Velocity Modulated Oscillator

Code: V246A/1K (CV228)

The V246A/1K is a velocity-modulated oscillator of the coaxial line type for operation in the frequency band 4400 to 4850 Mc/s.

CATHODE

Indirectly-heated, oxide-coated		
Heater voltage	6.3	V
Nominal current	0.3	A
(A.C. frequencies above 60 c/s must not be used)		

DIMENSIONS

Maximum overall length	89	mm
Maximum bulb diameter	19.8	mm
Base	B7G	
Net weight	22.5	g

MOUNTING

The valve is designed to mount by means of the resonator disc so that the antenna couples into a suitable tuning circuit.

MAXIMUM RATINGS

Maximum mean input power to all electrodes, other than the heater	18	W
Maximum direct cathode current	65	mA
Maximum peak cathode current	0.5	A
Maximum direct screen voltage	400	V
Maximum screen dissipation	1.5	W

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TYPICAL OPERATING CONDITIONS

Oscillator in the frequency range 4400 to 4850 Mc/s

Grid voltage (V_{g1})

20 volts negative with respect to cathode. The use of bias improves the proportion of cathode current which passes through the resonator and reaches the anode. See Figure 6 for a sketch of the electrode assembly.

Resonator voltage (V_{res})

225 ± 5 per cent at 4650 Mc/s. For other frequencies the resonator voltage is approximately proportional to the square of the frequency. See Figure 1.

Screen voltage (V_{g2})

Zero to V_{res} + 50 volts. Adjusted to obtain the appropriate value of cathode current (65 mA).

Screen current (I_{g2})

Not greater than 5 mA.

Anode voltage (V_a)

10 to 20 volts positive with respect to resonator.

PERFORMANCE

This valve should be operated in a tuning circuit as shown in Figure 7, and the resonator voltage and load coupling adjusted for maximum output. With a cathode current of 65 mA, a minimum output of 450 mW at 4650 Mc/s should be obtained. A typical curve of power output versus frequency is shown in Figure 2.

It is possible to operate the valve in a high voltage mode under pulse conditions. The resonator voltage will be 800 volts at 4650 Mc/s, and the starting time will be about 1 microsecond. The maximum mean input power is 18 watts and the peak input power is limited by the maximum peak cathode current of 0.5 ampere.

Under these conditions the peak output power will be in the region of 20 to 30 watts.

CIRCUIT

A sketch of a suitable tuning circuit is given in Figure 7 ; a typical curve of circuit length L_e versus frequency is given in Figure 3.

UNLOADED STARTING CURRENT

The anode current at which oscillations just start, when the valve is loaded only by the circuit, is referred to as the " unloaded starting current ", and serves as a useful measure of the efficiency of the

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tuning circuit. In Figure 4 the unloaded starting current for a typical valve is plotted as a function of frequency using the recommended circuit.

To illustrate the importance of good circuit construction a curve of power output versus the unloaded starting current of the valve circuit combination is given in Figure 5.

OUTPUT COUPLING.

The output power can be obtained from two coupling positions. The use of a probe in the end wall of the circuit, as shown at A in Figure 7, or the use of a loop in the side wall of the circuit, as shown at B, have been found satisfactory. Adjustment of probe penetration or loop rotation will usually be necessary when tuning over the frequency band.

OUTPUT MODULATION.

(*a*) Amplitude modulation.

The voltage required is dependent both upon the particular operating conditions, and the loading of the valve. For 100 per cent modulation it is only necessary to reduce the anode current to a value below the starting current of oscillation.

Modulation of either the grid (g_1) or the screen (g_2) is permissible. For the screen, however, positive modulating voltages are necessary, and, since the screen takes current, adequate modulation power should be provided.

(*b*) Frequency modulation.

The amount of frequency modulation obtainable by variation of the resonator voltage is about $\pm$ 8 Mc/s between half power points at 4650 Mc/s.

MAGNET AND MAGNET ALIGNMENT.

A permanent magnet is used to focus the electron beam. The recommended magnet is Jessop Type No. 10512, but any magnet giving a uniform field of approximately 1200 oersteds over a 22 mm gap can be used. The magnet must be aligned so that the best ratio of anode current to cathode current is obtained. (See Figure 6.) Three holes are punched in the valve disc and locate on pins fixed to the valve clamping plate. Once the magnet has been aligned, and has been securely clamped with respect to the locating pins, no further adjustment will be necessary when replacing valves. It is recommended that at least three, and preferably six, valves are used to establish the initial alignment of the magnet.

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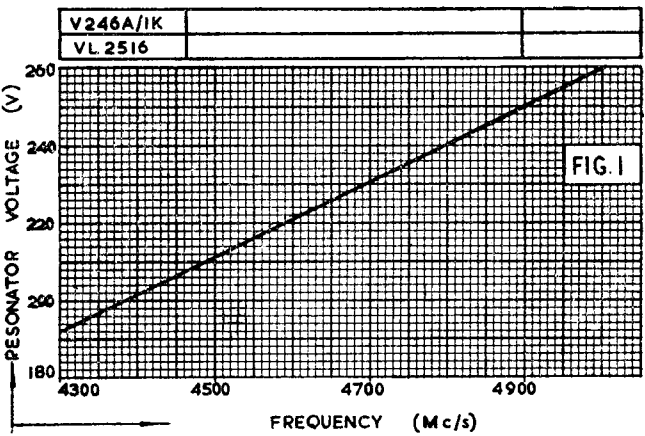

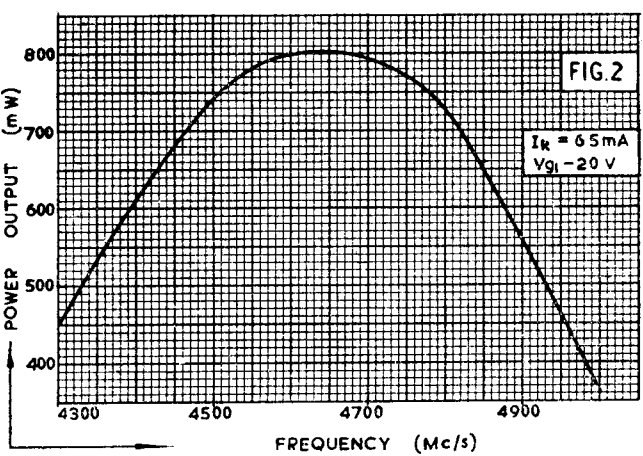

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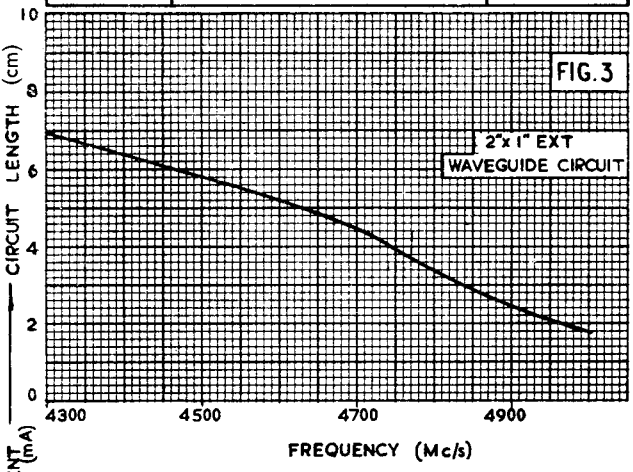

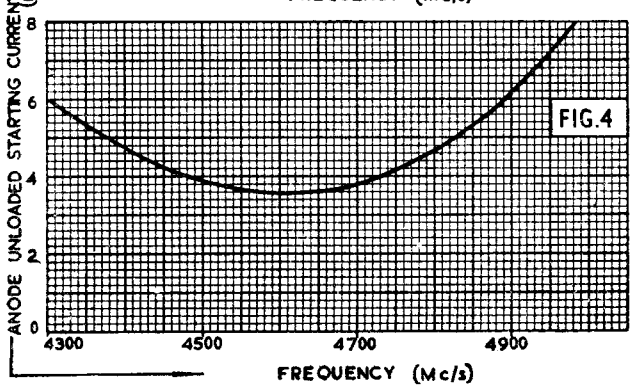

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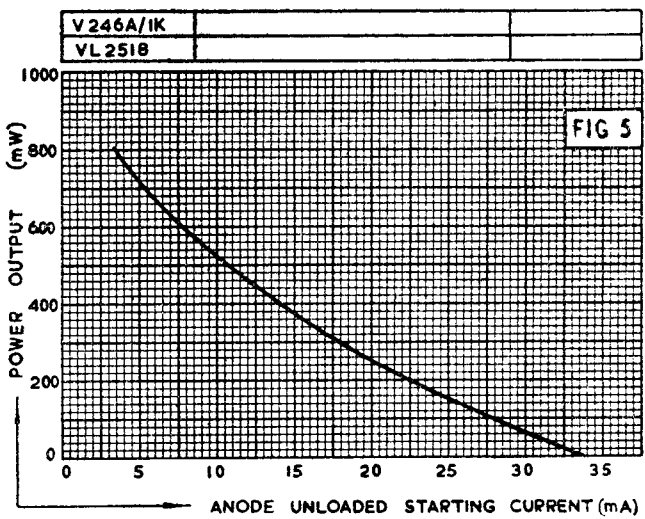

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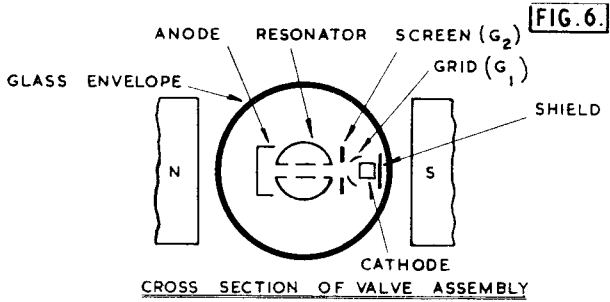
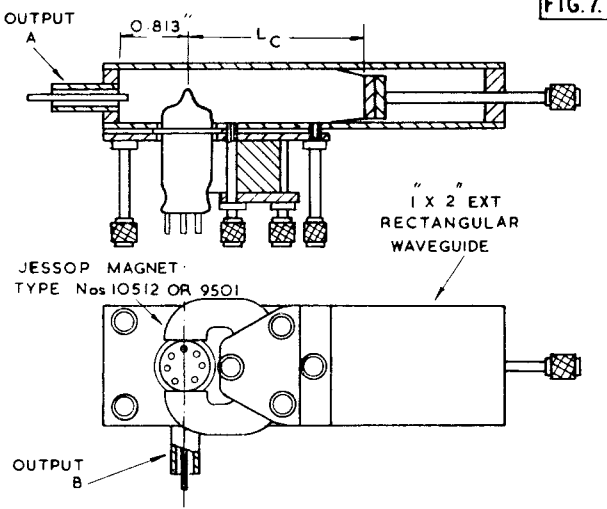
FIG.6.



CROSS SECTION OF VALVE ASSEMBLY

FIG.7.



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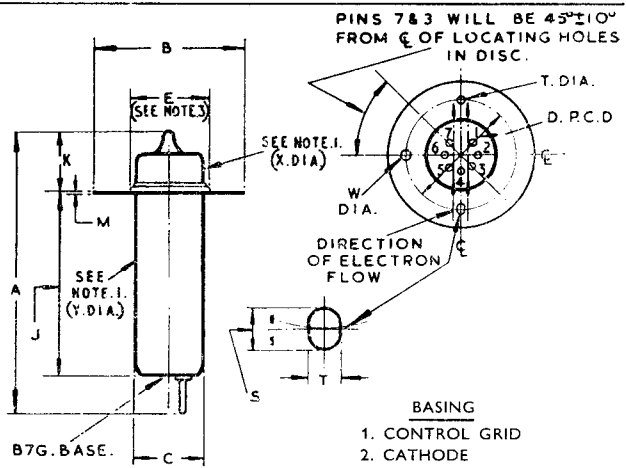

BASING

1. CONTROL GRID
2. CATHODE
3. HEATER
4. HEATER
5. ANODE
6. RESONATOR
7. SCREEN GRID

NOTE. 1. THIS PORTION OF BULB WILL NOT FOUL A CYLINDER OF INT. DIA. SPECIFIED WHICH IS CONCENTRIC WITH THE PITCH CIRCLE OF THE LOCATING HOLES IN THE DISC.

DIM	MILLIMETRES	INCHES	DIM	MILLIMETRES	INCHES
A	89 MAX.	$3\frac{1}{2}$ MAX.			
B	42 MAX.	1.65 MAX.			
C	19.81 MAX.	0.78 MAX.	S	$3.2^{+0.13}_{-0.00}$	$0.125^{+0.005}_{-0.000}$
D	30.96 ± 0.06	1.218 ± 0.002			
E	24 MAX.	0.94 MAX.	T	$2.36^{+0.06}_{-0.00}$	$0.093^{+0.002}_{-0.000}$
J	55.6 ± 4	$2\frac{3}{16} \pm \frac{5}{32}$			
			W	$2.79^{+0.13}_{-0.00}$	$0.110^{+0.005}_{-0.000}$
K	23 MAX.	$\frac{29}{32}$ MAX.			
M	0.3 MAX.	0.012 MAX.			

NOTE 2:—BASIC FIGURES ARE IN.
NOTE 3:—ALSO MIN. CLAMPING DIA.

X	21.59 MIN.	0.850 MIN.
Y	20.07 MIN.	0.790 MIN.

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