

MILITARY SPECIFICATION

TUBE, ELECTRON, TYPE USAF KU-54

1. SCOPE

1.1 This specification covers a Hydrogen Thyatron Tube; designated Type USAF KU-54.

2. APPLICABLE SPECIFICATIONS AND STANDARDS

2.1 The following specifications, and standard, of the issue in effect on the date of invitation for bids, shall form a part of this specification to the extent specified herein:

SPECIFICATIONS

Military

MIL-E-1

Electron Tubes

STANDARD

Military

MIL-STD-129

Marking of Shipments

(Copies of specifications and standard required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 General. - The requirements in Specification MIL-E-1 are applicable as requirements of this specification with the following additions or exceptions to Specification MIL-E-1 as identified by the similarity of paragraph headings. Where the requirements of the general specification and this specification conflict, the requirements of this specification shall govern.

3.2 Characteristics. - The Electron Tube shall have the following ratings:

Ratings	Ef	opy	opx	Eob	ogy	ogy	Ec	ib	Ib
Absolute	Vac.	kv	kv	kVdc	v	v	Vdc	a	Aac
Maximum:	6.3 (5%)	25.0	25.0	---	---	650	---	1000	1.0
		(Note 15)	(Note 1)						

Minimum: --- 10.0 5% opy 5.0 (Note 2) --- --- ---

Test Cond.: 6.3 25.0 --- --- 550 --- 0 --- ---

Ratings:	Cooling	opy x prr x ib	tk	TA	dt	Reservoir (Ef)
Absolute	---	---	sec.	°C	a/us	Vac
Maximum:	Note 3	9.0 x 10 <sup>9</sup>	---	75	4500	5.5 (Note 4)
Minimum:	---	---	900	-55	---	2.5

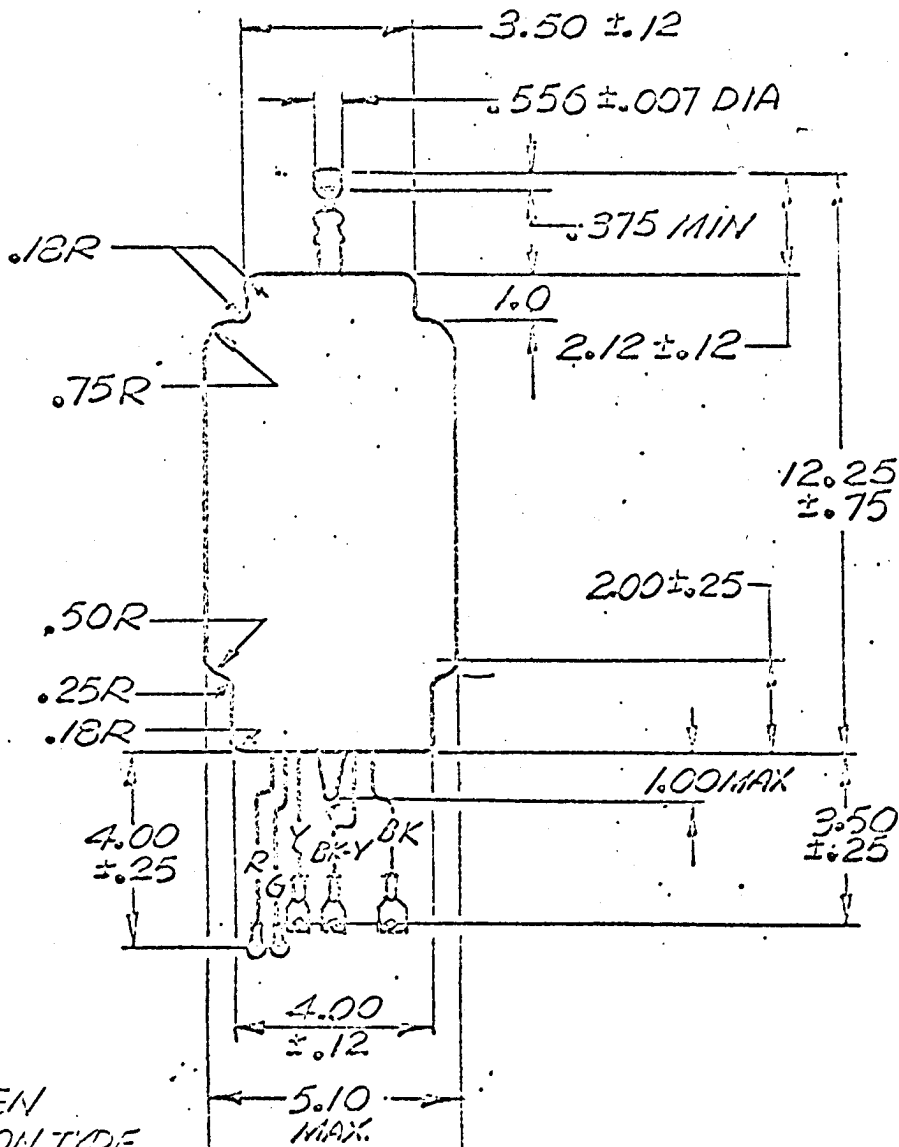
Test Cond.: --- --- 900 (Note 5)

\*\*Base: Per Outline, Figure 1      \*\*Cathode: Unipotential, tied to  
 \* Lead Connections: Per Outline      Midpoint of Heater  
 Mounting Position: Vertical Only, Base Down      \*\*Dimensions: Per Outline, Figure 1

4. SAMPLING, INSPECTION AND TEST PROCEDURES

4.1 General. - The sampling, inspection and test procedures specified in Specification MIL-E-1 are applicable as sampling, inspection and test procedures of this specification with the following additions or exceptions to Specification MIL-E-1 as identified by the similarity of paragraph headings:

Ref.	Test	Conditions	Min.	Max.
4.2	Qualification Approval:	Required		
3.7	Marking of Tubes:	Tubes shall be marked USAF KU-54		
4.5	Holding Period:	T-96 hours		
4.9.18.1.6	Drop:			
4.10.2	Cathode Heater Current:		If: 25.0	33.0 Aac
4.10.8	Reservoir Heater Current:	Eros=4.5Vac	Iros: 3.0	6.0 Aac
---	Instantaneous Starting:	opy=18kv (min) Notes 6 and 13	---	---
4.10.17.2	EC Anode Voltage:	Notes 6 and 11	Ebb: ---	4000 Vdc



HYDROGEN  
 THYRATRON TYPE  
 YELLOW: HEATER  
 BLACK-YEL: HEATER-  
 RESERVOIR  
 BLACK: CATHODE  
 RED: RESERVOIR  
 GREEN: GRID

DIMENSIONS ARE  
 IN INCHES

SCALE:  $\frac{1}{4}$  SIZE

- 3- RESERVOIR CONNECTED TO HEATER INTERNALLY
- 2- CENTER TAP CONNECTED TO CATHODE INTERNALLY
- 1- FLEXIBLE LEADS & LUGS AS PER NOTE 16.

FIGURE 1. ELECTRON TUBE TYPE USAF KU-54

Ref.	Test	Conditions	Min.	Max.
---	① Operation (1):	epy=25.0kv; prr=360pps (min); Note 6	egy: ---	550 v
---	*Anode Delay Time:	Operation (1) Note 12: t=120	tad: ---	1.0 us
---	*Anode Delay Time Drift:	Anode Delay Time; Note 14	Δ tad: ---	0.25 us
---	*Time Jitter:	Operation (1) except epy=8kv; Note 7	tj: ---	0.01 us
---	Operation (2):	Note 10; t=10 minutes prr= 1500 pps	egy: ---	550 v
---	Reservoir Voltage (2):	Operation (2); Note 4	Eres: 2.5	5.5 Vac
---	**Operation (3)	TA=75°C; t=5.0 hrs; Note 6; prr=360pps	egy	--- 550 v
4.10.24	Emission	ik=1500a; tp=5.0 us ±10% prr=60pps ±10%; tr=0.5us Max; Note 9	egk: ---	400 v
4.11	Life Test	Group ③; Operation (2) Note 8	t: 500	---hrs.
4.11.4	Life Test End Point	Operation (2) Note 17 DC Anode Voltage Time Jitter	egy: --- Ebb: --- tj: ---	700 v 1500 Vdc 0.02 us

Note 1: In pulsed operation, the peak inverse voltage, exclusive of a spike of .05 us max. duration, shall not exceed 5.0 kv during the first 25 us following the anode pulse.

Note 2: The Driver pulse, measured at tube socket with thyratron grid disconnected: 700 volts (min); tr=0.20 us (max) between 225 and 675 volts point; grid pulse duration 1.0 microsecond (min). Impedance of drive circuit 40 to 200 ohms.

Note 3: Cooling of the anode lead is permissible, but there shall be no air blast directly on the bulb.

Note 4: The optimum reservoir voltage for operation in accordance with Operation (2) conditions is permanently inscribed on the (upper half) of the bulb of the tube and must be held to within ±5%. Applications involving other operating conditions will necessitate the redetermination of the optimum reservoir voltage.

Note 5: Adjust reservoir voltage to value indicated on tube within ±5%.

- Note 6: The tube shall be tested in the test circuit shown in Figure 2. Tests performed at repetition rates less than the resonant rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen under resonant charging conditions so that  $e_{py}=25kv$ ;  $i_b=1000a$  (min), rate of rise of current pulse ( $\frac{di}{dt}$ ) shall be  $1500a/us$  (min),  $t_p=2.5 \pm 0.25us$ ;  $prf=500$  pps (min).
- Grid pulse measured at tube socket with thyratron grid disconnected shall have the following conditions:  $t_r=.35us$ (min);  $t_p=2.0us$  (max). Internal impedance of driver: 250 ohms (min).
- The tube shall operate continuously for 30 minutes without evidence of arcbreak, or anode heating.
- Note 7: The tube shall be tested by applying a peak forward anode voltage not to exceed that specified in the test conditions for the Time Jitter test immediately after the cathode warm-up period ( $t_k$ ). The variation in firing time( $t_j$ ) shall be measured at 50% of the pulse amplitude and shall not be greater than the amount specified after 60 seconds of operation.
- Note 8: During every 96 hour period, the life test shall be shut off for 30 minutes (min).
- Note 9: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode not more than 2.5 us (max), after the beginning of the current pulse. The average voltage shall not rise during the last 4.0us. Plate Floating. As an alternate, the test may be conducted by connecting the grid to the plate through a one-ohm resistance, applying the positive pulse and reading  $e_{pk}$ . The limit for this reading will be the same as that for  $e_{pk}$  in Emission Test.
- Note 10: The anode circuit constants shall be so chosen that  $e_{py}=15kv$ ,  $i_b=500a$  (min) and rate of rise of current pulse ( $\frac{di}{dt}$ )  $=1500a/us$ (min),  $t_p=1.3us \pm 10\%$  (min),  $prf=150$  pps(min), and  $e_{px}=1.5kv$  (min). Grid pulse same as Note 6. Reservoir voltage shall be adjusted to optimum value for these test conditions. (The tube shall operate without evidence of arc back, or anode heating.) *add:*
- Note 11: This test shall be conducted within 60 seconds of the Operation (1) test.
- Note 12: Anode delay time ( $t_{ad}$ ): The time interval between the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.
- Note 13: This test shall be the first test performed after the holding period. The tube shall operate satisfactorily on push-button starting within 3 attempts when the anode voltage ( $e_{py}$ ) is applied to the tube under test in such a manner as to rise from 0 to 18kv(min) within 0.03 seconds. (The filter in the rectifier shall be designed so that the  $e_{py}$  reaches at least 9kv within 0.015 seconds.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 or more than 30 seconds. Any tube failing to start within three attempts will be considered a failure.

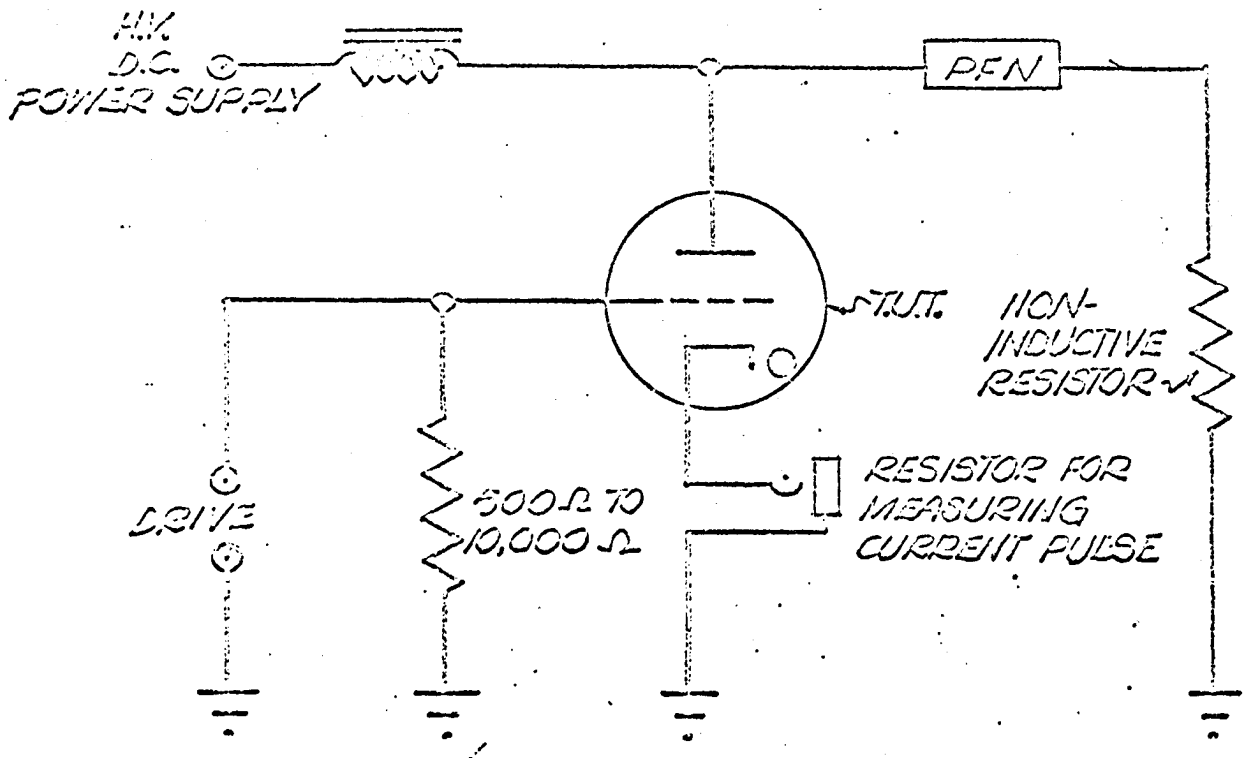


FIG. 2. TEST CIRCUIT

- Note 14: During interval between 2 minutes and 7 minutes of the Anode Delay Time test, the change in Anode Delay Time ( $\Delta$ , tad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.
- Note 15: Instantaneous starting is not recommended. When it is absolutely necessary, however, the maximum permissible  $e_{pr}$  is 18.0 kv and shall not be attained in less than 0.04 seconds.
- Note 16: The heater-reservoir lead shall be terminated in a 70 ampere soldering lug with a 1/4 inch screw hole. The other heater and the cathode lead shall be terminated in a 50 ampere soldering lug with a 3/16 inch hole. Reservoir and grid leads shall be terminated in 25 ampere soldering lugs with 3/16 inch screw holes. The lugs shall be permanently identified with symbols as follows: "G"--Grid, "X"--Cathode, "H"--Heater, and "R"--Reservoir. For lead length, see outline drawing, Figure 1.
- Note 17: Evidence of anode color at the end of Operation (1) life test end point check shall not be cause for rejection.

## 5. PREPARATION FOR DELIVERY

5.1 The electron tube shall be prepared for delivery in accordance with Specification MIL-E-1 and as follows:

5.1.1 Marking of Shipment. - Interior packages and exterior shipping containers shall be marked in accordance with Standard MIL-STD-129. The nomenclature shall include the following:

Tube, Electron, Type USAF, KU-54  
Specification MIL-T-4623 (USAF)

## 6. NOTES

6.1 Use - The electron tube covered by this specification is intended for pulsed switch tube applications.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacturer, use or sell any patented invention that may in any way be related thereto.