W
Conformance inspection, part 3								
Life test (2)	---	7580W	Group C; AB1 amplifier; Eb = 2,000 V dc; Ec2 = 400 V dc; Ec1/Ibo = 75 mA dc; Eg1/Ib = 250 mA dc; RL = 4,000 ± 100 ohms; anode tank Q = 10 to 15; F = 2 MHz (min), 10 MHz (max); t = 500 hours 7/	---	Po (initial)	250	---	W (useful)
Life-test (2) end points:	---							
Linear amplifier power output and distortion	2204		7/	---	3rd IM	-22	---	dB
					5th IM	-27	---	dB
Life test (2)	---	7580W	7/	---	ΔIb	---	40	mA dc
					Po	225	---	W (useful)
Life test (1)	---	7580W	RF useful output power; t = 500 hours 4/	---	---	---	---	---
Life-test (1) end points:	---							
Pulse emission	2212		Ef = 6.0 V ac	---	Δik	---	100	ma
Heater-cathode leakage	1336		Ehk = +150 V dc	---	Ihk	---	150	µA dc
			Ehk = -150 V dc	---	Ihk	---	150	µA dc
Primary grid emission (control)	1266			---	Isg1	---	-250	µA dc
Primary grid emission (screen)	1266			---	Isg2	---	-250	µA dc

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Type	Conditions	Acceptance level 15/	Symbol	Limits		Unit
						Min	Max	
Conformance inspection, part 3 - Continued								
Cooling	---	7580W	Ec1/Ib = 250 mA dc 4/ 5/	---	T (anode core)	---	250	°C
		8930	Eb = 1,400 V dc; Ec1/Ib = 250 mA dc 4/ 5/	---	T (anode core)	---	250	°C
Pressure drop	---	7580W	No voltages 4/ 6/	---	---	---	0.35	Inches H_2O
		8930	No voltages 4/ 6/	---	---	---	0.70	Inches H_2O
Life test (3)	---	7580W	Group D; rf useful output power, except air-flow = 1.5 cfm; t = 100 hours 4/	---	---	---	---	---
Life-test (3) end points:	---							
RF useful output power	2214			---	Po	200	---	W
Humidity	1011	7580W	4/	---	---	---	---	---
Humidity end point	---		Total grid current	---	Ic1	---	-15	µA dc
Vibration, mechanical	1032	7580W	Ef = 6.0 V; Ebb = 2,500 V dc; Ec2 = 500 V dc; Rp = 4,900 ohms; Ec1/Ib = 100 mA dc; Accel = 10 G peak (min); F = 28 to 2,000 to 28 Hz; 4/ 12/	---	Ep	---	30	V ac
Vibration, mechanical end points:	---							
Total grid current	1266			---	Ic1	---	-20	µA dc
Electrode voltage (grid)	1261			---	Ec1	-70	-100	V dc
Shock, specified pulse	1042	7580W	Eb = 2,000 V dc; Ec2 = 500 V dc Ec1 = -200 V dc; shock = 11 ± 2 ms; accel = 90 G peak (min); total impacts = 18 4/ 13/	---	---	---	---	---

See footnotes at end of table.

TABLE I. Testing and inspection - Continued.

Inspection	Method MIL-STD-1311	Type	Conditions	Acceptance level 15/	Symbol	Limits		Unit
						Min	Max	
Conformance inspection, part 3 - Continued								
Shock, specified pulse end points:	---							
Total grid current	1266			---	Ic1	---	-20	µA dc
Electrode voltage (grid)	1261			---	Ec1	-70	-100	V dc
Linear amplifier power output and distortion	2204	7580W	Eb = 2,000 V dc; Ec2 = 400 V dc; Ec1/Ibo = 75 mA dc; Eg1/Ib = 250 mA dc 1-tone; RL = 4,000 ± 100 ohms; Rg = 1,000 ohms (max); F = 2 MHz (min), 10 Mhz (max); anode tank Q = 10 to 15; t = 180 (min) 4/	---	Po 3rd IM 5th IM	250 -22 -27	--- --- ---	W (useful) dB dB

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

Frequency (MHz)	Ef (V ac)
300 or lower	6.00
301 to 400	5.75
401 to 500	5.50

It is recommended that the heater voltage be maintained within ± 5 percent when consistent operation and extended tube life are factors. This applies to both nominal and derated voltages.

2/ At the specified anode dissipation and an incoming air temperature of 25°C maximum, a minimum airflow, as specified, shall pass through the anode cooler. At this flow-rate, the static pressure drop across the tube and socket, with an appropriate chimney (air director) around the anode cooler, is approximately as specified below. The pressure drop varies with the amount of escaping air and with the shape and construction of the air director. This rating applies at bias voltages less than 100 volts and frequencies less than 500 MHz. Air cooling on the tube base shall be increased with increasing negative grid bias or with increasing frequency, or a combination of both. In all cases of operation, a socket which provides forced-air cooling shall be used and maximum seal and anode core temperature ratings shall not be exceeded. The airflow shall be applied before or simultaneously with electrode voltages, and may be removed simultaneously with them. Where emphasis is placed on long and reliable life, cooling in excess of minimum requirements shall be used.

Type	Anode dissipation (watts)	Airflow (cfm)	Static pressure drop (inch of water at sea level)	Socket
7580W	250	3.8	0.30	246-JAN
8930	350	6.0	0.60	246-JAN

3/ In all electrical tests involving application of heater voltage, the use of an air-system socket and forced-air cooling is permissible.

4/ This test shall be performed yearly. An accept on zero defect sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, acceptance level 6.5 (see 15/). The yearly sampling plan may be reinstated after three consecutive samples have been accepted.

TABLE I. Testing and inspection - Continued.

5/ The cooling test shall be made as follows: At an ambient temperature of 25°C, both base and anode shall be cooled by applying an airflow of; 7580W, 3.8 cfm maximum; 8930, 6.0 cfm maximum; at sea level from a single source using the infinite baffle system as shown on figure 2, or equivalent. At the specified test conditions, the anode core temperature shall not exceed the specified limit. Temperature shall be measured by means of a thermocouple, located as follows: The thermocouple shall be embedded in the top of the anode core, adjacent to the cooler, by means of drilling a small hole, shallow enough so that the tube vacuum shall not be lost, placing the welded thermocouple junction therein, and then peening the edges of the hole so as to hold the thermocouple firmly in place. Good electrical continuity between the thermocouple and the metal area in close proximity shall be demonstrated before the cooling test can be performed.

6/ An infinite baffle system as shown on figure 2, or equivalent, shall be used. Airflow shall be as follows: Type 7580W, 3.8 cfm at sea level; Type 8930, 6.0 cfm at sea level. The static pressure drop is measured across the tube and socket, with an air director (chimney) in place, to direct the total airflow through the anode cooler assembly of the tube under test (TUT).

7/ During the performance of life test (2), the rf grid driving voltage and the bias voltage shall be monitored and held constant. The bias voltage shall be adjusted to produce the specified value of Ibo and the rf drive shall be adjusted to produce the specified anode current of 250 mA dc during an initial adjustment period not to exceed 4 hours. In no case shall the grid be driven positive with respect to the cathode as indicated by a grid current of 50 μA dc maximum. At the conclusion of the life-test period, the change in anode current from the initial value (ΔIb), and the power output (Po) shall be noted and the tube shall meet the listed requirements for these parameters. Prior to the performance of life test (2), the tube shall have met the requirements of the linear amplifier power output and distortion test. A record shall be kept of the bias voltage used to produce the specified Ibo and the amplitude of the two-tone driving signal used in the distortion test initially, and when life test (2) is completed, the third and fifth IM distortion shall again be measured, using this same value of bias voltage (irrespective of the value of Ibo this voltage may produce) and this same value of drive signal, and the tube shall meet the listed end-point requirements.

8/ No other voltages shall be applied except for the test value shown. The test voltage, with the indicated polarity, shall be held for 30 seconds minimum, with no apparent arcing and a leakage current not to exceed the limit shown (see figure 4).

9/ Tube type 8930 is produced by using a larger diameter cooler on the basic 7580W tube which has met all the requirements listed herein. After replacement with the larger cooler, the 8930 tube shall meet the additional requirements as specified herein.

10/ The leakage current reading shall be taken during the 3 minutes immediately following the required 2-minute warmup period.

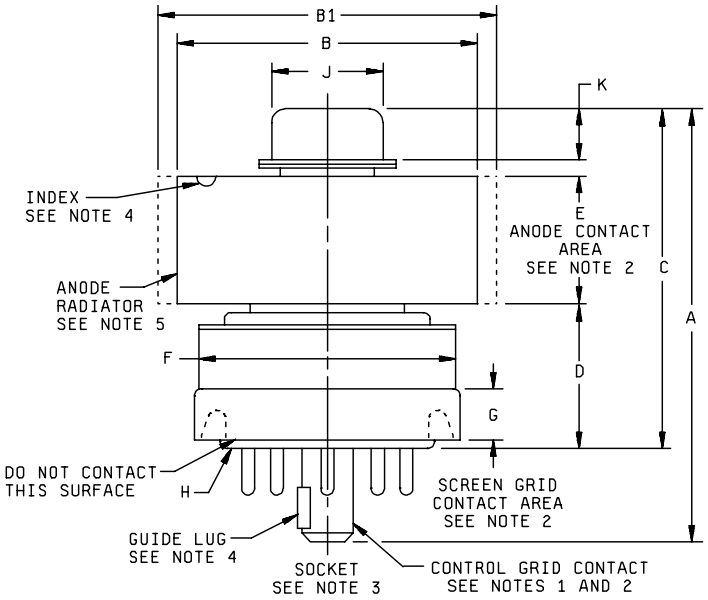
11/ Circuit and cavity shall be in accordance with Drawing 223-JAN.

12/ Each TUT shall be subjected to one sweep cycle in each of the three axes X, Y, and Z. The X axis shall be defined as normal to a plane drawn through base pins No. 1 and 5. The Y axis shall be defined as normal to a plane drawn through base pins No. 3 and 7. One sweep cycle (28 to 2,000 and return to 28 Hz) shall be covered in 6 to 12 minutes. The specified voltages shall be applied during the test using the basic test circuit shown on figure 3. Tubes found to electrically oscillate for causes other than vibration shall not be tested nor rejected on this test. Each tube shall be vibrated for 60 seconds at the frequency which gives the maximum vibration (noise) output voltage in each of the three axes. If at the end of the 60 seconds the vibration output voltage is increasing, the vibration shall be continued until there is no further increase. The tubes shall not show noise-voltage output in excess of the maximum limit specified, except one intermittent short per tube shall be allowable during this test. In addition to reading noise voltage output on the HP400D, or equivalent, a permanent recording shall be made using a good-quality recorder to produce a plot of noise voltage versus frequency. Noise-voltage amplifiers used with the recorder shall have a ± 1 dB frequency response over the range to be measured and the overall recording equipment shall be capable of fast response in order to show sharp noise voltage spikes resulting from internal tube resonances or other phenomena. Prominent noise peaks indicated on the recording shall be individually investigated by fixed-frequency operation, and the 60-second operation shall be made at the frequency of highest noise as so selected. Frequency at the extremes of the sweep shall be read with an accuracy of ± 1 Hz below 100 Hz and 1 percent above 100Hz.

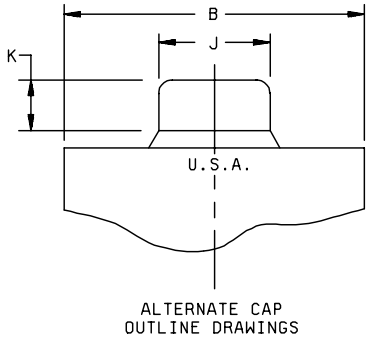
13/ The tube shall be subjected to the specified acceleration in the X, Y, and Z axes, with six shocks in each axis. Tubes showing any permanent shorts, or more than one temporary short during the test, shall be rejected. The applied shock shall be an approximate half-sine wave motion with duration measured at the zero axis level.

14/ This test is to be the first test performed at the conclusion of the holding period.

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



PIN CONNECTIONS	
PIN NO.	ELEMENT
1	g2
2	k
3	h
4	k
5	int con
6	k
7	h
8	k
CENTER POST	g1
RADIATOR	a
BASE RING	g2

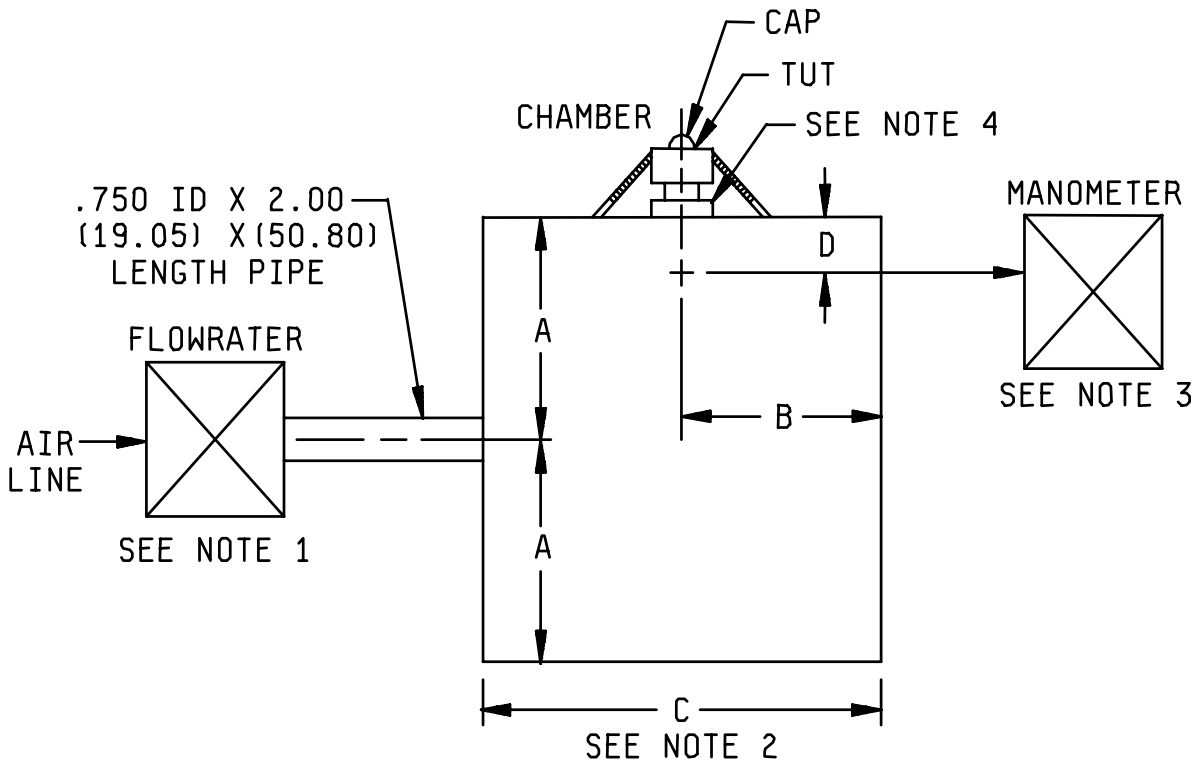


ALTERNATE CAP
OUTLINE DRAWINGS

Ltr	Dimensions				Tube type
	Inches		Millimeters		
	Min	Max	Min	Max	
Conformance inspection, part 2					
A	2.324	2.464	59.03	62.59	Both
C	1.810	1.910	45.97	48.51	Both
Conformance inspection, part 3 (see note 6)					
B	1.610	1.640	40.89	41.66	7580W
B1	2.050	2.080	52.07	52.83	8930
D	.750	.810	19.05	20.57	Both
E	.710	.790	18.03	20.07	Both
F	---	1.406	---	35.71	Both
G	.187	---	4.75	---	Both
H	Base: B8: 236 (EIA) (see note 1)				Both
J	.559	.573	14.20	14.55	Both
K	.240	---	6.10	---	Both

NOTES:
1. Pin alignment shall be checked by means of JEDEC gauge GB8-3. Dimensions of control-grid contact shall be inspected by means of gauge specified on Drawing 246-JAN and shall be conformance inspection, part 2.
2. Alignment of anode, screen-grid, and control-grid contact surfaces shall be determined by means of gauge specified on Drawing 168-JAN. Conformance inspection, part 2, shall apply. (Applies to tube type 7580W).
3. Air system socket shall be as specified on Drawing 246-JAN.
4. Location of guide lug of control-grid contact shall be referenced by a notch or arrow on the anode radiator in position shown.
5. Anode clamping shall be confined to anode radiator.
6. Dimensions shall be checked yearly. An accept on zero defect sampling plan shall be used, with sample of three tubes with an acceptance number of zero. In the event of failure, the test will be made as a part of conformance inspection, part 2, acceptance level 6.5 (see 15/). The yearly sampling plan may be reinstated after three consecutive samples have been accepted.

FIGURE 1. Outline drawing of electron tube types 7580W and 8930.



Ltr	Dimension			
	Inches		Millimeters	
	Min	Max	Min	Max
A	5.95	6.05	151.1	153.7
B	5.95	6.05	151.1	153.7
C	11.95	12.05	303.5	306.1
D	1.95	2.05	49.5	52.1

NOTES:
1. Fischer-Porter Flowrater Model B4-27-10/77, or equivalent.
2. Twelve-inch cube inside dimensions, compound sealed.
3. F. W. Dwyer Manometer, 0 to 1 inch of water (Fischer Scientific Company 11-295-5 draft gauge, or equivalent.
4. Socket shown on Drawing 246-JAN.
5. Dimensions are in inches.
6. Metric equivalents are based upon 1.00 inch = 25.4 mm.

FIGURE 2. Block diagram.

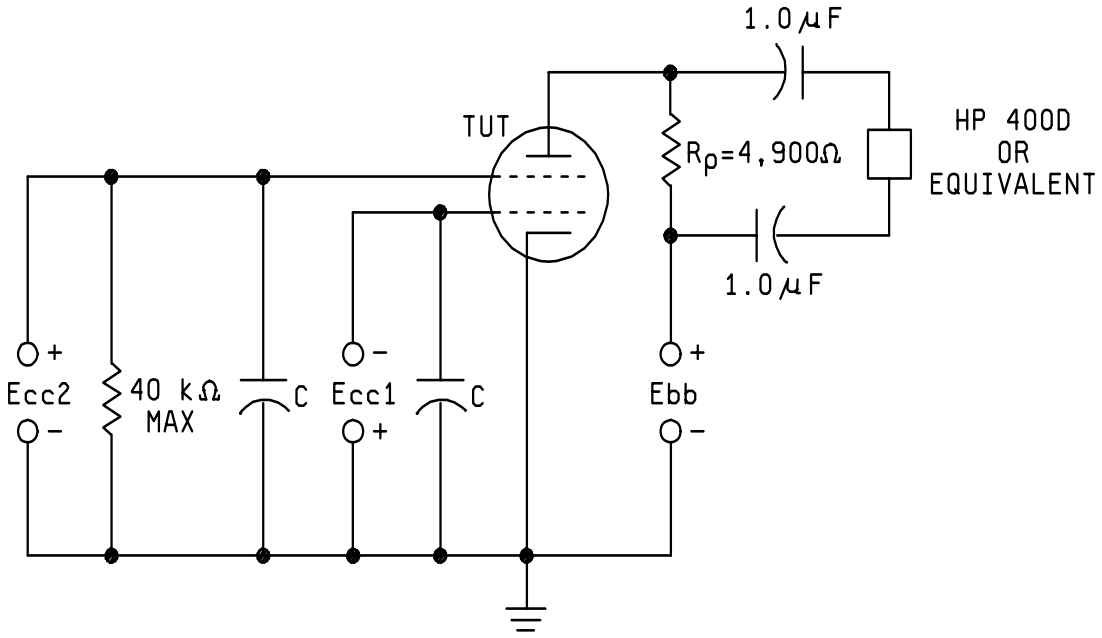


FIGURE 3. Basic test circuit for vibration test (noise).

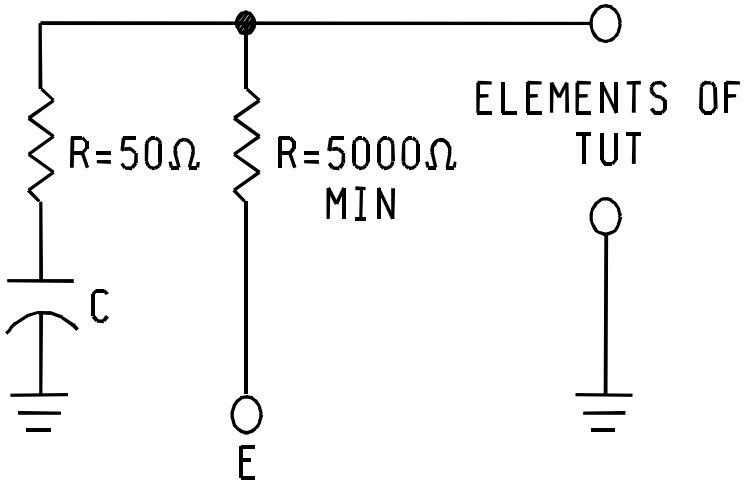


FIGURE 4. Basic test circuit for interelement leakage test.

NOTES

Referenced documents. In addition to MIL-PRF-1, this specification sheet sheet references MIL-STD-1311, Drawing 246-JAN, Drawing 168-JAN, and Drawing 223-JAN.

Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

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

Preparing activity:
DLA - CC

(Project 5960-3739)

Review activities:
Navy - AS, CG, MC, OS
Air Force - 99

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