MILITARY SPECIFICATION SHEET

ELECTRON TUBE, POWER

TYPE 8932 1/

This specification is approved for use by all Departments and Agencies of the Department of Defense.

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

DESCRIPTION: UHF, beam power tetrode, pulse amplifier, transmitting
See figure 1
Mounting position: Tube axis vertical, either end up
Weight: 38 pounds nominal

ABSOLUTE RATINGS:
(Anode pulsed amplifier, class B, see note 4)

Parameter: / Unit:	Ef Vac (see note 1)	ebb kv (see note 2)	Ebb kVdc	ec2 kv (see note 3)	Ec1 Vdc	ib a	Ib mAdc	ic1 a (see note 5)	Ic1 mAdc	ic2 a
On time = 15 μs										
Maximum:	1.05(dc) 1.05(60 Hz) 1.05(400 Hz)	45	---	2.2	-400	80	320	15	60	15
Minimum:	---	---	---	---	---	---	---	---	---	---
On time = 60 μs										
Maximum:	1.05(dc) 1.05(60 Hz) 1.05(400 Hz)	30	20	2.2	-400	60	1,200	5	90	5
Minimum:	---	---	---	---	---	---	---	---	---	---
TEST CONDITIONS:	---	---	---	---	---	---	---	---	---	---

ABSOLUTE RATINGS:
(Anode pulsed amplifier, class B, see note 4)

Parameter: / Unit:	Ic2 mAdc	Pi kW	Pp kW	tk sec (see note 6)	Cooling --- (see note 7)	Environmental requirements --- (see note 9)	Fl MHz	Fault protection (see note 10)	Duty ---	If(surge) A (see note 6)
On time = 15 μs										
Maximum:	60	16	14	---	---	---	550	---	0.004	550
Minimum:	---	---	---	90	---	---	---	---	---	---
On time = 60 μs										
Maximum:	90	16	14	---	---	---	550	---	0.02	550
Minimum:	---	---	---	90	---	---	---	---	---	---
TEST CONDITIONS:	---	---	---	---	Note 8	---	---	---	---	---

GENERAL:

Qualification - Required
Holding period - t = 96 hours

1/ Formerly identified as tube type 4666 (see note 29)

METHOD	REQUIREMENT OR TEST	NOTES	CONDITIONS	AQL (PERCENT DEFECTIVE)	INSPECTION LEVEL OR CODE	SYMBOL	LIMITS MIN	LIMITS MAX	UNIT
	Quality conformance inspection, part 1 -Continued								
---	Input resonant frequency	21		0.65	II	Fi	230	245	MHz
---	Output resonant frequency	21		0.65	II	Fo	240	245	MHz
	Quality conformance inspection, part 2								
1331	Direct-interelectrode capacitance	22	Use special shield adapter DESC Drawing No. 66060, or equivalent	---	---	Cg2k Cg1p	10,000 ---	18,000 0.15	pF pF
	Quality conformance inspection, part 3								
---	Life test	-	Group S	---	---	---	---	---	---
---	Initial life	1, 11, 13, 16, 17, 32	Ef = 0.95 V, 60 Hz; ebb = 30 kv; ec2 = 2 kv (max); Ec1 (note 16); pd/Ib = 165 mAdc; po = 750 kw (min); F = 225 ±15 MHz; t_p = 10 ±1 μs; prr = 300 ±5; specified life = 1,000 hours	---	---	---	---	---	---
---	Initial life-test end point:								
---	Peak power output	-	Initial life	---	---	po	750	---	kw
---	Multiple short life (1)	12, 33	Initial life except, po = 825 kw (min); t = 50 hours	---	---	---	---	---	---
---	Multiple short life-test end point (1):								
---	Peak power output	-		---	---	po	825	---	kw
	Periodic-check tests								
---	Vibration	23, 24		---	---	---	---	---	---
---	Shock	23, 25		---	---	---	---	---	---
---	Vibration and shock test end point:								
---	Peak power output	-		---	---	po	225	---	kw

NOTES: -Continued

8. The waterflow to the anode cooling connection shall be 8 $^{+1}_{-0}$ gpm. The minimum waterflow to the filament, filament-cathode, grid(1) cooling connections, shall be 0.5 gpm. Waterflow shall start before the application of any voltages, and shall be continued for at least 6 seconds after removal of all voltages. The outlet water temperature shall not exceed 70° C.

   Emergency conditions. Simultaneous interruption of cooling pump and tube electrode power is permissible.

9. Environmental requirements.

External gas pressure (absolute) 1/	60 2/ psi (max)
Gage pressure at any inlet	100 psi (max)
Metal-surface temperature	100° C (max)
Ceramic-bushing temperature	150° C (max)
Outlet liquid temperature (any outlet) for water	70° C (max)
Storage temperature 3/	-65° C (min)

   1/ Absolute pressure is the sum of the atmospheric pressure and gage pressure.
   2/ This pressure is related to the output cavity pressurization as required to prevent corona or external flashover.
   3/ The tube coolant ducts shall be free of liquid before storage or shipment of the tube to prevent damage from freezing.

10. High-speed electronic protective devices shall be used to prevent energy from the anode-power supply, grid(1) power supply, and from the grid(2) power supply from permanently damaging the tube and its circuitry in the event of abnormal operation. A suitable high-speed electronic protective device shall be capable of deactivating the various pulse sources supplying the tube during the inter-pulse interval following the occurrence of a fault in any single pulse, and shall be capable of meeting the requirements of the aluminum foil simulated fault tests. Thus, all pulses subsequent to a "fault" pulse shall not be applied until the device is reset. (A fault is a condition in which the peak pulse currents rise 20 percent or more above the normal peak current level.) Additional protection against damage from an anode-to-grid(2) fault shall be provided to prevent the grid(2) voltage from rising to a value in excess of 3,000 volts during the fault pulse. Minimum reset time shall be 1 second.

11. This requirement shall be waived for manufacturers qualified to tube type 8932 (see note 29).

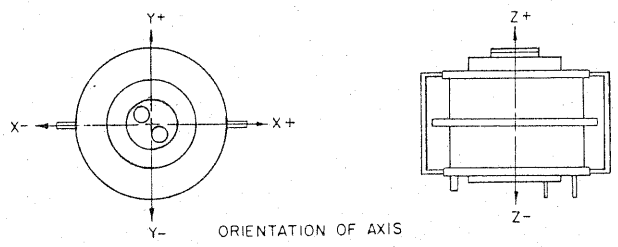
12. The following sampling plan shall be used:

Lot size	Sample	Sample size	Cumulative sample size	See 10.1.2 of MIL-STD-105	
				Accept	Reject
1	First	1	1	0	1
	Second	0	0	-	-
2	First	1	1	0	-
	Second	1	2	1	2
3 to 10	First	1	1	0	-
	Second	2	3	1	2
Over 10	First	3	3	0	2
	Second	3	6	1	2
	Second (see note)	3	6	2	3

NOTE: The second sample criteria applies only if the first sample from the previous lot had zero failures.

NOTES: -Continued

23. Vibration and shock tests shall be performed using vibration-shock fixture (DESC Drawing No. 67031), or equivalent. Tests shall be performed with no voltages applied.



ORIENTATION OF AXIS

Post vibration and shock need only be performed once (at the conclusion of both vibration and shock tests).

24. Vibration.

(a) The tube shall be vibrated in the X, Y, and Z axes at the following conditions:

Frequency (Hz)	Double amplitude (inches)
5 to 55	.060

(b) Frequency shall be swept logarithmically from 5 to 55 to 5 Hz in 5 minutes minimum. Two sweeps shall be made.

(c) The tube shall be vibrated in the X, Y, and Z axes at the following conditions:

Frequency (Hz)	Double amplitude (inches)	Duration (hours/axis)
50	.060	12

(d) Tubes which do not comply with the post-vibration limits shall be considered failures.

25. Shock. Test in accordance with MIL-STD-202, method 213, test condition A, except as follows:

(a) The peak acceleration of the shock shall be 15 G ±10 percent.

(b) The velocity change (V_i) = 3.39 ft/sec.

(c) Tubes which do not comply with post-shock limits shall be considered failures.

(d) This is not a destructive test.

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

27. The anode current pulse shall be examined for evidence of pulse droop. No pulse droop attributable to tube emission shall be permitted.

28. The tube shall operate under power output conditions for 1 hour without a trip-out. Measured data to be taken at the end of this 1-hour time period. A trip-out is defined as an increase in plate current in excess of 20 percent above normal level.

NOTES: -Continued

33. The following life test may be used as an alternate to multiple short life at the option of the manufacturer:

TEST	NOTES	CONDITIONS	SYMBOL	MINIMUM	MAXIMUM	UNIT
Multiple short life (alternate)	12	Same as initial life (alternate) except, po = 225 kw (min); t = 50 hrs (note 11 does not apply)	---	---	---	---
Multiple short life (alternate) test end point: Peak power output	-	Multiple short life (alternate)	po	225	---	kw

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

Preparing activity: Navy - EC

Agent: DSA - ES

(Project 5960-2719)

Ltr	Dimensions in inches with metric equivalents (mm) in parentheses		Notes
	Minimum	Maximum	
Quality conformance inspection, part 1			r
	G-3 Gage check		q
E	1.83 (46.48)	1.93 (49.02)	
R	.59 (14.99)	.69 (17.53)	
S	3.74 (95.00)	3.76 (95.50)	f, q, t
Quality conformance inspection, (periodic check) part 3			
A	8.31 (211.07)	8.93 (226.82)	
C	3.27 (83.06)	3.45 (87.63)	
D	5.68 (144.27)	6.18 (156.97)	
F	1.17 (29.72)		
G		8.75 (222.25)	
H	7.84 (199.13)	7.88 (200.15)	t
K		.59 (14.99)	
L	.13 (3.30)		g, t
M	1.04 (26.42)	1.14 (28.96)	q
P	1.22 (30.99)	1.28 (32.51)	
T	.97 (24.64)	1.12 (28.45)	
U	.83 (21.08)	.95 (24.13)	
V		11.25 (285.75)	
Y		.68 (17.27)	
AB	.50 (12.70)		g
AC	2.09 (53.09)	2.15 (54.61)	
AE		4.06 (103.12)	j
AF	1.38 (35.05)	1.50 (38.11)	
AG		2.00 (50.80)	
AH	.38 (9.65)		e
AJ	4.95 (125.73)		j
AK	.56 (14.22)	.63 (16.00)	
AL		.28 (7.11)	
AM	.09 (2.29)		
AN	.25 (6.35)		g
AP	.52 (13.21)	.60 (15.24)	
	Reference dimensions		
B	2.69 (68.33)		q
N	6.00 (152.40)		1
J	RAD 3.25 (82.55)		q
W	3°		q
X	6.25 (158.75)		q
Z	45°		q
AA	90°		q
AD	41°		q

FIGURE 1. Outline drawing of electron tube type 8932 - Continued.

NOTES:

a. Terminal has 1 inch (25.4)–16 unified thread, class 2A fit, .380-inch (9.65) long, and two holes .258 – .270-inch (6.55–6.86) diameter, spaced .438 inch (11.13) on centers.
b. The holes in the filament, grid No. 1, and grid No. 2 coolant terminal connections, will accept the pins of the plug-and-cylinder combination gage G1, shown on figure 5.
c. Terminal has 1-3/4 inch (44.45)–16 unified extra fine thread, class 2A fit, .380-inch (9.65) long, two holes .508–.522-inch (12.90–13.26) diameter, spaced .688 inch (17.48) on centers, and an index hole .160-inch (4.06) maximum diameter, spaced .344 inch (8.74) from the center of the terminal.
d. The holes in the anode coolant connection shall accept the pins of the plug-and-cylinder combination gage G2, shown on figure 6.
e. Pressure from circuit contacts shall be exerted only over maximum length, AH, of designated contact areas of the anode or grid No. 1 terminals.
f. This diameter dimension is held only over a length of AH.
g. Dimension L applies over length AB and AN, as indicated.
h. The contact surfaces, BA-BA and BB-BB of the rf cathode terminals, shall be parallel within .06 inch (1.52).
j. Contact of the input end, rf cathode terminal, shall not be made at a diameter smaller than 4.06 inch (103.12), nor greater than 4.95 inch (125.73).
k. To prevent excessive stress on the ceramic seal, a 15/16-inch (23.81) open-end wrench shall be used to permit gripping the terminal when removing or tightening the coolant connectors.
l. Contact of the output end, rf cathode terminal, shall not be made at a diameter smaller than 6 inches (152.40). The pressure exerted for this rf contact, shall be limited to that necessary for good electrical contact. The mechanical force for the cavity support and pressure seal shall be made at a diameter not less than 6 inches (152.40). On the output end, rf cathode terminal, there are four equally spaced .188-inch (4.78) diameter holes on a circle having a diameter of 6.75 inches (171.45). These holes are for tube manufacturing purposes only. Attention is called to the existence of these holes so that equipment designers can avoid making a pressure seal or electrical contact at points which are coincident with these holes. Mechanical clamping devices for the output cavity shall be designed so as to exert their clamping force across outer edge of output-header flange
m. Serial number is located on this surface between grid No. 2 and the insulated filament terminal.
n. Corners may be rounded or chamfered, but not to exceed .05 inch (1.27).
p. Keep this 5-inch diameter annular-volume region clear. Do not allow circuit components (conductors or insulators) to protrude into this region.
q. The output end shall accept the output end of gage G3, shown on figure 7. Proper acceptance is obtained when gage is seated on the output end, rf cathode terminal, contact surface. The gage is properly seated when a .015-inch (.38) thickness gage, 1/2-inch (12.70) wide will not enter between the gage and the rf cathode contact surface. The pins on the 1.500-inch (38.10) movable section of the output end of gage G3, shall enter the anode coolant holes such that the height slot represented by the 2.098-inch (53.29) dimensions is below the shoulder of the gage, and the 2.219-inch (56.36) dimension is visible above the shoulder. The input end shall accept the input end of gage G3, shown on figure 7. Proper acceptance is obtained when the gage is seated on the input end, rf cathode terminal surface, and the projecting guide pins of the output end engage the mating holes of the input end. The gage is properly seated when a .015-inch (.38) thickness gage, 1/2-inch (12.70) wide will not enter between the gage and the rf cathode terminal contact surface. The pins on the .875-inch (22.23) movable section of the input end shall enter the grid coolant holes such that the height slot represented by the 2.379-inch (60.43) dimension is below the shoulder of the gage, and the 2.559-inch (65.00) dimension is visible above the shoulder, when gage G3 is properly seated.
   (1) Dimensions B, J, M, W, X, Z, AA, and AD shall vary only within the limits of the gage.
   (2) The centerline through the grid No. 1 coolant connection holes will have a maximum angle of 2 degrees with respect to the centerline of the anode coolant connection holes.
   (3) The axis of the rf anode terminal contact surface is coincident with the axis of the grid No. 1 terminal contact surface, within .05 inch (1.27).
   (4) The axis of the anode and coolant connection is coincident with the axis of the rf anode terminal contact surface, within .025 inch (.64).
r. Unless otherwise specified, the AQL for all tests listed under quality conformance inspection, part 1, shall be 1.0, inspection level II.
s. The outside diameter of this ceramic bushing shall not enter the annular region defined by a circle of 3.88 inch diameter (98.55mm) concentric with diameter S of the rf grid No. 1 terminal.
t. Measurement of this dimension shall be made on both input and output ends.
u. The centers of the water course holes, in each connection around the periphery of the tube, shall be on a line through the center of these holes and perpendicular to a line through the center of the tube within ±2 degrees.

FIGURE 1. Outline drawing of electron tube type 8932 - Continued.

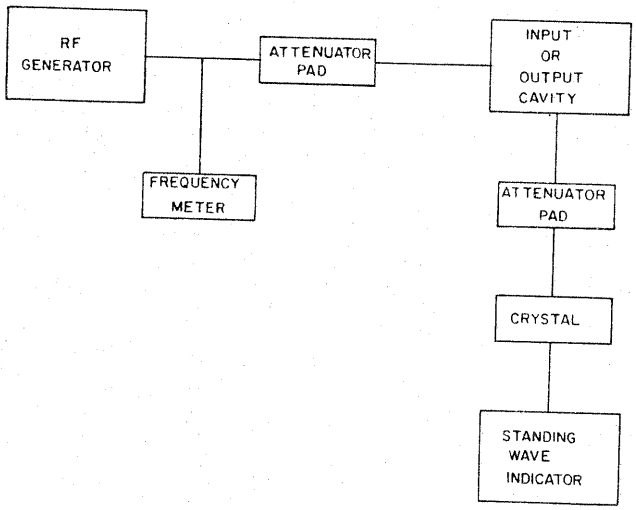
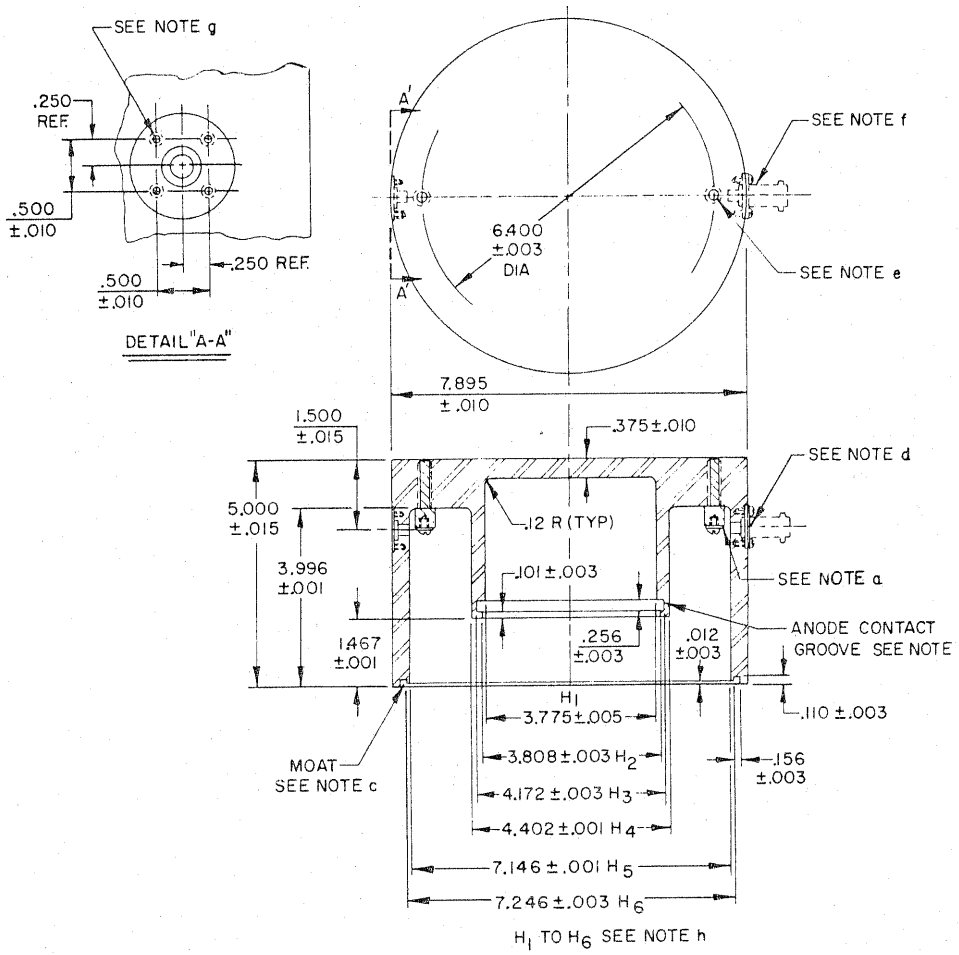


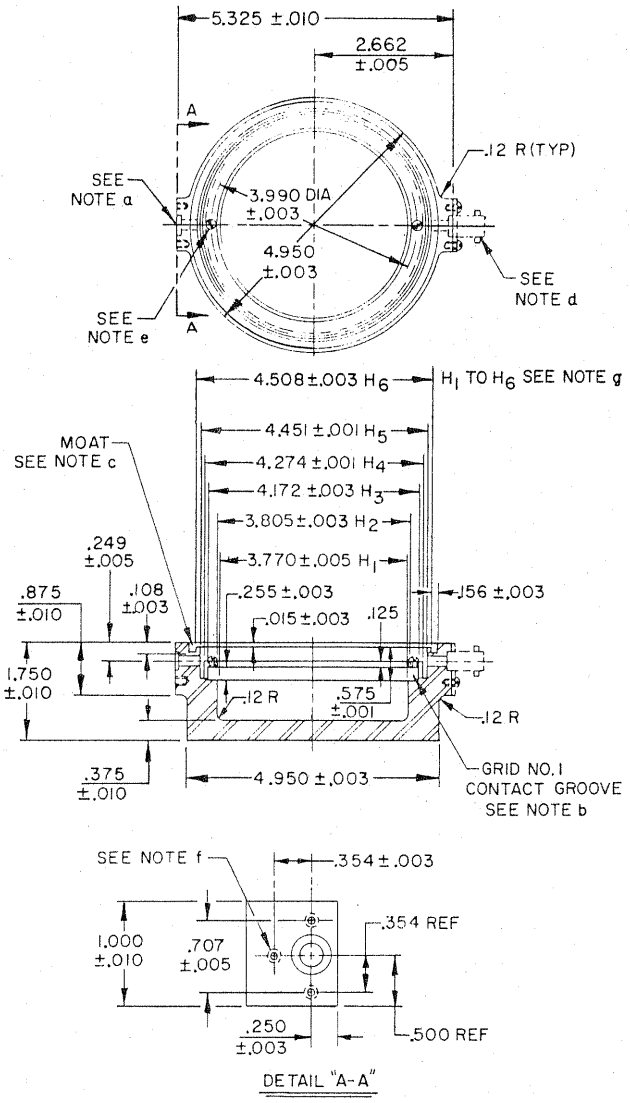
FIGURE 2. Typical block diagram of test circuit.



NOTES:

a. Two studs. 1-1/2-inch long threaded 1/4-inch-20 NC by 1 inch with 3/8-inch-diameter head. Head of stud shall be drilled and tapped 1/4-inch deep for No. 6-32 RH machine screw. Use standard 5/32-inch-flat washer under screw.
b. Anode contact groove shall be filled with the following spring: .020-inch-diameter wire wound to give a .250-inch O.D. at 35 TPI, 14-1/4 inches in length (approx.).
c. Moat shall be filled with a braid to insure continuous braid contact and yet permit firm seating of the cavity on the rf cathode terminal contact surface.
d. Two holes. Drill 7/32-inch diameter (thru), C' bore 3/8- diameter by 1/8-inch deep. Spot face 1-inch diameter by 1/16-inch deep.
e. Two holes. Drill and tap for 1/4-inch-20 NC screws.
f. Location of A-N connector -UG-290/U (two connectors 180 degrees apart).
g. Four holes. Drill and tap for No. 3-48 screws by 1/4-inch deep.
h. Cylindrical holes H_1 to H_6 have axes coincident within .001 inch.
i. Dimensions are in inches.

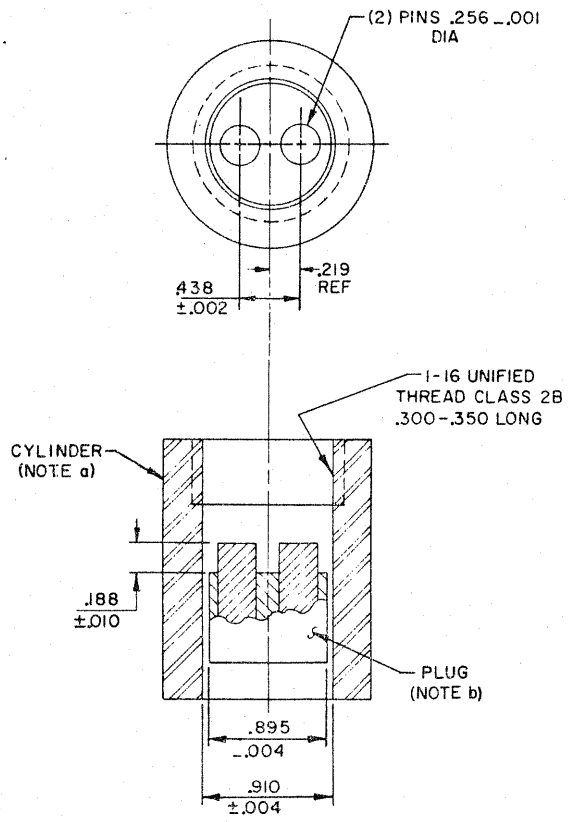
FIGURE 3. Output cavity required for resonant frequency test.



NOTES:

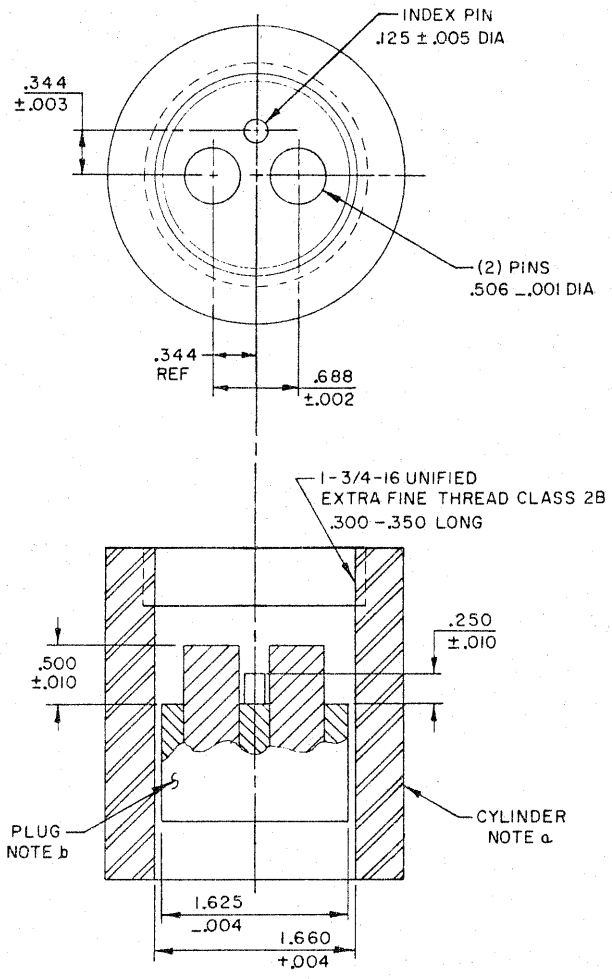
a. Two holes, drill 7/32-inch diameter (thru), C' bore 3/8-inch diameter by 1/16-inch deep.
b. Grid No. 1 contact groove to be filled with the following spring: .020-inch-diameter wire wound to give a .250-inch O.D. at 35 TPI, 14-1/4 inches in length (approx.).
c. Moat shall be filled with a braid to insure continuous braid contact and yet permit firm seating of the cavity on the rf cathode terminal contact surface.
d. Location of A-N connector - UG-290/U (two connectors 180 degrees apart).
e. Two holes. Drill and tap for No. 3-48 screws.
f. Three holes. Drill and tap for No. 3-48 screws by 3/16-inch deep.
g. Cylindrical holes H_1 to H_6 have axes coincident within .001 inch.
h. Dimensions are in inches.

FIGURE 4. Input cavity required for resonant frequency test.



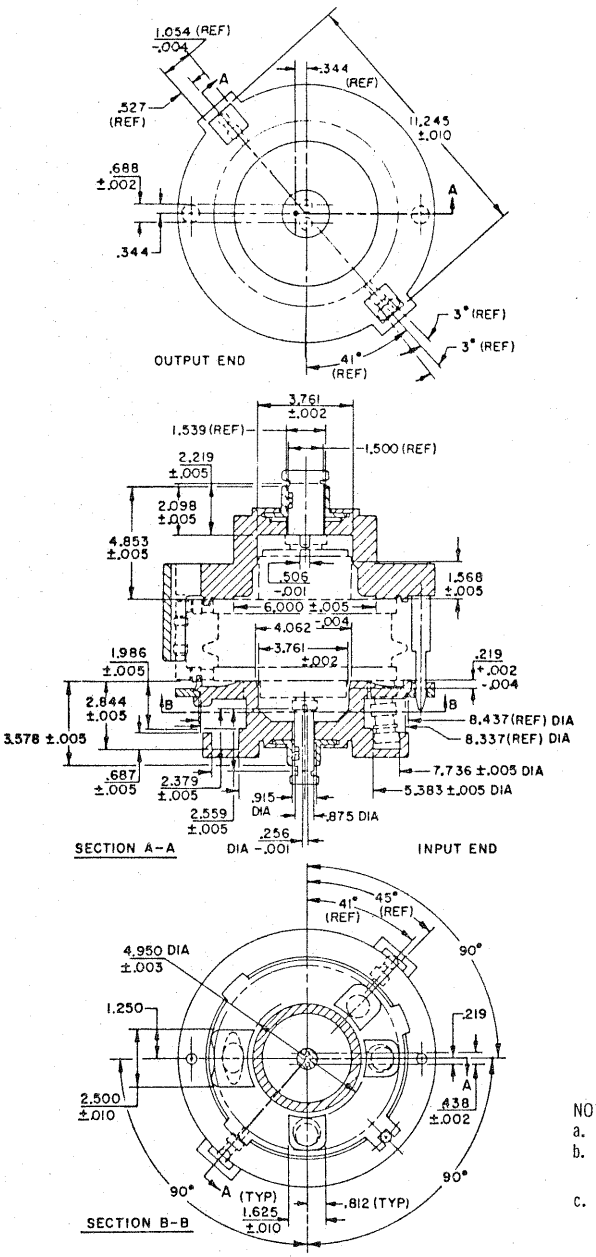
NOTES:
a. Axis of the cylindrical holes and threaded section shall be coincident within .002 inch.
b. Plug sides and pin sides shall be parallel within .001 inch.
c. Dimensions are in inches. Tolerances shown are gage tolerances and shall not be considered tube tolerances.

FIGURE 5. Gage G-1.



NOTES:
a. Axis of the cylinder holes and threaded section shall be coincident within . 002 inch.
b. Plug sides and pin sides shall be parallel within . 001 inch.
c. Dimensions are in inches. Tolerances shown are gage tolerances and shall not be considered tube tolerances.

FIGURE 6. Gage-G-2.



NOTES:
a. Dimensions are in inches.
b. Tolerances shown are gage tolerances and shall not be considered tube tolerances.
c. See DESC Drawing No. 67038.

FIGURE 7. Gage G-3.