SFD-373A

CEM® COAXIAL MAGNETRON

(COMMERCIAL PRODUCT)

TEST SPECIFICATION APPROVAL SHEET

TITLE ELECTRON TUBE, SFD-373A CEM® COAXIAL MAGNETRON

APPROVED MGR. QC./DATE	APPROVED MGR. ENG./DATE	APPROVED MGR. MKT./DATE	APPROVED MGR. MFG./DA
[signature] 2-7-73	[signature] 3-27-73	[signature] 8/10/73	

REV	LOCATION	DESCRIPTION	DATE	APPROVA
A	Page 10	Pictorial Addition of slots in Mounting plate. ECO-76-1876	2/9/76	[signature]
B		Change per ECO# 76-1967. Changes per marked up copy.	3/17/76	[signature]
C	77-2757	Changes per marked-up copy.	12/20/77	F/KACZ 12/21/7
D	Pg. 8	Change Lead Lengths ECO 79-3604	6/18/79	[signature]
E	Pg. 8,16	Changes per ECO# 82-1807	11/4/82	[signature]
F	PG 2,4	CHANGES PER ECO #83-3035	10/28/83	[signature]
G	Pg. 12	Changes per DCO 86-1264	3/20/86	

The provisions of the latest issue of MIL-E-1 apply to this specification

DESCRIPTION 5600-5650 MHz, tunable frequency, integral magnet, air cooled, 320 Kw minimum peak power output, unipotential cathode.

ABSOLUTE MAXIMUM AND MINIMUM RATINGS: Note 1

INDEPENDENT

PARAMETER	If Surge	tk	VSWR	Tuner Torque	Body Temp	Input Bushing Temp	Pressurization Input	Pressurization Output		
UNITS	a	sec	---	in-oz	°C	°C	psia	psia		
MAXIMUM	30	---	1.5:1	200	120°	270°	30	60		
MINIMUM	---	300	---	---	---	---	15	--		
NOTES	20			2	3	3	4	14		

DEPENDENT

PARAMETER	Ef	If	ib	Pi	pi	Du	tpc	prr	rrv
UNITS	V	A	a	W	kw	——	μsec	pps	kv/μ sec
MAXIMUM	10.5	13	35	1000	1000	.0012	3.5	---	125
MINIMUM	---	---	---	---	---	---	0.2	---	70
NOTES	5						6		7

MECHANICAL

MOUNTING POSITION _____ Any

SUPPORT _____ Mounting flange

COOLING _____ Forced air (Note 8)

OUTLINE _____ Figure 1

MAGNET _____ Note 9

COUPLING _____ WR 187, Figure 1 (Notes 14 and 18)

NET WEIGHT _____ 36 pounds nominal

MIL-STD 1311	TEST	CONDITIONS	SYMBOL	LIMITS MIN	LIMITS MAX	UNITS
	General					
3.6	Marking	See Figure 1	---	---	---	---
4.8.5	Holding period		---	168	---	Hours
30(b)	Dimensions	See Figure 1	---	---	---	---
4.1.1(b)	Qualification Tests	See Note 16				
4027	Temperature coefficient	Osc (1); T (body) = 50°C to 120°C; F = 5600 MHz (See Notes 3 and 10)	$\Delta F/\Delta T$	---	0.20	MHz/°C
1143A	Forced Cooling	Osc (1); (See Notes 8 and 11)	ΔT	---	70	°CRise
1042B	Shock	G = 15; t = 11 ms (See Note 19)	---	---	---	---
1031A	Low frequency vibration	No voltage (See Note 21) F = 25 Hz	---	---	---	---
1031A	High frequency vibration	No voltage (See Note 21) F = 50 Hz	---	---	---	---
4266	Input capacitance		C	17	35	pf
4.1.1(c)	Quality Conformance Inspection, Part 1	Note 16				
4003A	Pressurization	45 psia minimum output assembly (Note 13)	---	---	---	---
4289	Heater current	Ef = 9.5 V; tk = 300 sec min	If	10	12	A
4223	Tuner drive torque	Note 12	Torque	---	50.0	in-oz

MIL-STD 1311	TEST	CONDITIONS	SYMBOL	LIMITS MIN	LIMITS MAX	UNITS
---	Oscillation (1)					
---	Coupling	VSWR = 1.1 max except as noted; Notes 14 and 18				
4223	Tunable frequency	Note 22	F	5600	5650	MHz
4303	Heater-cathode warm-up time	Ef = 9.5 V; tk = 300 sec; Note 5	---	---	---	---
4304	Pulse characteristics	tpc = 3.0 ± 0.5 Du = .001 rrv = 125 kv/μs min; Notes 6 and 7				
----	Average anode current	Ib = 26.0 mAdc				
4306A	Pulse voltage	F = 5600 MHz	epy	26.0	28	kv
4250	Power output	F = 5600 MHz	Po	320	---	w
4308A	Radio frequency bandwidth	F = 5600 MHz; Note 17	BW	---	2/tpc	MHz
4315A	Stability	F = 5600 MHz; Note 17	MP	---	0.25	%

NOTES:

1. The requirements of Paragraph 6.5 of MIL-E-1 shall apply. For the assistance of designers of electronic equipment, the ratings have been divided into two groups as follows:

   a. Independent (ratings which may be obtained simultaneously).

   b. Dependent (ratings which are interrelated and may not necessarily be obtained simultaneously).

2. The tuner drive shall be capable of supplying a minimum of 50 inch-ounces of torque to the magnetron tuning shaft and shall never supply more than 200 inch-ounces of torque including inertial effects.

3. The temperature is to be measured at the point indicated on Figure 1.

4. The magnetron shall be capable of normal operation without electrical breakdown with the input bushing at normal atmospheric conditions.

5. Prior to the application of high voltage, the cathode shall be heated to the required initial operating temperature. This shall be done by applying 9.5 volts ± 10% for 300 seconds minimum. Heater-voltage is not to be reduced during operation providing average anode power input does not exceed 700 watts. For average anode power input (Pi) of 700 to 1000 watts the heater voltage shall be determined by the following formula:
   $E_f = 9.5(1 - \frac{Pi}{2850})$ volts, where Pi = Ib x PAV.

6. The characteristics of the applied pulse must be those which result in proper starting and oscillation. The rate of rise of the voltage pulse, the percentage of pulse voltage ripple, and the rate of pulse voltage fall are among the more important considerations. The tube manufacturer should be consulted regarding pulse characteristics as related to the specific application.

7. The rate of rise of voltage (rrv) shall be measured in accordance with MIL-E-1 , Method 4304 , except that the steepest tangent to the leading edge of the voltage pulse shall be measured above the 70 percent amplitude point.

8. The cooling required is partially determined by the total power input to the magnetron. The following table gives MINIMUM air flow values that are deemed necessary tc limit the body temperature to a maximum of 120°C at an ambient temperature of 50°C at sea level.

NOTES: (Continued)

Total Magnetron Power Input (Watts)	Cooling Air Flow (Cu. Ft./Min.)
Standby Condition	5
200	20
400	40
600	50
800	60
1000	80

9. In handling and mounting the magnetron, care shall be taken to prevent demagnetization. Ferromagnetic materials shall not, at any time, be permitted to come closer than 4 inches from the magnet. Energized magnets shall not, at any time, be permitted to come closer than 12 inches from the tube magnet.

10. Temperature measurements shall be made only after thermal equilibrium has been reached.

11. With specified airflow, using a 2.0 ± 0.5 inch dia. conduit located 1.0 ± 0.25 inch from the tube body which directs the air towards the tube body in the direction shown on Figure 1, the rise above ambient specified shall not be exceeded.

12. The tuning mechanism shall operate as specified over the entire frequency range.

13. The specified pressure shall be applied to the tube output. There shall be no leaks as evidenced by metered pressure fall off or by bubbles if the test is performed with the tube immersed in water. The time of the test shall be one (1) minute minimum. The fixture shall be such that the seal area conforms to the seal area of a UG 148 B/U.

14. The gas used for pressurization shall provide insulating properties consistent with the power levels required. The minimum pressure is, therefore, dependent on the type of insulating gas used.

15. The radio frequency bandwidth and side lobes shall be within the limits specified when a VSWR of 1.5 minimum is introduced in the load at a distance of 0.2 ± 0.05 meters from the magnetron flange and the phase is adjusted at the start of each measurement to produce maximum degradation.

16. Unless otherwise specified, all tests required by this specification shall be made under the following atmospheric conditions:

Temperature 20 ± 10°C
Relative humidity 90% or less
Barometric pressure - Local Standard

NOTES: (Continued)

17. Stability shall be measured in terms of the average number of output pulses missing, expressed as a percentage of the number of input pulses applied during the period of observation. The missing pulses (MP) due to any causes, are considered to be missing if the RF energy is less than 70 percent of the normal energy level, or is at a frequency greater than plus or minus 5 MHz from the operating frequency. The stability shall be measured when a VSWR of 1.5 minimum is introduced in that phase producing maximum instability. The missing pulse count shall be performed over a three minute test interval.

18. The magnetron shall be coupled directly to a UG 148 B/U choke flange with eight holes drilled out to 7/32" diameter.

19. This is a survival test. The tube shall be subjected to 18 impact shocks of 15 g, consisting of three shocks in opposite directions along each of three axes perpendicular to planes A, B and C, (Figure 1) with each shock impulse having a time duration of 11 ± 1 milliseconds. The "g" value shall be within ± 10 percent when measured with a .2 to 250 cps filter, and the maximum "g" shall occur at approximately 5-1/2 milliseconds.

20. The internal impedance of the heater filament supply shall limit the surge current to the maximum specified.

21. This is a survival test. The tube shall be mounted in a rigid fixture, and vibrated with simple harmonic motion at a double amplitude (total excursion) of 0.080 inch. The tube shall be vibrated in each of three mutually perpendicular planes for a period of one minute in each plane. The planes of vibration shall be perpendicular to planes A, B and C as shown on the outline drawing, Figure 1. At the end of the test, the tube shall meet the requirements of oscillation (1) of the Quality Conformance Inspection, Part 1.

22. Tube must be capable of tuning over the specified range.

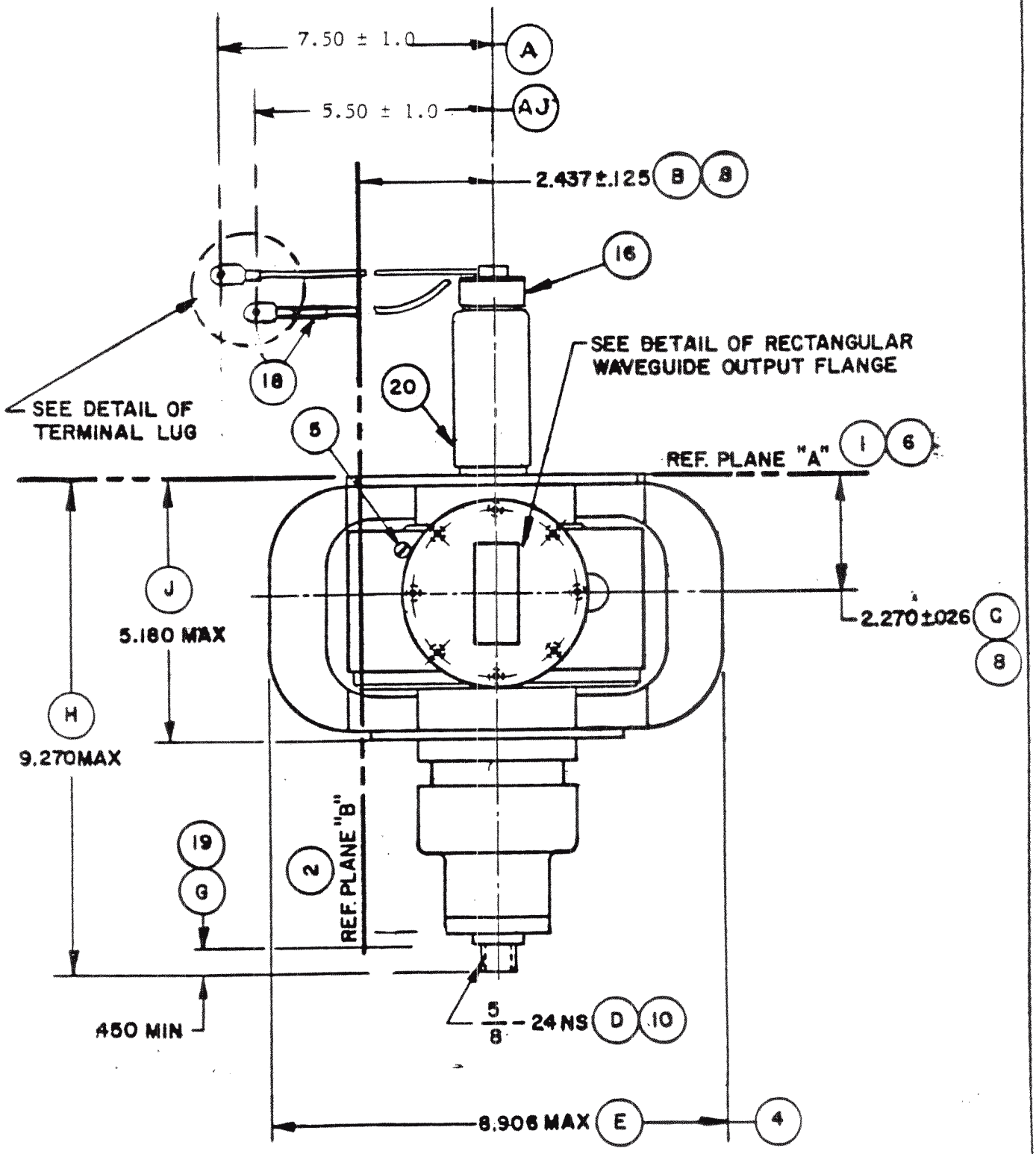

7.50 ± 1.0
A
5.50 ± 1.0
AJ
2.437±.125
B
8
16
18
20
SEE DETAIL OF TERMINAL LUG
SEE DETAIL OF RECTANGULAR WAVEGUIDE OUTPUT FLANGE
5
REF. PLANE "A"
1
6
J
5.180 MAX
2.270±026
C
8
H
9.270MAX
19
G
2
REF. PLANE "B"
450 MIN
5/8 - 24 NS
D
10
8.906 MAX
E
4

FIGURE 1a

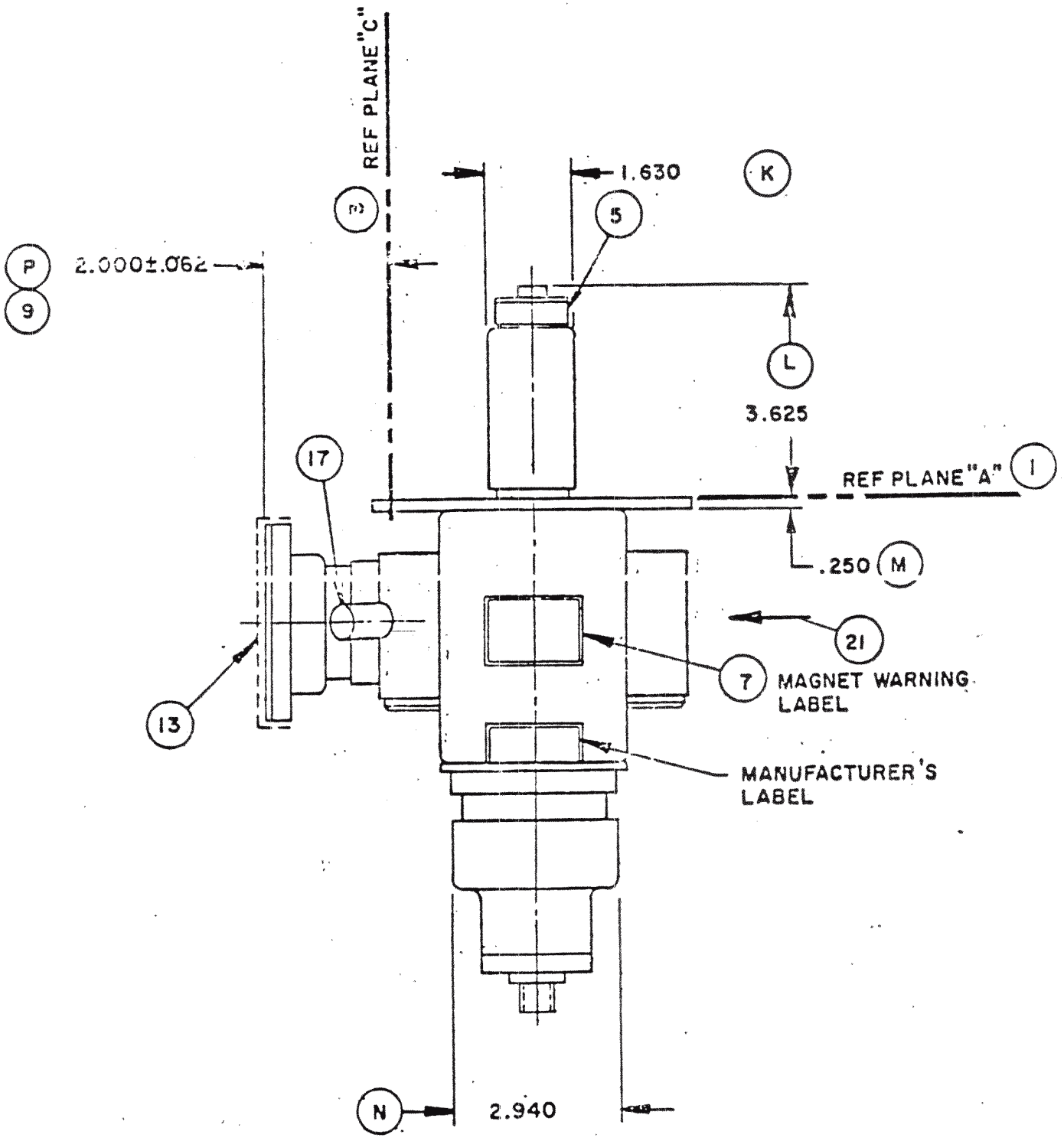

REF PLANE "C"
3
1.630
K
5
P
9
2.000±.062
L
3.625
17
REF PLANE "A"
1
.250
M
21
7
MAGNET WARNING LABEL
13
MANUFACTURER'S LABEL
N
2.940

FIGURE 1b

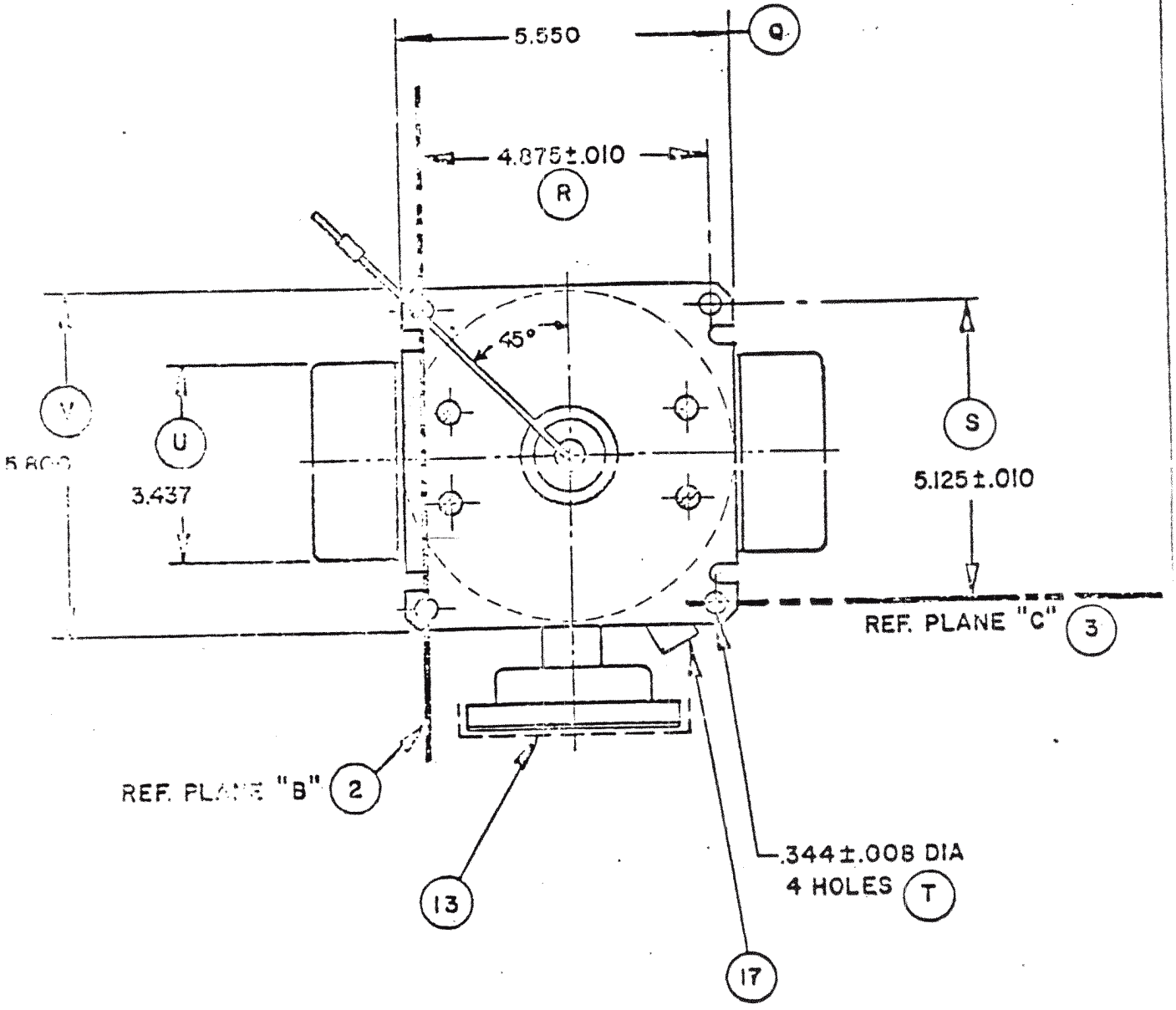
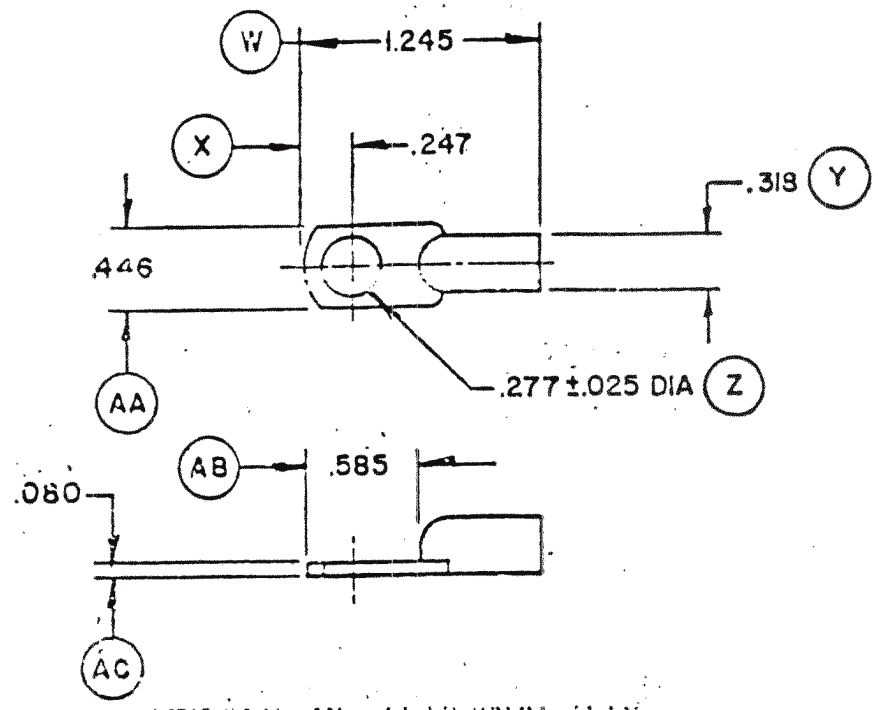
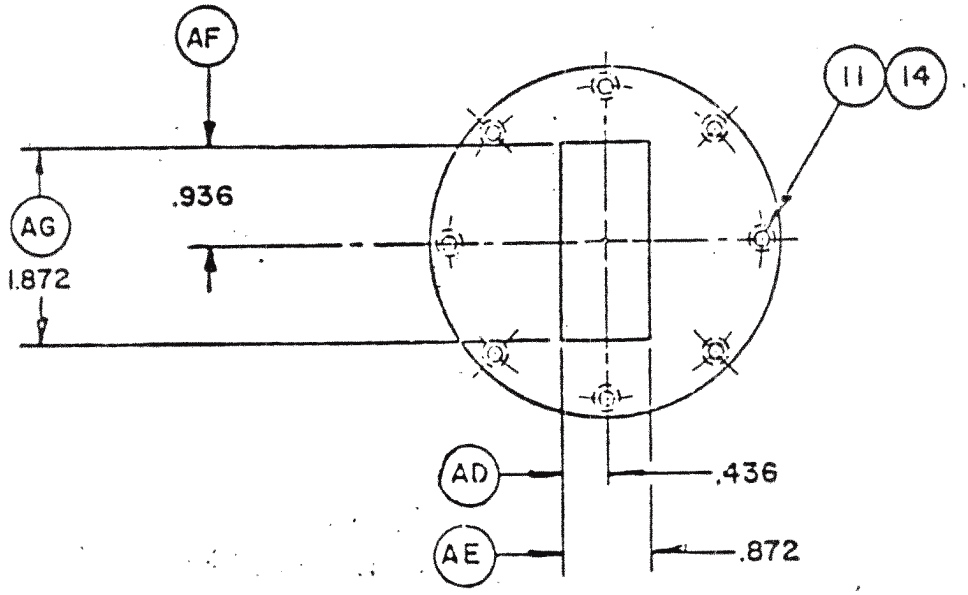

5.550
Q
4.875±.010
R
45°
V
5.800
U
3.437
S
5.125±.010
REF. PLANE "C"
3
REF. PLANE "B"
2
13
17
.344±.008 DIA
4 HOLES
T

FIGURE Ic

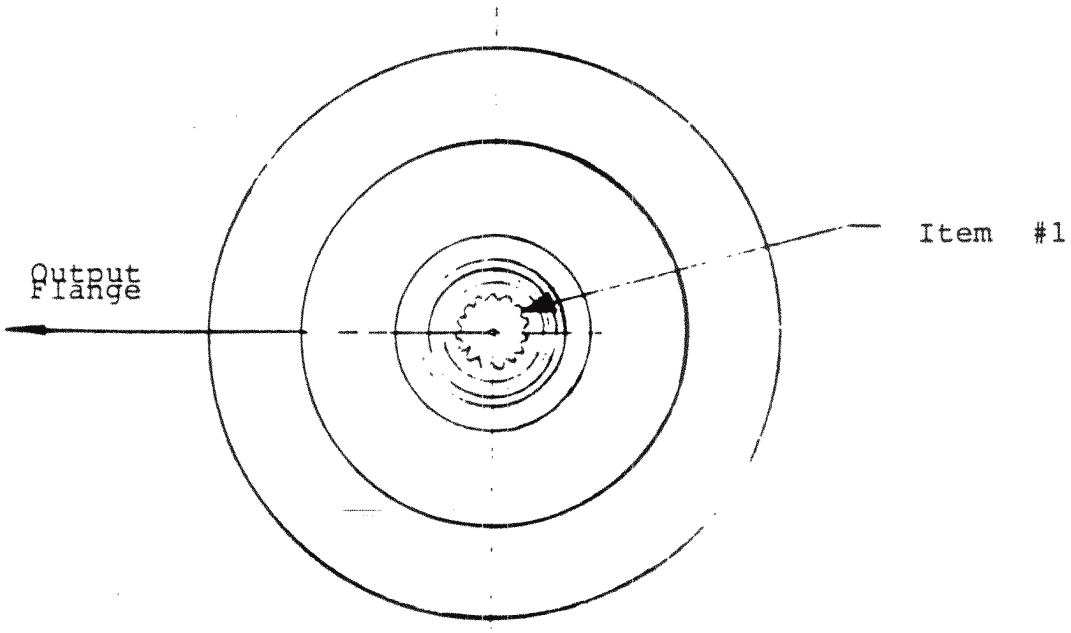


DETAIL OF TERMINAL LUG



12 15 DETAIL OF RECTANGULAR WAVEGUIDE OUTPUT FLANGE

FIGURE 1d



View of Tuner Cap

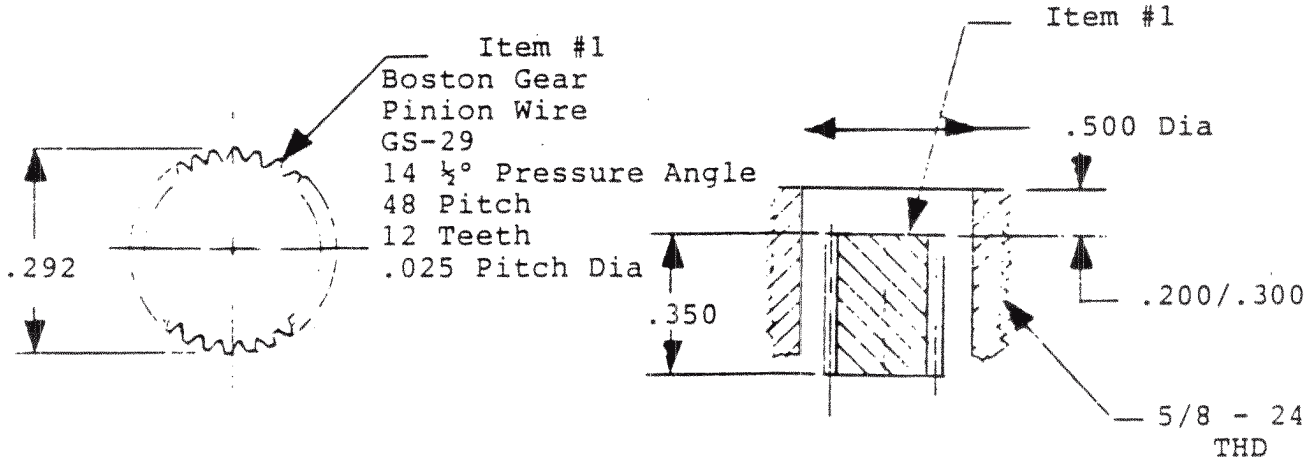


FIGURE 1e

NOTES FOR FIGURE 1

1. Reference plane "A" is defined as a plane passing along the face of the mounting plate.
2. Reference plane "B" is defined as a plane perpendicular to plane "A" passing through the axis of the holes, as shown at reference plane "A".
3. Reference plane "C" is defined as a plane mutually perpendicular to planes "A" and "B" passing through the axis of the holes, as shown at reference plane "A".
4. Dimensions without tolerances are for information only.
5. Temperature measurements to be made at points indicated.
6. For vibration and shock testing, the planes of testing shall be perpendicular to reference planes "A" - "B" - "C".
7. Warning: Maintain minimum clearance 4 inches between magnetic materials, steel tools, plates, etc. and 12 inches between other magnets.
8. This dimension refers to the center of the rectangular opening of the waveguide.
9. The output flange face to be parallel to plane "C" within .100.
10. Mates with S.S. White flexible shaft No. RY 18-2 or equivalent.
11. 10 (.190)-32, 8 holes.
12. Mates with modified UG 148B/U choke flange (clearance instead of threaded holes).
13. Protective closure.
14. A plane passing through the axis of the tapped holes at this surface shall be parallel with planes "A" and "B" within .080.
15. For pressurization of the output, "O" ring No. MS 90064-16 can be used to effect a hermetic seal to the face of the waveguide flange.
16. The axis of this diameter shall not deviate by more than .180 from the mutual center of the four mounting holes.
17. Permanently attached protective closure for the exhaust tubulation of the magnetron, will not restrict air flow nor impair serviceability of the magnetron.
18. Brown coded lead identifies the common cathode connection.

NOTES FOR FIGURE 1

19. Applies to turns counter only.

20. This identifies a North seeking pole. This may be tested by observing which compass needle points to the geographic South. The same compass needle will point toward the magnetron North seeking pole when it is brought near the input stem of the magnetron. Care should be taken to insure that the magnetron field does not reverse the polarity of the compass.

21. Indicates direction of cooling air flow.

QUALITY CONFORMANCE INSPECTION (PART 1)				
A	6.500	8.500	165.10	215.90
B	2.312	2.562	58.724	65.074
C	2.244	2.296	56.997	58.318
P	1.938	2.062	49.225	52.374
R	4.865	4.885	123.571	124.079
S	5.115	5.135	129.921	130.429
T	.336	.352	8.534	8.940
AJ	4.500	6.500	114.300	165.100

DIMENSIONS		
LETTER	INCHES	MILLIMETERS
	NOMINAL DIMENSIONS	
E	8.906	226.212
G	.450	11.430
H	9.270	235.458
J	5.180	131.572
K	1.630	41.402
L	3.625	92.075
M	.250	6.350
N	2.940	74.676
Q	5.550	140.970
U	3.437	87.299
V	5.800	147.320
W	1.245	31.623
X	.247	6.273
Y	.318	8.077
AA	.446	11.328
AB	.585	14.859
AC	.080	2.032
AD	.436	11.074
AE	.872	22.148
AF	.936	23.774
AG	1.872	47.548
AH	1.450 RAD.	36.830

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