REGISTRATION DATA
WESTERN ELECTRIC 5780 MAGNETRON

DESCRIPTION

The 5780 is an integral magnet type tunable magnetron intended for service as a pulsed oscillator capable of operating over a frequency range of 8500 to 9600 megacycles per second. The peak power output is approximately 250 kilowatts and the tube is forced air-cooled.

GENERAL ELECTRICAL DATA

Pre-heat Heater Voltage	20 volts
Pre-heat Heater Current (at 20 volts)	4 ± 0.4 amperes
Minimum Pre-heat Time	180 secs
Heater Cold Resistance	0.5 ohms
Anode-Cathode Capacitance	14 ± 1.5 μμf

MAXIMUM RATINGS, Absolute Values

Heater Voltage	22 volts
Heater Current	4.5 amperes
Heater Surge Current	16.0 amperes
Peak Anode Voltage	40 kv
Peak Anode Current	36 amperes
Average Power Input	600 watts
Duty Cycle	.001
Pulse Duration	0.30 usec.
Rate of Rise of Anode Voltage	300 kv/usec.
Anode Temperature	100°C

GENERAL MECHANICAL DATA

Mounting Position	May be mounted in any position - see 4 hole mounting plate in Fig. 1.
Net Weight	16 pounds
Cooling Data	
To limit rise in body temperature to 50°C for a dissipation of 450 watts	20 cfm
Coupling Between Tube and Load	Waveguide Choke
Input Connection	See Footnote A
Output Connection	See Footnote B

The output section is coupled to RG-51/U waveguide by means of a standard waveguide flange.

from JEDEC release #870A, Sept. 21, 1959

Note A: The coaxial cathode input connector shall utilize a heater shunt capacitor in close proximity to the cathode input terminal so as to minimize voltage surges which could damage the heater. See Figure 1.

Note B: A connection has been provided to the "arc quencher" wire, by means of a standard grid cap. When wired into the appropriate voltage supply and relay circuitry an arc across the output window, caused by RF voltage breakdown in the waveguide load, can be extinguished by automatically turning off the applied pulse voltage momentarily. The effect of the quencher is to protect the output window from "suck in" when such an arc is permitted to run.

TYPICAL OPERATING CONDITIONS

Frequency	8500 to 9600 Mc
Peak Anode Voltage	
At 8500 Mc	33 ± 1 KV
At 9600 Mc	35 ± 1 KV
Pulling Factor (VSWR 1.5/1)	16 Mc

TYPICAL OPERATION

#	Ef V	If A	Ib mA	epy kv	Pi W	Du	tp µsec.	rrv kv/µs
1.	13.0	3.1	9.5	36	340	.00033	0.24	200
2.	14.5	3.4	4.9	36	175	.00020	0.20	210
3.	11.0	2.3	14.5	36	520	.00072	0.18	160

The data on lines #1, #2 and #3, shown under "Typical Operation" caption, each constitute a satisfactory set of simultaneous operating conditions. Fig. 2 shows typical satisfactory pulse shapes for these, observed when using a Line Type Modulator.

OPERATING DATA

These data are embodied in the following set of figures. A family of curves are shown which represent the spread in range of the tube as manufactured. Data involving VSWR have been carried beyond the 1.5 test value for information purposes only.

Figure 3 This is a plot of required filament current and anode cooling air versus applied average anode power input.

These data were taken under single and simple multiple pulse conditions and it is anticipated that some deviation may occur when complex multiple group pulse conditions are employed.

Figure 4 This is a plot of tuning dial reading versus frequency. It is assumed that thermal equilibrium has been obtained at each of the calibrated points.

Figure 5 This is a plot of both applied peak anode voltage and overall operating efficiency versus peak anode current. The recommended operating range of voltage, current, and efficiency are indicated as a guide within which satisfactory operation is expected. These data were taken at 9100 mc. For lower frequencies the spread will decrease, for high frequencies the spread will increase.

Figure 6 This is a plot of percent of power output change from matched load conditions one can obtain by varying the phase of a 1.5 and a 2 VSWR from sink to anti-sink.

The nominal match curve is obtained relative to the frequency tuning band by equating the output at each frequency point against the power output at 8500 mc. Therefore the change due to load mismatch and phase is that difference between the nominal line and the appropriate sink or anti-sink line at any associated frequency point.

Figure 7 This is a plot of frequency pulling relative to VSWR and represents the greatest variations wherever encountered in the full frequency tuning band.

Figure 8 This is a plot of "phase of sink" vs frequency.

Figure 9 This is a plot of long line relationships vs line length for the specific case of 16 mc pulling which is the 5780 maximum specification limit.

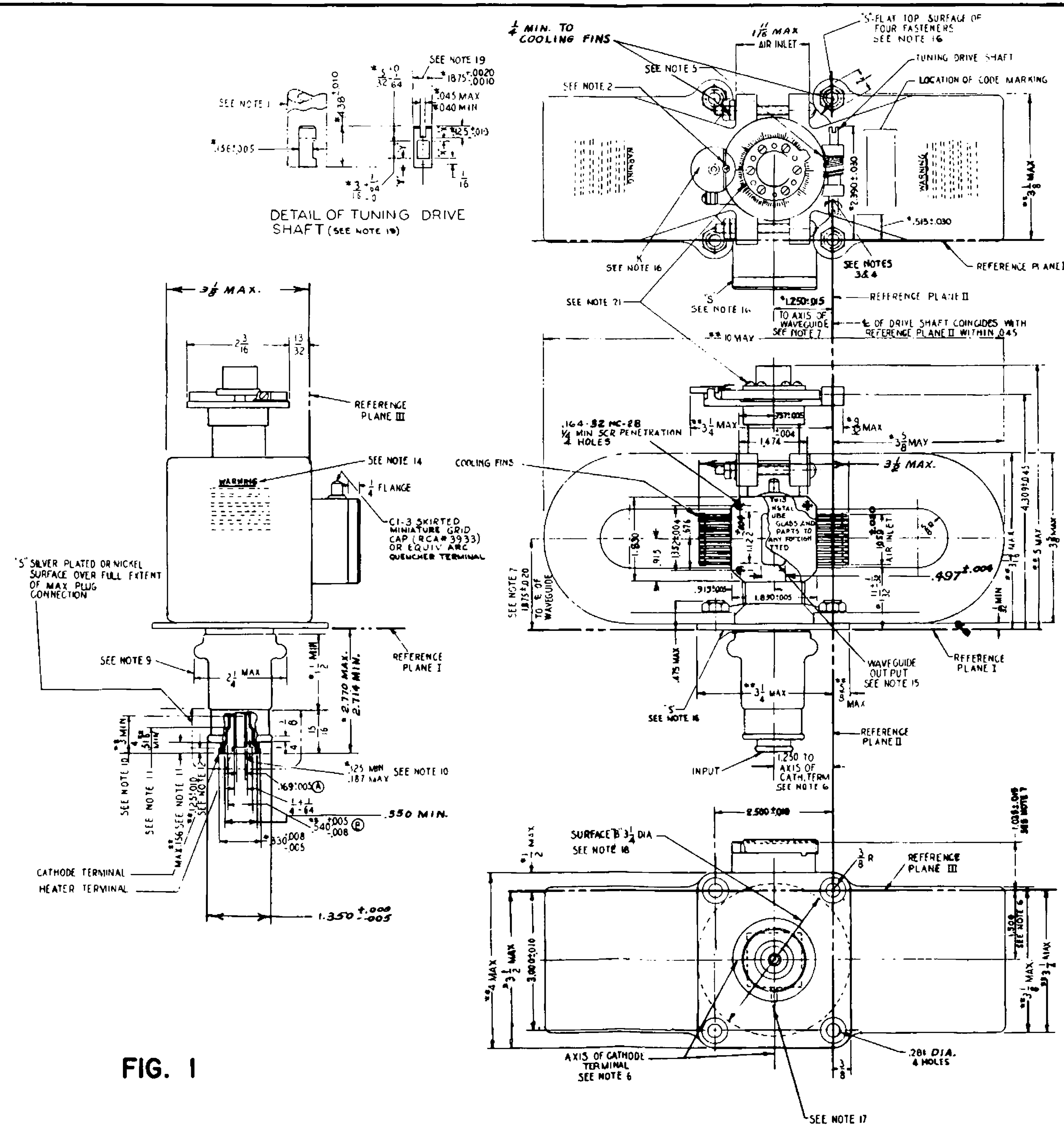


FIG. 1

Notes:

1. A sleeve .195 I.D. X .406 O.D. X 1 inch long shall pass over ends of drive shaft as far as face of worm bracket.

2. The number on the geneva appearing through the hole in the geneva cover indicates complete revolutions of the gear from zero to six. The number on the gear is to be read directly opposite hole position in the geneva cover. The tube is so adjusted that with the geneva set at "0" the upper frequency limit occurs between 0.5 and 2.5 on the gear setting. To obtain the correct value it is necessary to operate the tube for at least 20 minutes under oscillator at full input per PCG-951.

3. The frequency increases when drive shaft is driven in direction indicated by arrow shown in top view.

4. Complete frequency range is covered in not more than 180 nor less than 150 turns of drive shaft.

5. The tuning mechanism shall operate smoothly over the entire mechanical range when subjected to torque of 6 inch ounces max. applied at the drive shaft. In equipment, no less than 6 inch ounces nor more than 3 inch-pounds shall be applied at drive shaft.

6. The axis of the cathode terminal shall be within a radius of 3/64 of specified location.

Note 7 Applies.

7. The limits on location of waveguide output and cathode terminal include angular as well as lateral deviations.

8. With a pressure of 30 PSI applied at the waveguide output the leak rate of the external choke and the arc suppressor shall not exceed 0.1 cubic inches per minute.

9. Any portion of the assembly extending below reference plane 1 shall be within a 1-3/16 inch radius of the specified axis of the input.

10. These dimensions define the extremities of the cylindrical section given by the "A" dimension.

11. These dimensions define the extremities of the cylindrical section given by the "B" dimension.

12. No clamping means to bear beyond this dimension.

13. The heater terminal shall be concentric with the cathode terminal within .010.

14. Warning

Maintain minimum clearance of 2 inches between this magnet and magnetic materials. (Magnets, Steel tools, plates, etc.).

15. The opening of the waveguide shall be enclosed by a dust cover when tube is not in use.

16. All metal surfaces covered by gray finish except those marked S and drive and stop mechanism (K).

17. Exhaust tubulation cover shall not extend beyond plane of defined by mounting plate edge.

18. With the 3-1/4 dia. resting on a plane surface, coincident with reference plane 1. A .010 gauge 1/8 wide shall not enter and areas of the base plate outside the 3-1/4 dia. shall be within .010 of the plane surface.

19. The .1875 $^{+.002}_{-.001}$ dia. does not necessarily apply to the part of the tuning drive shaft, between the slot and the keyway designated "X-X", and to the 1/16" wide strip adjacent to the keyway towards the middle of the shaft designated "Y-Y". These parts of the shaft may be slightly less than the .1875 $^{+.002}_{-.001}$ dia. to obtain better deburring, but may not be larger than the .1875 $^{+.002}_{-.001}$ diameter.

20. Dimensions with a single asterisk (*) denote design test. Dimensions with a double asterisk (**) denote qualification approval.

21. Geneva stop + RH Brass machine screws are optional.

TOLERANCE UNLESS OTHERWISE INDICATED
FRACTIONAL ± 1/64
DECIMAL ±.005

TYPICAL 5780 PULSES

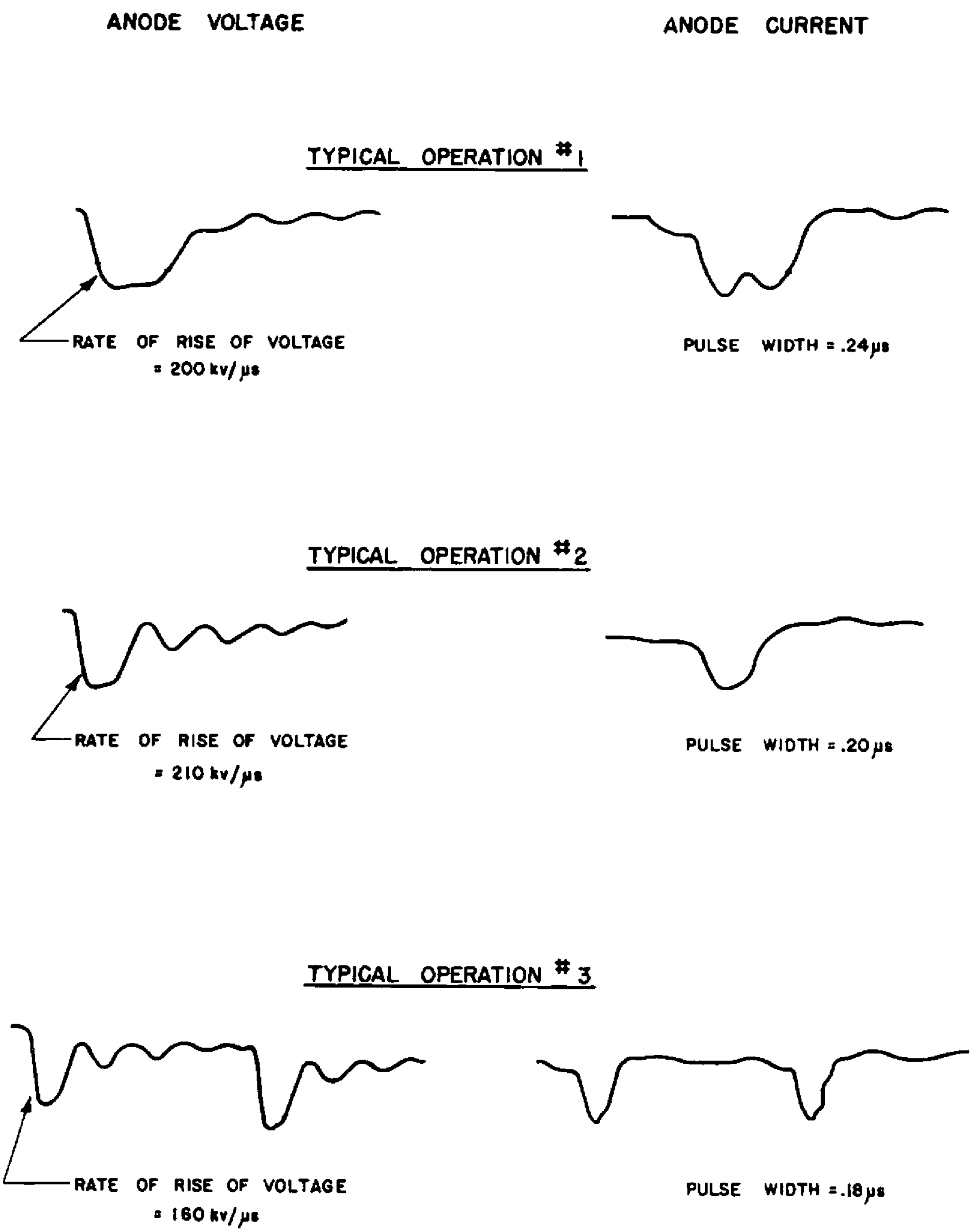


FIG. 2

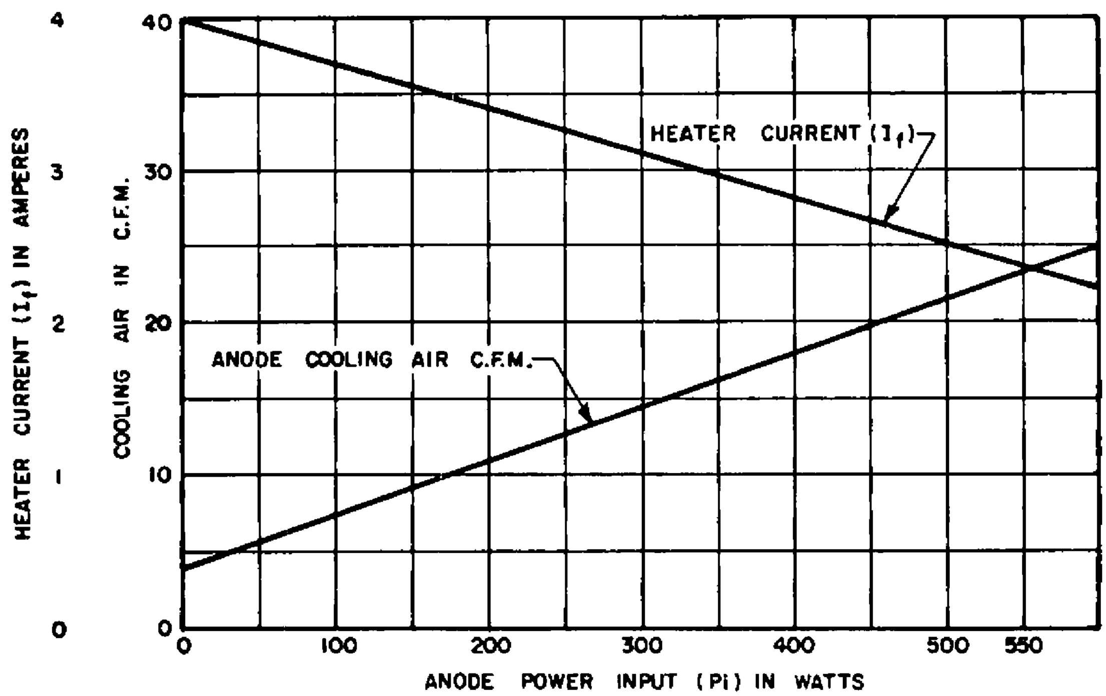


FIG. 3

NOTE: The air cooling information plotted in Figure 3 above is based on a maximum rise in magnetron body temperature of 50°C above a maximum ambient of 50°C with an anode dissipation of 450 watts.

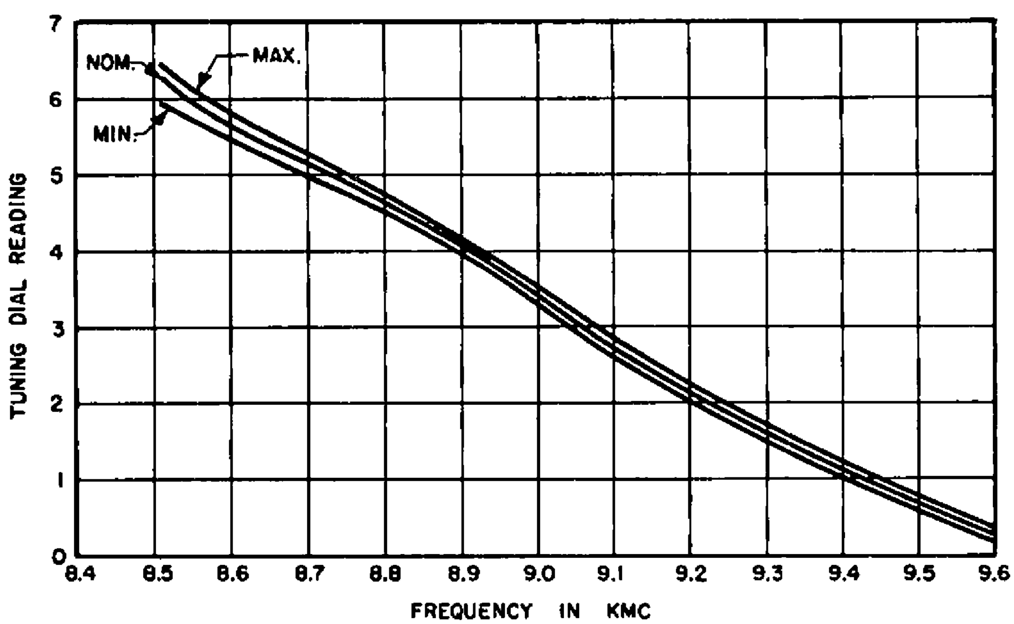


FIG. 4

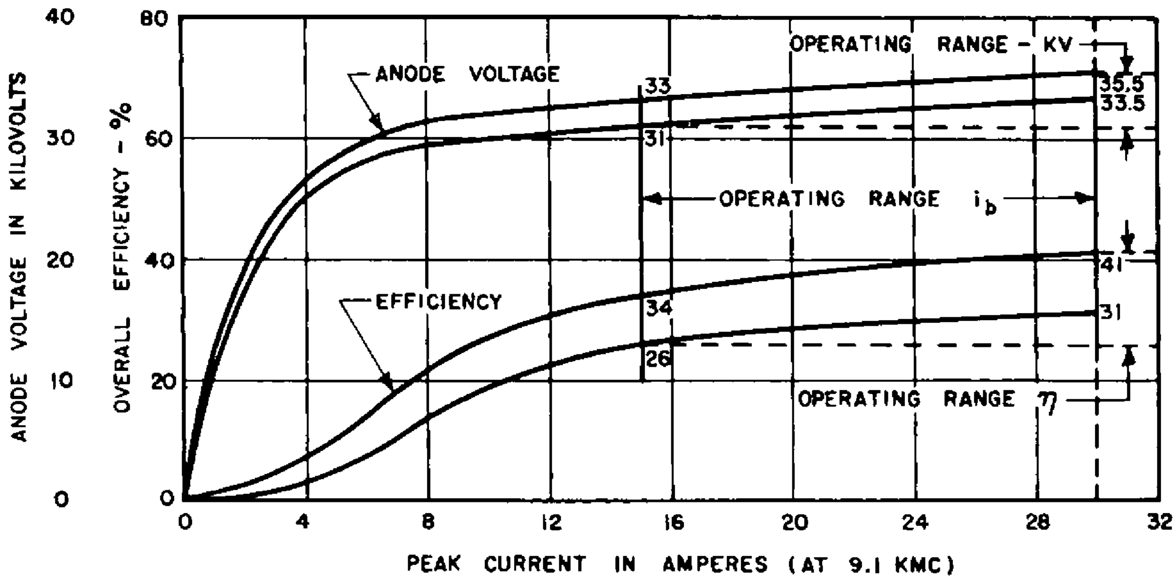

ANODE VOLTAGE IN KILOVOLTS
OVERALL EFFICIENCY - %
ANODE VOLTAGE
EFFICIENCY
OPERATING RANGE - KV
OPERATING RANGE i_b
OPERATING RANGE η
33
31
34
26
35.5
33.5
41
31
PEAK CURRENT IN AMPERES (AT 9.1 KMC)

FIG. 5

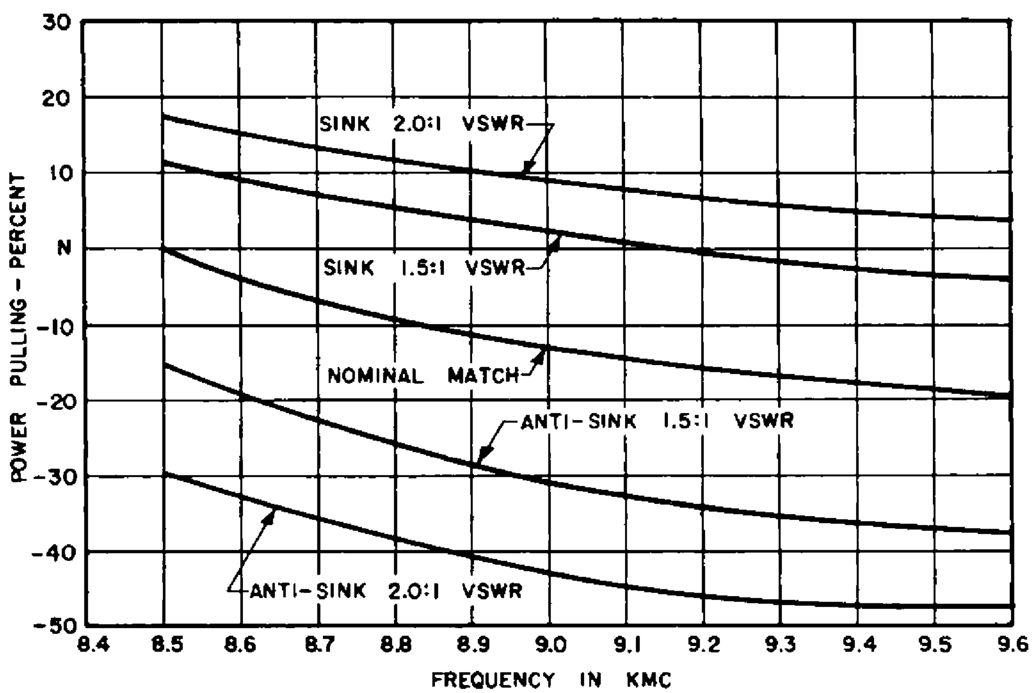
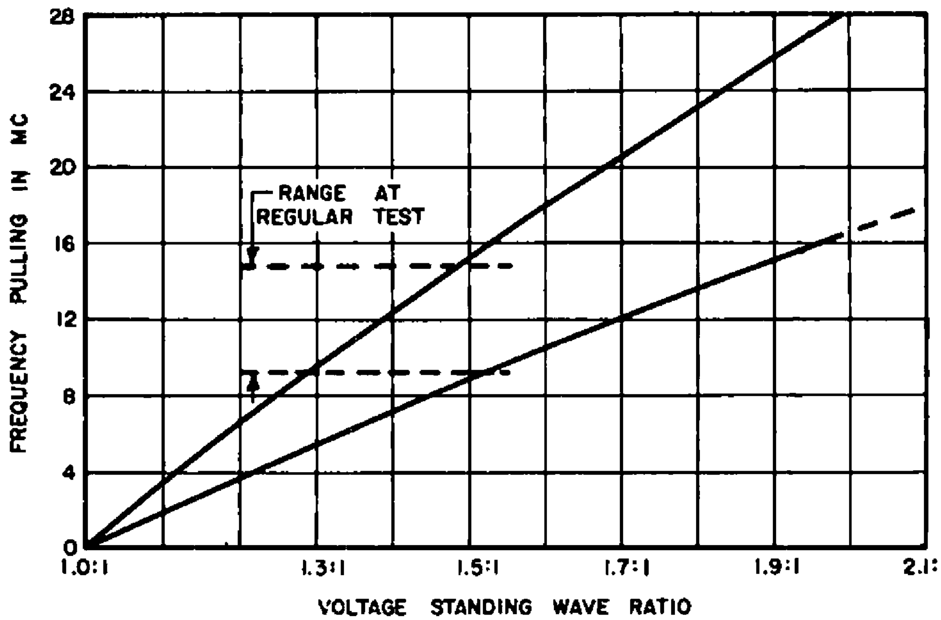
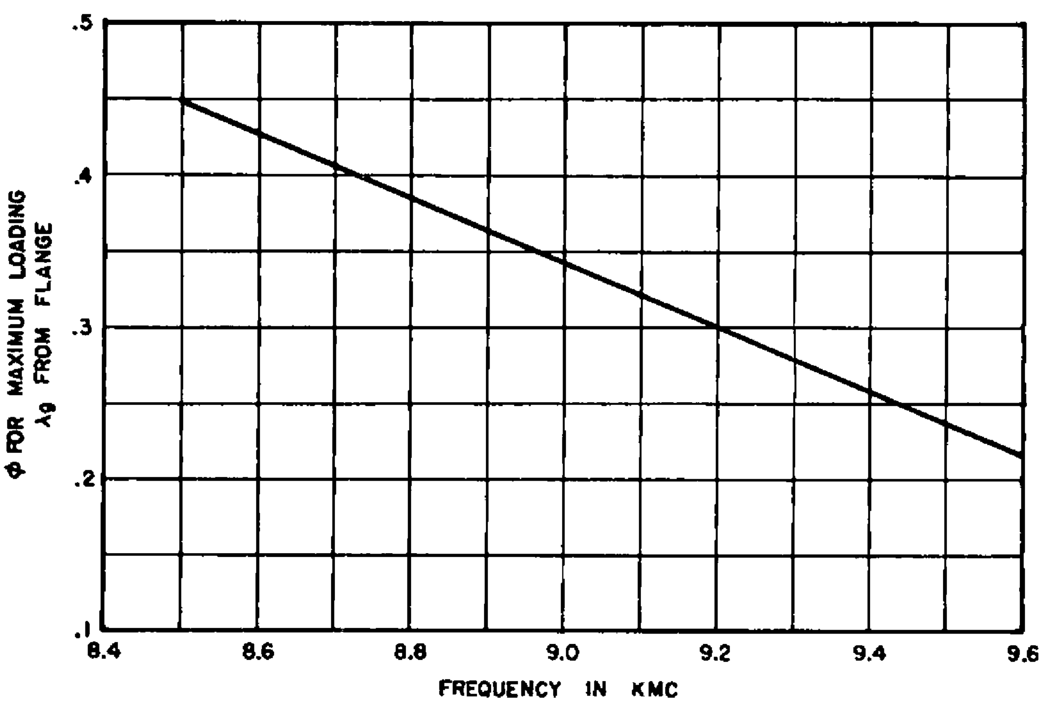

POWER PULLING - PERCENT
SINK 2.0:1 VSWR
SINK 1.5:1 VSWR
NOMINAL MATCH
ANTI-SINK 1.5:1 VSWR
ANTI-SINK 2.0:1 VSWR
FREQUENCY IN KMC

FIG. 6



28
24
20
16
12
8
4
0
FREQUENCY PULLING IN MC
RANGE AT
REGULAR TEST
1.0:1
1.3:1
1.5:1
1.7:1
1.9:1
2.1:1
VOLTAGE STANDING WAVE RATIO

FIG. 7



.5
.4
.3
.2
.1
ϕ FOR MAXIMUM LOADING
λg FROM FLANGE
8.4
8.6
8.8
9.0
9.2
9.4
9.6
FREQUENCY IN KMC

FIG. 8

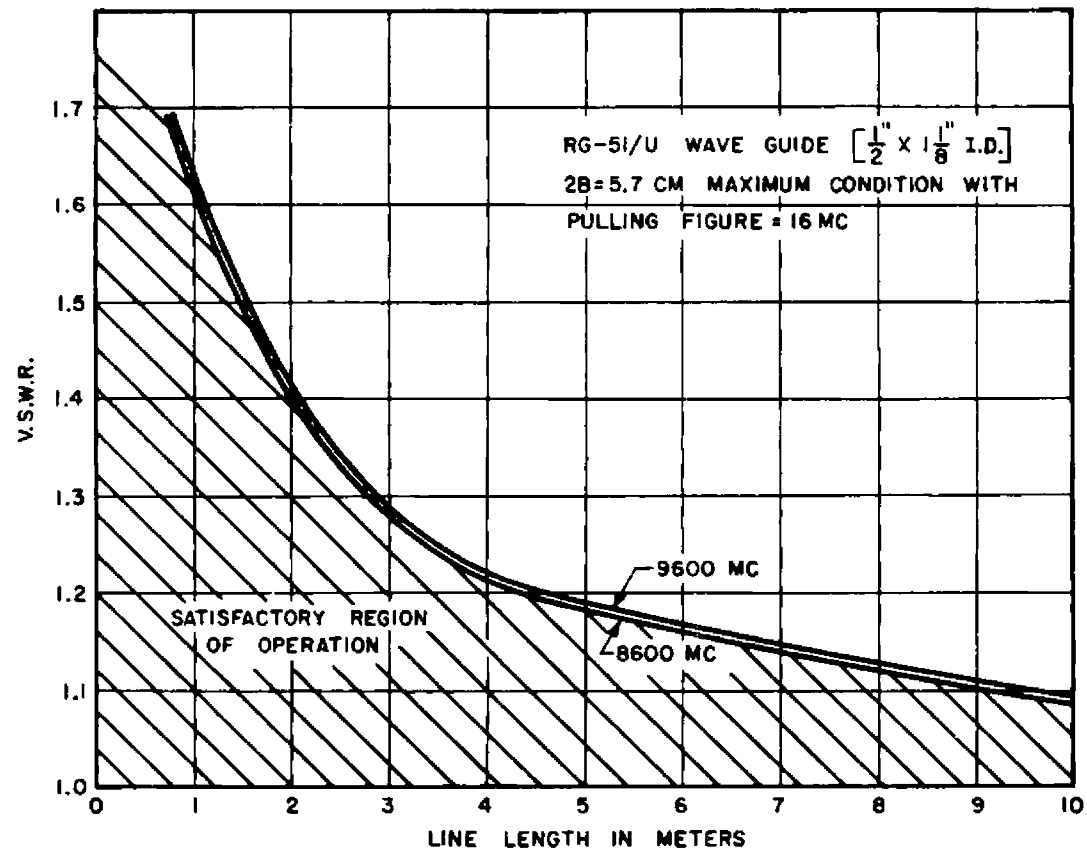

RG-51/U WAVE GUIDE [1/2" X 1 1/8" I.D.]
2B = 5.7 CM MAXIMUM CONDITION WITH
PULLING FIGURE = 16 MC
9600 MC
8600 MC
SATISFACTORY REGION
OF OPERATION
V.S.W.R.
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0
1
2
3
4
5
6
7
8
9
10
LINE LENGTH IN METERS

FIG. 9