MILITARY SPECIFICATION SHEET

ELECTRON TUBE, THYRATRON

[redacted]

The complete requirements for procuring the electron tube described herein shall consist of this document and the latest issue of MIL-E-1.

DESCRIPTION: Hydrogen thyratron with reservoir, ceramic.

DIMENSIONS AND CONNECTIONS: See figure 1.

MOUNTING POSITION: Any

ABSOLUTE RATINGS:

Parameter:	Ef	epy	epx	Ebb	egy	egx	ib	Ecc	Ip
Unit:	Vac	kv	kv	kVdc	V	V	a	Vdc	A
Maximum:	6.8	12.0 (Note 1)	12.0 (Note 2)	---	600 (Note 3)	200	350	150	5.0 (Note 4)
Minimum:	5.8	---	5% epy	0.3	175	---	---	---	---
TEST CONDITIONS:	6.3	12.0	---	---	150	---	---	---	---

ABSOLUTE RATINGS:

Parameter:	Ib	prr	Eres	Pb	tk	$\frac{dik}{dt}$	TA	tj	Cooling
Unit:	Adc	pps	Vac	--	sec	a/us	°C	us	---
Maximum:	0.2	(Note 5)	6.8	4.0×10^9 (Note 5)	---	2,000	+150	(Note 7) .005	(Note 6)
Minimum:	---	---	5.8	---	180	---	-55	---	---
TEST CONDITIONS:	---	1500	6.3	---	180	---	---	---	---

REQUIREMENT OR TEST:

GENERAL

3.2 Qualification - Required (Note 14) E-50.2 Holding period (t = 96 hrs.)

Section 5 Preparation for delivery

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FSC 5960

METHOD OR PARA.	REQUIREMENT OR TEST	CONDITIONS	SYMBOL	LIMITS MIN.	LIMITS MAX.	UNITS
	Quality conformance inspection, part 1 (Note 20)					
Appendix D, 20(a), 30	Visual and mechanical inspection criteria					
3241	Heater current (cathode)		If	3.5	7.0	Aac
3241	Heater current (reservoir)		Ires	1.0	2.5	Aac
3267	Instantaneous starting	epy = 12kv(min) Ef = Eres = 6.8Vac (Notes 9 and 10)	—	—	—	—
—	Critical anode voltage for conduction	Ef = Eres = 5.8Vac (Notes 9 and 11)	Ebb	—	300	Vdc
—	Operation (1)	epy = 14.0kv Ef = Eres = 5.8Vac (Notes 9, 12 and 13)	egy	—	150	v
—	Operation (1A)	Operation (1) Ef = Eres = 6.8Vac	egy	—	150	v
3251	Emission	ik = 350a tp = 5.0 us ± 10% prr = 60pps ± 10% tr = 0.5us max. (Note 18)	egk	—	200	v
	Quality conformance inspection, part 2					
3256	Anode delay time	Operation(1) t = 120	tad	—	0.5	us
3256	Anode delay time drift	Anode delay time (Note 15)	Δtad	—	0.10	us
3261	Time jitter	Operation(1) except epy = 3 kv (Note 16)	tj	—	0.005	us
	Quality conformance inspection, part 3					
4.7	Life test	Group C (Notes 9, 19, 21 and 22)	t	500	—	hrs.
4.7.3	Life test end points	Operation(1) and (1A) DC Anode voltage egy = 150v Time jitter egy = 150v	egy Ebb tj	— —	150 1000 0.005	v v us
4.1.1.2	Periodic-check tests					
1031	Vibration	(0 to 2000 Hz) (Note 8)				
1041	Shock	100 G				
—	Post Vibration and Shock end points	Operation(1) DC Anode voltage Time jitter	egy Ebb tj	— — —	150 300 0.005	v Vdc us
—	Operation (2)	TA = 150°C t = 5 hours (Notes 9 and 17)	egy	—	150	v

NOTES:

1. Instantaneous starting is permissible. The maximum permissible instantaneously applied epy is 8.0kv and shall not be attained in less than 0.04 seconds. The epy may then be raised to full rating.

2. In pulse operation, the peak inverse voltage, exclusive of a spike of 0.05us maximum duration, shall not exceed 2.0kv during the first 25us following the anode pulse.

3. The driver pulse, measured at tube socket with thyratron grid disconnected shall have the following characteristics: 175 volts minimum; 600 volts maximum; tr = 0.35us maximum; tp = 2.0us minimum, impedance of drive circuit = 1500 ohms maximum. At -55°C, 250V minimum shall be required.

4. For hydrogen thyratron applications, Ip shall be computed as the square root of the product of Ib x ib.

5. The tube is capable of operation of over 50,000pps within the limitations of the Pb and Ib current ratings. With a saturable reactor, Pb equal to to 4×10^9 is permissible for certain applications.

6. It may be desirable to employ forced air cooling under conditions of high Pb number operations. A cooling air blast of 5 cfm may be directed into the anode cup.

7. Appreciably less jitter than 0.005us can be realized if the anode voltage is 3kv or more, grid drive amplitude is near the maximum and grid drive impedance is near minimum.

8. There shall be no pronounced resonance in the range from 0 to 2,000Hz.

9. The tube shall be tested in the test circuit shown on 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: epy = 14kv; ib = 150a minimum; dik/dt = 1500 a/us minimum; tp = 1.0 + 10 percent; prr = 1,000pps minimum.

   WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltage and repetition rates for each test are specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be.

   Grid pulse, as measured at tube socket with thyratron grid disconnected, shall have the following characteristics: t_r = 0.35 us minimum; tp = 2.0 us maximum. The internal impedance of driver shall be 500 ohms minimum.

10. The tube shall operate satisfactorily on push-button starting within three attempts when the anode voltage (epy) is applied to the tube under test in such a manner as to rise from 0 to 8 kv minimum within 0.03 seconds. (The filter in the rectifier shall be designed so that the epy reaches at least 4 kv within 0.015 second.)

11. This test shall be conducted within 60 seconds of the Operation (1) test.

12. The tube shall operate continuously for 10 minutes.

13. There shall be no evidence of arcback or detrimental anode heating during this test.

14. The activity responsible for the Qualified Products List is the Naval Electronics Systems Command, Department of the Navy, Washington, D.C. 20360, and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6". (Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.)

NOTES: (Continued)

15. This test shall be performed simultaneously with the Operation (1) test. An anode delay time measurement shall be made at the end of 2 and 10 minutes of the Operation (1) test. The change in anode delay time (with respect to the 2 minute reading) shall not exceed the specified value at any time during this test.

16. 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 (tk). The variation in firing time (tj) shall not be greater than the amount specified after 60 seconds of operation.

17. This test shall be conducted for a total of 5 consecutive hours with no more than 3 kickouts and with no evidence of detrimental anode heating. The tube shall be started with Eres 107-1/2 percent Vac and operate at this value for 4 hours. At the start of the fifth hour, and while the tube is still operating, the filament voltage shall be lowered to Eres = 92-1/2 percent Vac and remain there for the final hour of operation.

18. 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 after the beginning of the current pulse. The average voltage shall not increase after the voltage measurement point. 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 epk. The limit for the reading will be the same as that for egk in emission test.

19. During every 96-hour life test period, the life test shall be shut off for 60 minutes, minimum, and then checked for life test end points.

20. The AQL for the combined defectives for attributes in Quality conformance inspection, part 1 excluding inoperatives and mechancial, shall be 1 percent.

21. Where production is less than 50 tubes per month, life test sample size shall be one tube per month.

22. Where the month's production to be sampled is less than 250 units, the following alternative sampling procedure may be used:

$N_1 = 2$ $\quad C_1 = 0$

$N_2 = 2$ $\quad C_2 = 1$

except that $C_1 = 1$ if the first samples from the preceding lot contained no defectives.

Where:

N_1 is size of first sample

N_2 is size of second sample

C_1 is allowable failures in first sample

C_2 is total allowable failures for first and second sample.

Preparing activity:

Navy - EC

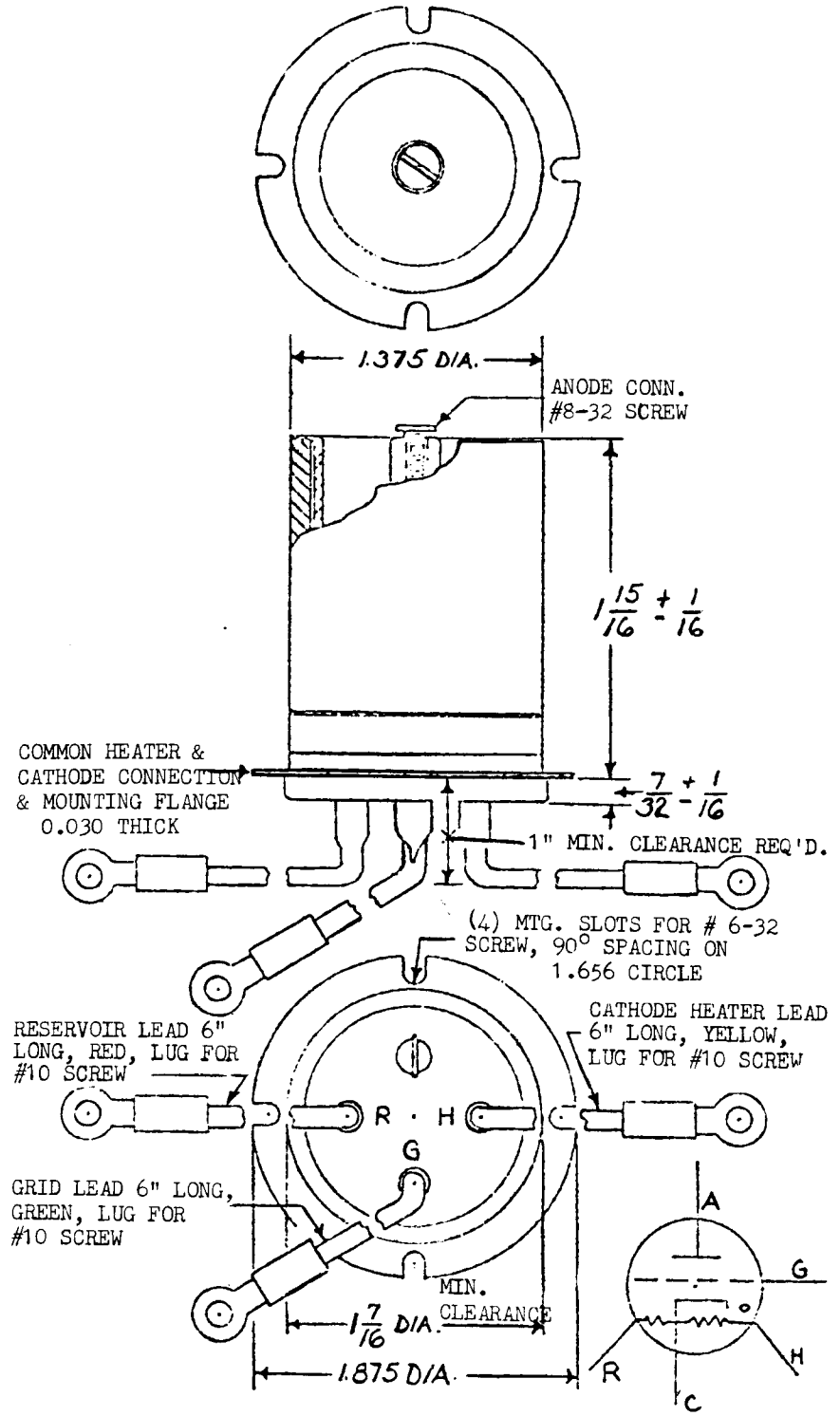
(Project 5960-N732(NAVY))

Review activities:

Navy - EC, SH

User activities:

Navy - AS, OS, MC, CC



NOTE:
Unless otherwise specified, tolerances shall be as follows:
Decimals ± .005; Fractions ± 1/64; Angles ± ½ degree.

Figure 1 Outline drawing of electron tube, type 7782.

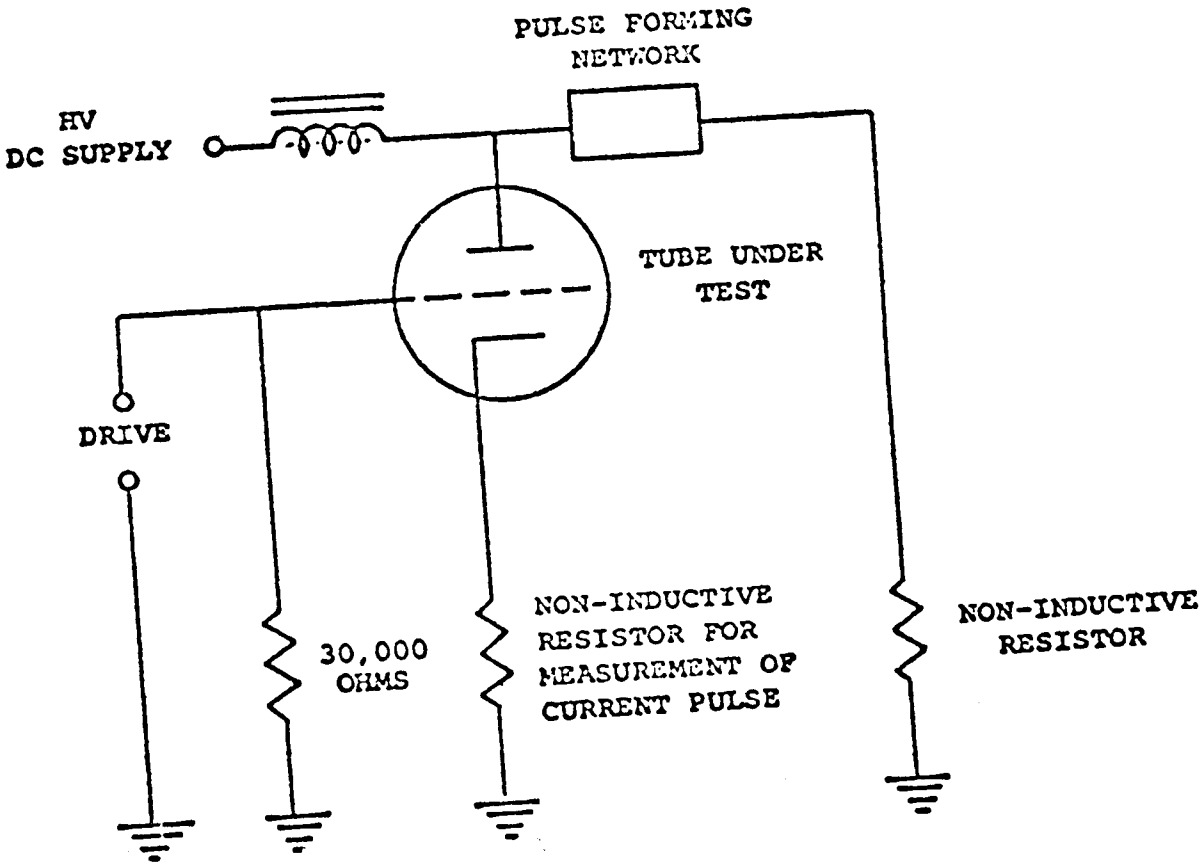


Figure 2 - Test circuit.

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