

TENTATIVE SPECIFICATIONS FOR ELECTRON TUBE TYPE RK6177

The provisions of MIL-E-1B apply to this specification. Note 22

Description: Magnetron, continuous wave, fixed frequency, electro-mechanically frequency modulated.

ABSOLUTE RATINGS

	Ib	Pi	Reed Drive	Reed Drive	FM Deviation	Eb
	mAdc	W	V	W	Mc	V
Maximum:	35	12	Note 1	.55	87	350
Minimum:	--	--	--	--	--	--
		Ef	Ehk	tk	Shell T	σ'
		V	V	sec	°C	
Maximum:		7.0	45	--	110	1.5
Minimum:		5.7	--	40	--	
		Note 2			Note 3	Note 4

The absolute ratings must not be exceeded under any conditions, otherwise the serviceability of the tube may be impaired. It does not necessarily follow that combinations of absolute ratings can be applied simultaneously. The provision of MIL-E-1B 6.5 apply on the selection of the operating point.

Storage, Handling, and Installation

Cooling: Convection  
 Magnet Isolation: Note 5  
 Mounting Support: Note 6  
 Mounting Position: Base Horizontal

Output Coupling: Note 7  
 Input Connections: Note 7  
 Vibration Shock: Note 8  
 Weight: Approx. 1 pound

Ref.	Test or Title	Conditions or Notes	Min.	Max.
3.1	Qualification Approval	Required for JAN marking		
3.7	Marking:			
4.5	Holding Period:	t = 168 hours		
4.9.2	Dimensions:	Raytheon Dwg. C-64910		
4.9.8	** Salt Spray Corrosion	Omit		
4.9.18	Carton Drop	Package Group 9; Container Size A; Drop Test (i)		
4.9.19.1	* Vibration:	No Voltage		

RAYTHEON MANUFACTURING COMPANY  
 MICROWAVE & POWER TUBE OPERATIONS  
 WALTHAM 54, MASSACHUSETTS

Ref.	Test or Title	Conditions	Min.	Max.	
4.10.8	*Heater Current:	Ef = 6.3 V	If: 0.54	0.66	A
4.10.15	*Insulation:	Ehk = $\pm$ 45 Vdc	Ihk: --	75	$\mu$ Adc
---	*Reed Coils D.C. Resistance:	Stabilized shell T = Approx. 25°C			
		Coil current = 25 mAdc max. for test	Drive Coil Resistance: 0.3	0.4	ohms
			Pickup Coil Resistance: 0.55	0.7	ohms
---	Transfer Loss (1):	F = 100 $\pm$ 3; Note 9	Voltage Ratio:	30	37 db
---	*Transfer Loss (2):	F = 5000 $\pm$ 3%; Note 9	Voltage Ratio:	12	-- db
---	*Natural Reed Frequency:	Note 10	F:	275	350 cps
---	Null Reed Frequency:	Note 11	F:	500	600 cps
---	**Reed Secondary Resonances:	Note 12			
4.16.3	<u>Oscillation (1):</u>	Note 13			
---	Standing Wave Ratio:	$\Gamma$ = 1.10 max.			
4.16.3.2	Heater Cathode Warmup Time:	tk = 40 sec. at Ef = 6.3V Ef = 6.3V for test			
---	*Anode Voltage:	Ib = 30 mAdc	Eb:	280	330 Vdc
4.15.1	*Power Output:		Po:	1.10	-- W
4.16.5	* Pulling Factor:	Oscillation (1)	F:	--	4.0 Mc.
4.10.7.3	Frequency:	Note 14	F:	4268	4350 Mc.
4.16.3	<u>Oscillation (2):</u>	Note 13			
---	Standing Wave Ratio:	$\Gamma$ = 1.15 max.			
---	FM Drive Voltage:	F = 100 $\pm$ 3; Note 15	Vac:	0.17	0.48 Vac
---	Distortion:	Note 16			
---	* Compression Linearity:	Note 17	Deviation:	--	15 %

Ref.	Test or Title	Conditions or Notes	Min.	Max.
---	FM Deviation:	Note 18		
	*Room Temperature:	After t = 3 min.	Deviation: ---	+8 %
		After t = 12 min.	Deviation: ---	+4 %
	*Cold Test (-55°C):	After t = 10 min.	Deviation: ---	+8 %
		After t = 20 min.	Deviation: ---	+4 %
	*Hot Test (+70°C):	t = 20 min.	Deviation: ---	+4 %
---	Dynamic Impedance:	Note 19		
4.11	Life Test	Group C; Note 20	t: 500	--- hrs
4.11.4	Life Test End Point	Oscillation (1) Distortion; Note 16 Dynamic Impedance; Note 21	Po: 0.88 Eb: 270	--- W 345 Vdc

Note 1: The maximum voltage applied to the reed drive coil shall not be sufficient to cause distortion of the pickup coil voltage.

Note 2: The maximum value specified is for a non-oscillating condition.

Note 3: The temperature is to be measured at the point indicated on the Electron Tube Dwg, Raytheon C-64910.

Note 4: Frequency skipping or unstable operation may be encountered at some phase positions when the mismatch occurs at the end of a "long" line.

Note 5: In handling and mounting the magnetron care must be exercised to prevent demagnetization. Ferromagnetic materials or energized magnets shall not be brought within one inch of the tube.

Note 6: Non-magnetic sheet metal clamps are recommended as additional support to that provided by the base pins.

Note 7: See electron tube drawing: Raytheon C-64910

Note 8: Reasonable care should be used in the storage, installation, and use of the tube to avoid imparting vibration or shock in excess of the values for which it is designed to withstand.

Note 9: A rms input of 0.1 Vac shall be applied to the drive coil of the reed modulator at the specified frequency. The rms output across the pickup coil terminals shall be within the specified amount with reference to 0.1 Vac. This test shall be made with a high grade volt meter.

- Note 10: The reed modulator shall be driven over the required frequency range with an input of .01 Vac or less. The frequency shall be adjusted so the rms voltage across the pickup coil terminals is a maximum. The natural reed frequency shall be considered the frequency at which the rms voltage across the pickup coil is a maximum, and shall fall within the frequency limits specified.
- Note 11: The reed modulator shall be driven over the required frequency range with approximately 0.1 Vac input. The frequency shall be adjusted so the rms voltage across the pickup coil terminals is a minimum. The null frequency shall be considered the frequency at which the rms voltage across the pickup coil is a minimum and shall fall within the frequency limits specified.
- Note 12: When a constant sinusoidal voltage of 10 millivolts is applied to the reed drive coil, and the frequency of this voltage is varied from 1 to 10 kilocycles, the voltage across the pickup coil at any secondary resonance shall not increase more than 8.0 db above that voltage which would be measured in the absence of the secondary resonance.
- Note 13: The heater shall be energized for 40 seconds before the application of Eb. After the application of Eb a two minute stabilizing period shall be observed. The rate of rise of Eb shall not exceed 50 kilovolts per second.
- Note 14: To be measured at approximately 30°C ambient, and at approximately 3 minutes after application of Eb.
- Note 15: This voltage shall be obtained from a high quality audio oscillator. With the reed coil connected in a closed loop circuit as per Raytheon Drawings T-30416 and T-30418 or equivalent, 76 Mc peak to peak frequency modulation of the carrier signal shall be obtained with the drive voltage adjusted within the specified limits. The measurement of rms drive voltage shall be made 6 minutes after the application of Eb, and at least 2 minutes after the application of 76 megacycle drive voltage.
- Note 16: The tube shall be placed in operation as specified for frequency modulation, and the drive voltage shall be increased from 0 volts to 15% above that voltage required for 76 megacycles peak to peak frequency modulation. When viewed on an oscilloscope connected at the magnetron reed drive pins, the wave form of the drive voltage shall not show any visible distortion as compared to the wave form of the audio output voltage of the signal generator. This test shall be made at least two minutes after the application of the drive voltage required for 76 megacycles of peak to peak frequency deviation.
- Note 17: The peak to peak r.f. bandwidth versus reed drive shall be obtained in the following manner: Plot the 42 and 84 mc. bandwidth versus drive points. A straight line passing through the origin and extending to the 84 mc. point shall be the reference line upon which calculations are based. At the 42 mc. drive level, compute the difference frequency between the actual 42 mc. point and that frequency indicated on the reference line. The calculated difference frequency divided by 42 mc. shall be considered the percentage of non linearity, and shall be below the maximum limit specified. This test shall be made with the tube stabilized before each measurement.

Note 18: The tube shall be placed in oscillation as in oscillation 2. The peak to peak bandwidth at the start of the room temperature test shall be approximately 60 megacycles, and the modulator input drive voltage used during the  $-55^{\circ}\text{C}$  test and the  $+70^{\circ}\text{C}$  test shall be the same as that used during the room temperature test. In each instance, the bandwidth deviation is with respect to the room temperature test bandwidth at  $t = 20$  minutes. The bandwidth deviation must stay within the specified percentage of the reference bandwidth after the specified times.

Note 19: The anode current shall be continuously sinusoidally modulated from 5 to 60 milliamperes peak. The tube shall look into an r.f. system whose VSWR is 2.0 average and which is adjustable in phase. At any load phase, and between the current extremes of 15 and 45 milliamperes, the slope of the voltage current characteristic shall not become less than zero ohms. The rated heater and anode voltages must have been applied for at least 4 minutes previous to this test. The viewing oscilloscope shall be calibrated for a sensitivity of at least 12 milliamperes per inch horizontally, and 24 volts per inch vertically when performing this test.

Note 20: Life test shall be conducted with  $E_f$  and  $E_b$  as defined under conditions for Oscillation (1). A 60 cps potential of 0.2 Vac shall be applied to the Reed Drive Coil. The pickup coil shall remain open-circuited during this test. Voltages shall be cycled in the following manner:

<u>Condition</u>	<u>Duration</u>	<u><math>E_f</math></u>	<u><math>I_b</math></u>	<u>E Reed</u>
1	40 sec	6.3 V	0	0
2	105 min	6.3 V	30 mAdc	0.2 Vac
3	15 min	0 V	0	0

Total minimum life time is defined as a total of 500 hours of condition (2).

Note 21: The anode current shall be continuously modulated from 5 to 60 milliamperes peak. The tube shall look into a mismatched load whose VSWR is 1.50 minimum and which is adjustable in phase. At any load phase and between the current extremes of 15 and 45 milliamperes, there shall be no break in the voltage-current characteristic.

Note 22: The following drawings also form part of the specifications:

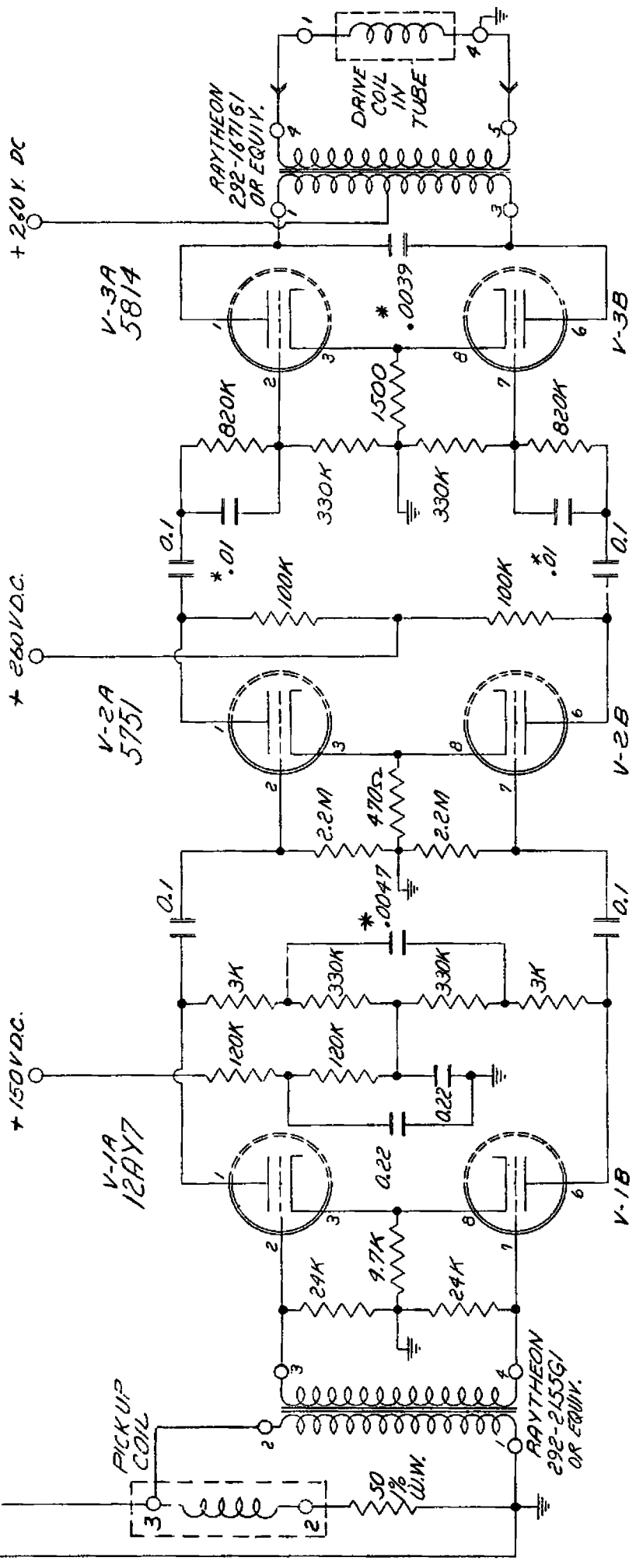
Raytheon C-64910

Raytheon T-30416

Raytheon T-30418

INPUT

RK-6177 REED MODULATOR



NOTES:

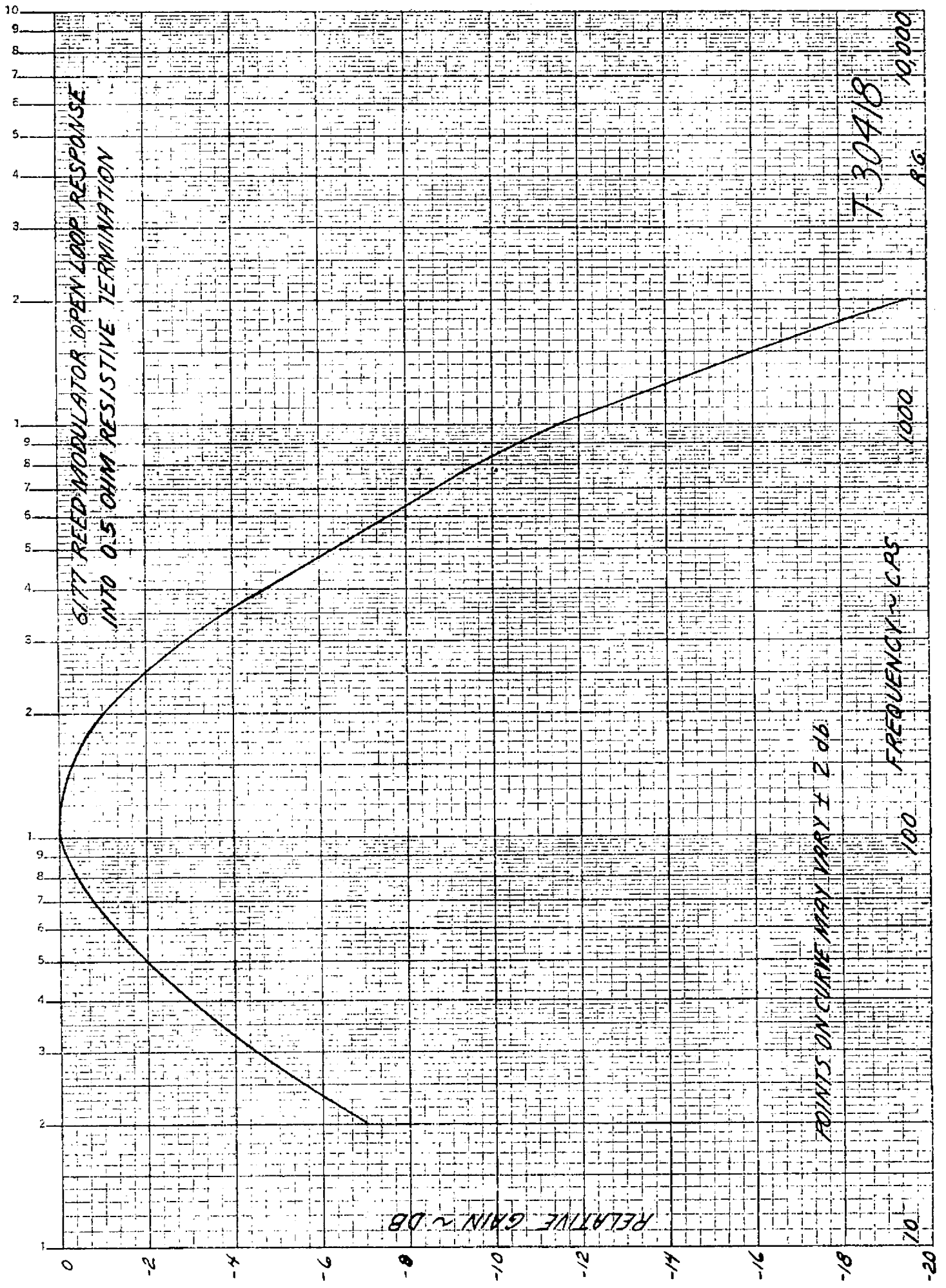
\* EXTENDED FOIL TYPE

USE D.C. HEATER SUPPLY

T-30416

RAYTHEON MANUFACTURING CO.  
MICROWAVE & POWER TUBE OPERATIONS

REV. 1 6-17-54 B.M. 2-17-DES.

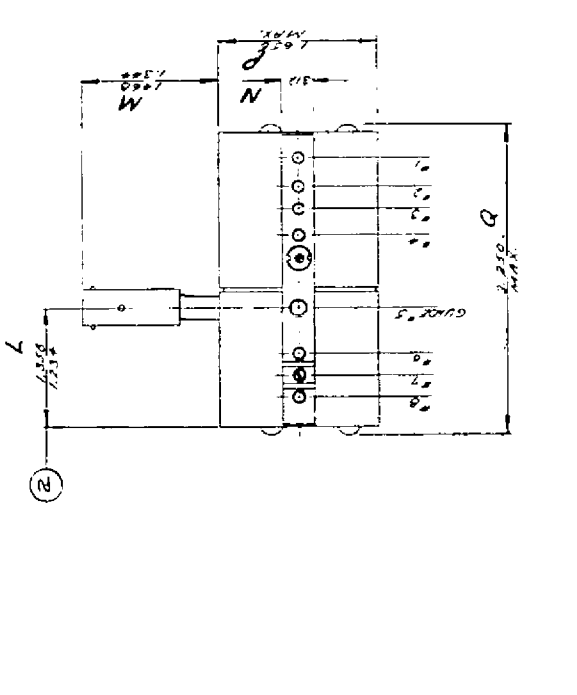
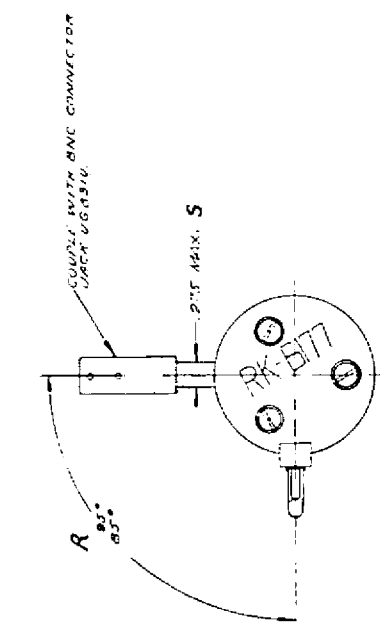
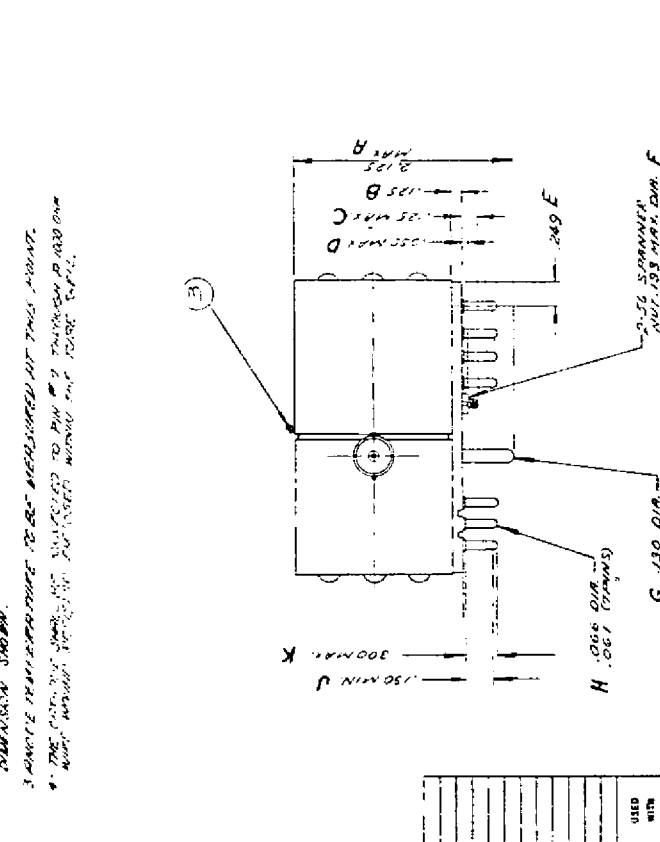
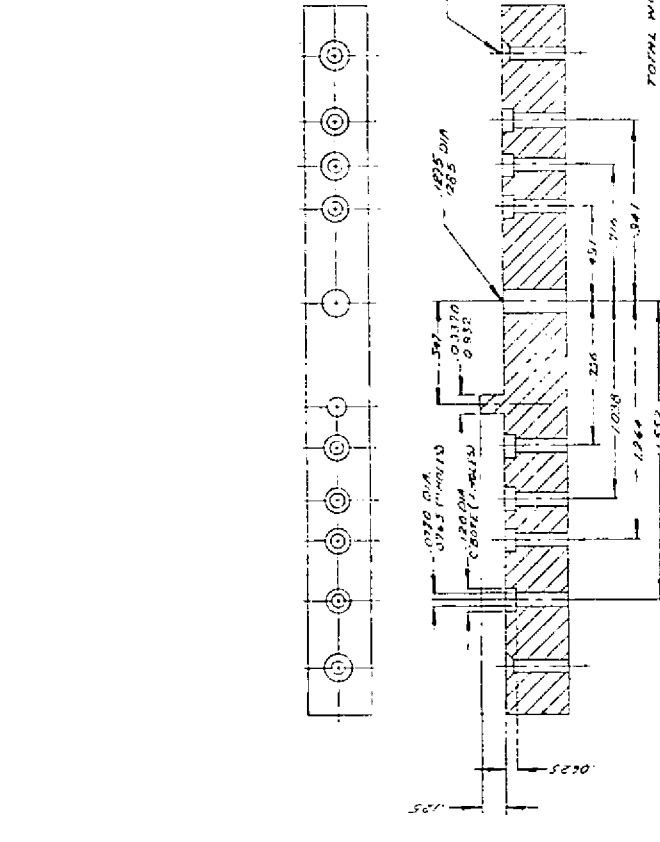


FOR THIS REV  
SHEET NO  
DATE  
BY  
CHECKED BY  
APPROVED BY  
PART NO  
REVISIONS

REV.	DATE	DESCRIPTION
1	10/27/57	INITIAL DRAWING
2	11/27/57	CHANGED DIMENSIONS TO ACCOMMODATE GAUGE 8
3	12/13/57	ADDED DIMENSIONS TO GAUGE 8
4	1/15/58	ADDED DIMENSIONS TO GAUGE 8
5	2/19/58	ADDED DIMENSIONS TO GAUGE 8
6	3/13/58	ADDED DIMENSIONS TO GAUGE 8
7	4/10/58	ADDED DIMENSIONS TO GAUGE 8
8	5/12/58	ADDED DIMENSIONS TO GAUGE 8
9	6/11/58	ADDED DIMENSIONS TO GAUGE 8
10	7/10/58	ADDED DIMENSIONS TO GAUGE 8
11	8/15/58	ADDED DIMENSIONS TO GAUGE 8
12	9/19/58	ADDED DIMENSIONS TO GAUGE 8
13	10/23/58	ADDED DIMENSIONS TO GAUGE 8
14	11/26/58	ADDED DIMENSIONS TO GAUGE 8
15	12/30/58	ADDED DIMENSIONS TO GAUGE 8
16	1/31/59	ADDED DIMENSIONS TO GAUGE 8
17	3/5/59	ADDED DIMENSIONS TO GAUGE 8
18	4/8/59	ADDED DIMENSIONS TO GAUGE 8
19	5/12/59	ADDED DIMENSIONS TO GAUGE 8
20	6/15/59	ADDED DIMENSIONS TO GAUGE 8
21	7/19/59	ADDED DIMENSIONS TO GAUGE 8
22	8/22/59	ADDED DIMENSIONS TO GAUGE 8
23	9/25/59	ADDED DIMENSIONS TO GAUGE 8
24	10/29/59	ADDED DIMENSIONS TO GAUGE 8
25	11/31/59	ADDED DIMENSIONS TO GAUGE 8
26	1/3/60	ADDED DIMENSIONS TO GAUGE 8
27	2/6/60	ADDED DIMENSIONS TO GAUGE 8
28	3/10/60	ADDED DIMENSIONS TO GAUGE 8
29	4/13/60	ADDED DIMENSIONS TO GAUGE 8
30	5/17/60	ADDED DIMENSIONS TO GAUGE 8
31	6/19/60	ADDED DIMENSIONS TO GAUGE 8
32	7/22/60	ADDED DIMENSIONS TO GAUGE 8
33	8/25/60	ADDED DIMENSIONS TO GAUGE 8
34	9/28/60	ADDED DIMENSIONS TO GAUGE 8
35	10/31/60	ADDED DIMENSIONS TO GAUGE 8
36	11/3/60	ADDED DIMENSIONS TO GAUGE 8
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39	2/12/61	ADDED DIMENSIONS TO GAUGE 8
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61	12/9/62	ADDED DIMENSIONS TO GAUGE 8
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65	4/1/63	ADDED DIMENSIONS TO GAUGE 8
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67	5/27/63	ADDED DIMENSIONS TO GAUGE 8
68	6/24/63	ADDED DIMENSIONS TO GAUGE 8
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148	8/19/69	ADDED DIMENSIONS TO GAUGE 8
149	9/16/69	ADDED DIMENSIONS TO GAUGE 8
150	10/14/69	ADDED DIMENSIONS TO GAUGE 8

RATHEON MFG. CO. TITLE ELECTRON TUBE (RM-6177)  
POWER TUBE DIVISION WALTHAM MASS  
NO. 64910  
SHEET 1/3  
DESCRIPTION OR MATERIAL  
PAR 2M

1. TUBE BASE MUST BE CHECKED TO BEING CHECKED IN ACCORDANCE WITH THE  
WORKING DRAWING. THE TOTAL WEIGHT PRESENTED ON THE GAUGE AND THE ENTIRE  
LENGTH OF PIN SHALL PASS INTO THE GAUGE, ON WITHDRAWAL, SHALL  
RECORDS DISCLOSED WITHOUT LIFTING THE TOTAL WEIGHT OF THE GAUGE &  
ACCESSORY WEIGHT.  
2. GAUGE OF 5" O.D. PIN & GAUGE OF GUNNY SOCKET CAN ON SAME & WITHIN  
DIMENSION SHOWN.  
3. GAUGE TEMPORARILY TO BE MEASURED AT THIS POINT.  
4. THE GAUGE OF 5" O.D. PIN & GAUGE OF GUNNY SOCKET CAN ON SAME &  
WITHIN DIMENSION SHOWN TO BE USED THROUGH THE TUBE BASE.  
300 MAX. J  
150 MIN. J



PIN RA-6177 PART

1	DRIVE (1)
2	PLATE (1)
3	PIN (1)
4	BASE GROUND
5	BASE GROUND
6	HEATER
7	CATHODE
8	HEATER