

PERFORMANCE SPECIFICATION SHEET

ELECTRON TUBE, POWER
TYPE 8116

This specification is approved for use by Naval Electronic Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

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

DESCRIPTION: Double tetrode
See figure 1
Mounting position - - - Vertical, base up or down; horizontal with anode pins in a horizontal plane.
Weight - - - - - 2.5 ounces nominal (70.9 grams)

ABSOLUTE RATINGS:

Parameter:	Ef	F	Eb	Ec1	Ec2	Ehk	Ib	Ic1
Unit:	V ac	MHz	V dc	V dc	V dc	V dc	mA dc	mA dc
Maximum: AB, SSB (Note 2)	13.25/26.5 ±10%	30	1,000	-175	360	±100	220	10
Test Conditions:	13.25/26.5	- - -	600	Adj	250	0	40	- - -

ABSOLUTE RATINGS:

Parameter:	Pg1	Pg2	Pp	Pi	T	tk
Unit:	W	W	W	W	°C (Note 3)	sec (min)
Maximum: AB, SSB (Note 2)	2x1	7	2x30	200	- - -	30
Test Conditions:	- - -	- - -	- - -	- - -	- - -	120

GENERAL:

Qualification - Not required

Table 1. Testing and Inspection.

Inspection	Method	Notes	Conditions	Acceptance Level	Inspection Level or Code	Symbol	Limit Min	Limit Max	Unit
<u>Conformance inspection, part 1</u>									
Peak emission	1231	5, 6	eb = ec1 = ec2 = 225 v	1.0	II	is	1.5	- - -	a
Electrode current (screen)	1256	5		1.0	II	Ic2	- - -	6.0	mA dc
Electrode voltage (1) (grid)	1261	5		1.0	II	EC1	-25	-35	V dc
Total grid current	1266	1, 5	Ib = 60 mA dc; t = 180	1.0	II	Ic1	- - -	-6.0	μA dc
Heater current	1301	-	If = 13.25 V; t = 300	1.0	II	If	760	1,260	mA ac
Short and discontinuity detection	1201	-		0.65	II	- - -	- - -	- - -	- - -
<u>Conformance inspection, part 2</u>									
Low-frequency vibration	1031	5	Ec1/Ib = 10 mA dc; Eb = 250 V dc; Rp = 2,000 ohms					2,000	mV ac
Bump	1036	-	Angle = 30°						
Electrode voltage (2) (grid)	1261	9				Ec1	-40	-52	V dc
Electrode current (anode)	1256	5	Ec1 = -85 V dc			Ib		10	μA dc
Power output (1)	- - -	3, 4 8, 10	Paralleled operation class AB1 amplifier; Ef = 26.5 V ac; F = 15 MHz (max); Eb = 1,000 V dc; Ec1/Ib = 55 mA dc; Ec2 = 270 V dc; Ic2 = 30 mA dc (max)			Po	130	- - -	W (useful)
Power output (2)	-	-	After 5 minutes, power output (1)			ΔPo t		10 15	%
Power output (3)	-	-	Ef = 23.9 V ac; power output (1)			ΔPo Ef		0.080 11.8	%
Direct-interelectrode capacitance	1331	7				Cgp Cin Cout	0.050 9.4 2.6	3.7	pF pF pF

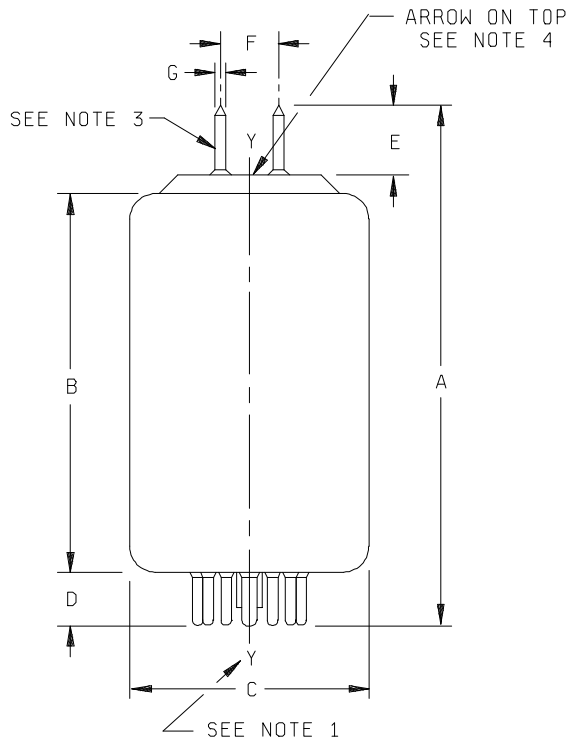
See notes at end of Table I.

Table 1. Testing and Inspection. -Continued.

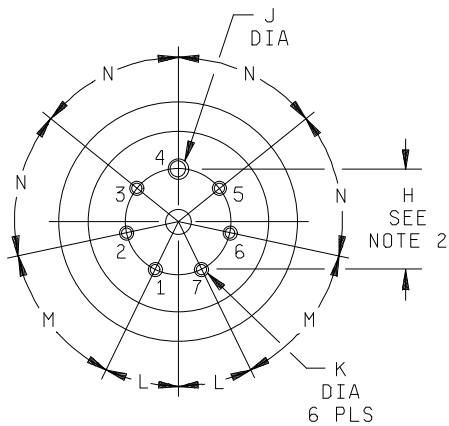
Inspection	Method	Notes	Conditions	Acceptance Level	Inspection Level or Code	Symbol	Limit Min	Limit Max	Unit
<u>Conformance inspection, part 3</u>									
Life test	---	3, 8	Group C; power output (1); t = 500 hours except; Ec1/Ib = 50 mA dc; Ec2 = 250 V dc	---	---	---	---	---	---
Lift-test end points:	---			---	---				
Peak emission	1231	-		---	---	is	1.1	---	a
Power output (1)	---	-				Po	120	---	W (useful)
Electrode current (grid)	1256	-		---	---	Ic1	---	-100	μA dc
Vibration	1031	11	F = 50 Hz; t = 900; no voltages	---	---	---	---	---	---

NOTES:

1. This test is to be the first test performed at the conclusion of the holding period.
2. Class AB linear RF amplifier single sideband suppressed carrier operation, both sections in parallel.
3. Maximum glass and seal temperature shall be 250°C. When operating the tube at maximum ratings, with forced air cooling, it is necessary to cool both the lateral bulb surface as well as the anode pin seals by directing the flow of air toward the top and sides of the bulb. In most cases, approximately 20 cfm is sufficient. At reduced ratings, the use of heat sink is permissible. However, regardless of the type of cooling being used, the degree of cooling shall be determined by direct temperature measurement of both the seals and the bulb.
4. Power output is total power at drive frequency delivered to load. Drive power is not subtracted from total output. Output circuit tuned for maximum power output.
5. Read each unit separately. Grid (1) of section not under test shall be connected to -100 V dc.
6. Tie both anodes and the screen together. The pulse duration measured at 5 percent of the maximum value shall not be less than 3 μs. At 50 percent amplitude, the duration shall be less than 2 μs. The applied voltage shall have a maximum repetition rate such that the duty cycle, based on the pulse length measured at 50 percent amplitude, shall not exceed 0.0002 (0.02 percent).
7. The test shall be duplicated on each unit separately. The unit not under test shall be tied to ground. Shielding shall be in accordance with figure 2.
8. Operation as class "AB1" amplifier, Q = 10 minimum. Power output is total power at drive frequency delivered to load. Drive power is not subtracted from total output. Output circuit tuned for maximum power output. Drive to true "0" bias point condition which shall be met after all tuning is completed.
9. Ef = 13.25, Eb = 800 V dc, Ec2 = 325 V dc, anodes and grids (1) in parallel, vary Ec1 for Ib = 45 mA dc (total, both sections).
10. These test conditions exceed the absolute maximum ratings and operation shall be limited to 5 minutes maximum "on" time followed by an "off" time of at least 5 minutes. Total "on" time for power output (1) plus power output (2) tests shall be limited to 5 minutes with power output (3) test requiring as short a time as possible beyond the 5 minutes to reach stabilization.
11. Vibration test shall be checked annually, using a sample of three tubes with no failures allowed. In case of a sample failure, the test shall become a part of conformance inspection, part 2, for three consecutive successful submissions, at which time the test may revert to the conformance inspection, part 3 test.



Dimensions in inches with metric equivalents (mm) in parentheses			
Ltr	Minimum	Maximum	Notes
Conformance inspection, part 2			5
A	3.594 (91.29)	4.031 (102.39)	
B	2.688 (68.28)	2.938 (74.63)	
C	1.710 (43.43)	1.800 (45.72)	
D	0.375 (9.53)	0.500 (12.70)	
E	0.531 (13.49)	0.594 (15.09)	
F	0.722 (18.34)	0.738 (18.75)	3
G	0.122 (3.10)	0.128 (3.25)	
K	0.052 (1.32)	0.060 (1.52)	
Reference dimensions			
H	1.000 (25.40)		2
J	0.125 (3.18)		
L	26°		
M	52°		
N	51°		



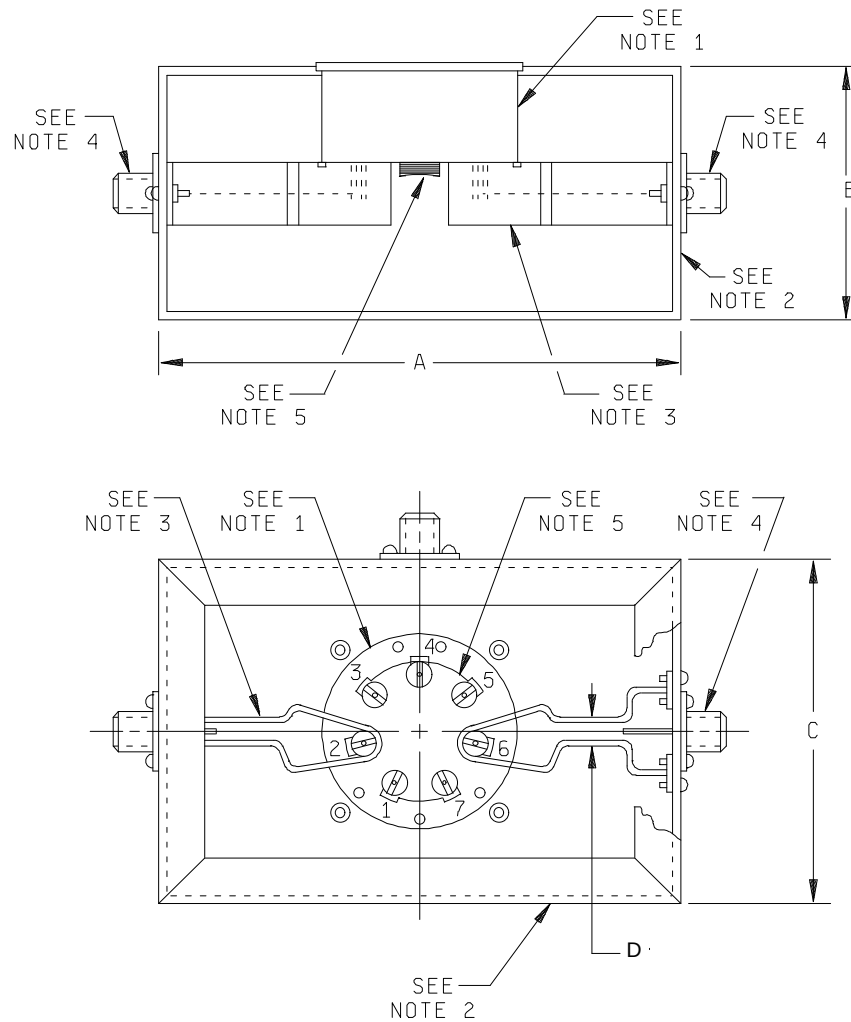
Pin connections	
Pin No.	Element
1	h
2	2g1
3	g2
4	k
5	hct
6	1g1
7	h

FIGURE 1. Outline drawing of electron tube type 8116.

NOTES:

1. The axis Y - Y is defined as the axis of the base pin gage described in note 2.
2. The tube base shall be capable of entering to a distance of 0.375 (9.53 mm) a flat plate gage having six holes 0.0800 (2.03 mm) ± 0.0005 (0.01 mm) and one hole 0.1450 (3.68 mm) ± 0.0005 (0.01mm), all arranged on a 1.0000 (25.40mm) ± 0.0005 (0.1 mm) circle at the angles $\pm 5^\circ$ specified on the outline. A 0.500 (12.70mm) ± 0.010 (0.25mm) diameter hole at the center of the pin circle shall also be required. The axis Y - Y is defined by the center of this hole.
3. The anode leads shall be capable of entering a flat plate gage of 0.375 (9.53 mm) ± 0.001 (0.03 mm) thickness having two holes 0.2000 (5.08 mm) ± 0.0005 (0.01 mm) diameter spaced 0.365 (9.27 mm) ± 0.001 (0.03 mm) from a point coincident with the axis Y - Y. The axes of the holes shall be parallel to axis Y - Y and the plane of these axes shall be 90 degrees $\pm 5^\circ$ from the plane through axis Y - Y and pin No. 4.
4. Location of large base pin shall be referenced by an arrow in the top stem.
5. Tubes shall be inserted in jig shown on figure 3. Tubes that do not fit in the jig shall be rejected.

FIGURE 1. Outline drawing of electron tube type 8116 - Continued.



Ltr	Dimensions in inches with metric equivalents (mm) in parentheses.
A	6.00 (152.40)
B	3.00 (76.20)
C	4.00 (101.60)
D	0.250 (6.35)

NOTES:

1. Septar tube socket (7 pin) (Johnson No. 122-101-100 or equivalent).
2. Aluminum mounting box 6 (152.40 mm) x 4 (101.60 mm) x 3 (76.20 mm).
3. Copper shielding, 0.040 (1.02 mm) thick x 0.750 (19.05 mm) wide. (May be hand formed to shape.)
4. Female sockets for RF connectors (Amphenol S0-239 or equivalent).
5. Copper connection wire, AWG No. 20.
6. Metric equivalents are in parentheses.

FIGURE 2. Mounting box with 7 pin Septar socket, shielding, and connection lead.

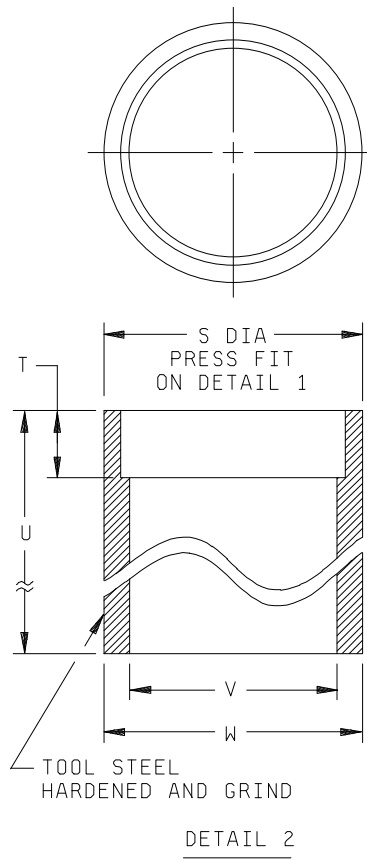
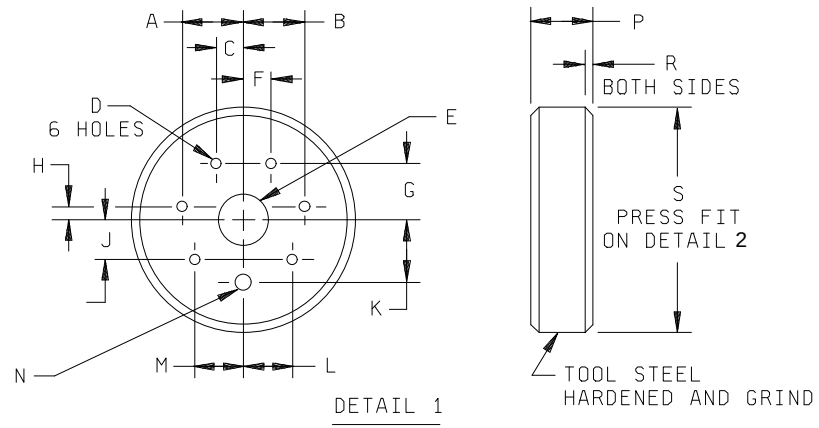


FIGURE 3. Outline gage for electron tube type 8116.

Dimension	A	B	C	D	E	F	G	H	J	K
INCHES	0.4891 ±0.0005	0.4891 ±0.0005	0.2192 ±0.0005	0.0800 ±0.0005 DIA (6 holes)	0.500 DIA	0.2192 ±0.0005	0.4494 ±0.0005	0.1039 ±0.0005	0.3147 ±0.0005	0.5000 ±0.0005
MM	12.42 ±0.01	12.42 ±0.01	5.57 ±0.01	2.03 ±0.01	12.70	5.57 ±0.01	11.41 ±0.01	2.64 ±0.01	7.99 ±0.01	12.70 ±0.01

Dimension	L	M	N	P	R	S	T	U	V	W
INCHES	0.3886 ±0.0005	0.3886 ±0.0005	0.1450 ±0.0005 DIA	0.500 -0.003 +0.000	0.031 x 45° (Both sides)	1.875 DIA	0.500 +0.003 -0.000	3.500	1.800 +0.002 -0.000	2.000 DIA
MM	9.87 ±0.01	9.87 ±0.01	3.68 ±0.01 DIA	12.70 -0.08 +0.00	0.79 x 45° (Both sides)	47.63 DIA	12.70 +0.08 -0.00	88.90	45.72 +0.05 -0.00	50.80 DIA

NOTES:

1. Alternate method: May use standard drill bushing press fit in position.
2. Pin circle to be concentric to 1.875 (47.63 mm) dia within 0.002 (0.05 mm) TIR.
3. Dimension 1.875 (47.63 mm) to be concentric to 1.800 (45.72 mm) dia within 0.002 (0.05 mm) TIR.

FIGURE 3. Outline gage for electron tube type 8116. -Continued.

Custodians:
Navy - EC

Review activities:
Navy - AS, CG, MC, OS, SH

Preparing activity:
DLA - CC

Project (5960-3434)