Velocity-Modulated Oscillator

Code: V190C/1M

The V190C/1M is a coaxial-line velocity-modulated oscillator for C.W. operation in the frequency range 800 to 1 000 Mc/s.

CATHODE.

Indirectly heated, oxide coated		
Heater voltage	6.3	V
Nominal current	1	A
(A.C. frequencies above 60 c/s must not be used)		

DIMENSIONS.

Maximum overall length	114.3	mm
Maximum bulb diameter	31.8	mm
Base	B8G	
Net weight	75	g

MOUNTING.

This valve is designed to mount by means of the resonator disc in a suitable tuning circuit.

MAXIMUM RATINGS.

Maximum mean input power to all electrodes other than the heater	25	W
Maximum direct cathode current	100	mA
Maximum direct screen voltage	400	V
Maximum direct screen dissipation	2	W
Maximum bulb temperature	250	°C

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TYPICAL OPERATING CONDITIONS.

Oscillator in the frequency range 800–1 000 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 7 for a sketch of the electrode assembly.

Resonator Voltage.

A typical curve of resonator voltage versus frequency is shown in Figure 1.

Cathode Current.

This is dependent on the output power required from the valve and should be kept as low as possible to obtain the maximum life from the valve. A typical value is 80 mA, for which greater than 70 mA anode current should be obtained and an output power of greater than 2 watts over the band.

Screen Voltage (V_{g2}).

Zero to V_{res} +50 volts. Adjusted to give the desired operating cathode current. A typical value for a cathode current of 80 mA at a frequency of 900 Mc/s is 110 volts. Where the valve is intended for use in unattended equipment, the screen voltage should be adjusted automatically so as to keep the cathode current approximately constant.

Screen Current (I_{g2}).

Not greater than 5 mA.

Anode Voltage (V_a).

This may be maintained at the same voltage as the resonator.

Output Power (P_o).

Not less than 2 watts over the frequency range 800–1 000 Mc/s with a cathode current of 80 mA and the load adjusted for maximum output. A typical curve of output power versus frequency is shown in Figure 2. The variation of output power with anode current at a frequency of 900 Mc/s is shown in Figure 3.

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MODULATION.

Frequency modulation may be obtained by variaticn of the drift tube voltage (the drift tube is connected to the centre conductor of the tuning circuit), and is greater than $\pm$ 2 Mc/s between half-power points for a cathode current of 80 mA when the load has been adjusted to give maximum output power.

A capacitor must be built into the centre conductor of the tuning circuit to allow modulation of the drift tube voltage, as shown in Figure 8.

The drift tube current will be a maximum of 10 mA if the valve is correctly aligned in the magnet and the modulation–sensitivity is about 50 kc/s per volt. The d.c. drift tube voltage must, of course, be maintained equal to the resonator voltage.

Amplitude modulation can be obtained by variation of either control grid (g_1) or screen grid (g_2) voltages.

CIRCUIT.

A sketch of a suitable circuit is shown in Figure 8. The frequency of oscillation is a function of circuit length L_C. A typical curve of circuit length versus frequency is shown in Figure 4. Care must be taken to see that the centre-conductor is maintained concentric with the outer conductor at all tuning piston positions to avoid damage to the valve.

OUTPUT COUPLING.

The specified output power is obtained over the range 800–1 000 Mc/s by means of the coupling loop, as shown in Figure 8. Satisfactory loading of the valve into 70 ohm cable is obtained but adjustment is required to loop penetration or rotation as the valve is tuned over the frequency band.

UNLOADED STARTING CURRENT.

The anode current at which oscillation just starts, 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 quality of the tuning circuit. A typical curve of unloaded starting current versus frequency for the circuit of Figure 8 is shown in Figure 5. The importance of good quality circuit construction is illustrated in Figure 6, which shows the output power obtained at 900 Mc/s, with a cathode current of 70 mA, as the unloaded starting current is varied.

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MAGNET AND MAGNET ALIGNMENT.

A permanent magnet is used to focus the electron beam. A suitable magnet is made by Jessops to their sketch No. SK625, but any magnet giving a uniform field of approximately 1 200 oersteds over a 32 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 7). 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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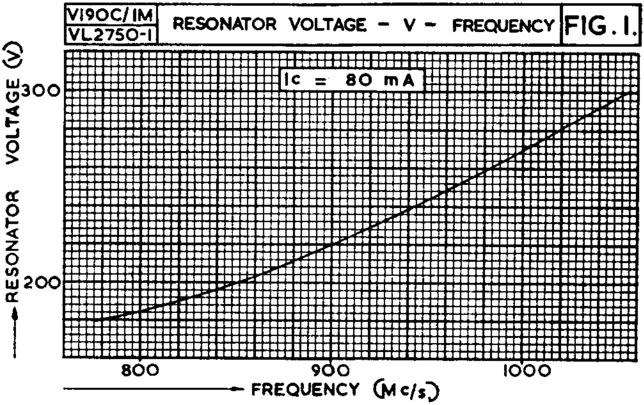

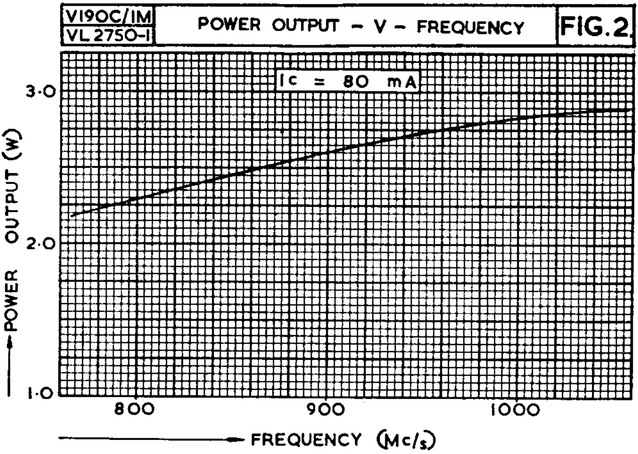

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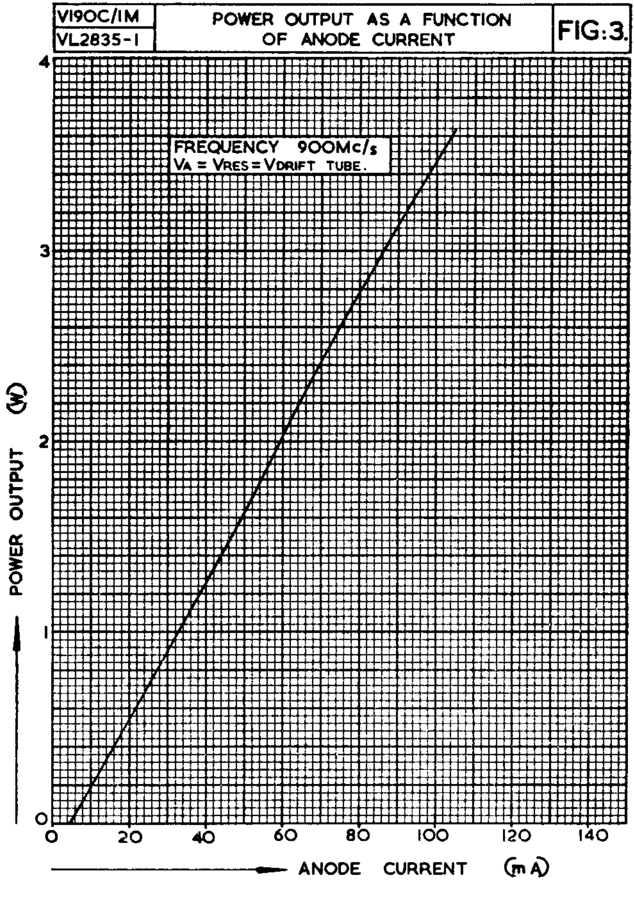

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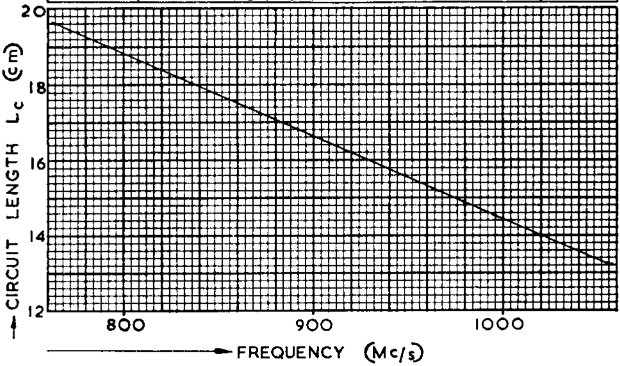
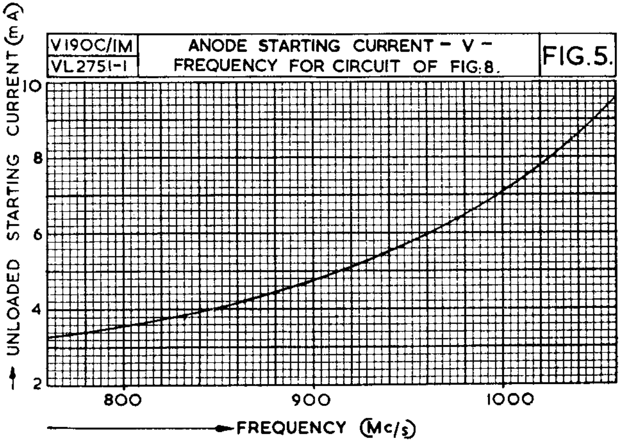
V190C/1M VL2751-1	CIRCUIT LENGTH – V – FREQUENCY FOR CIRCUIT OF FIG: 8.	FIG. 4.



V190C/1M VL2751-1	ANODE STARTING CURRENT – V – FREQUENCY FOR CIRCUIT OF FIG: 8.	FIG. 5.



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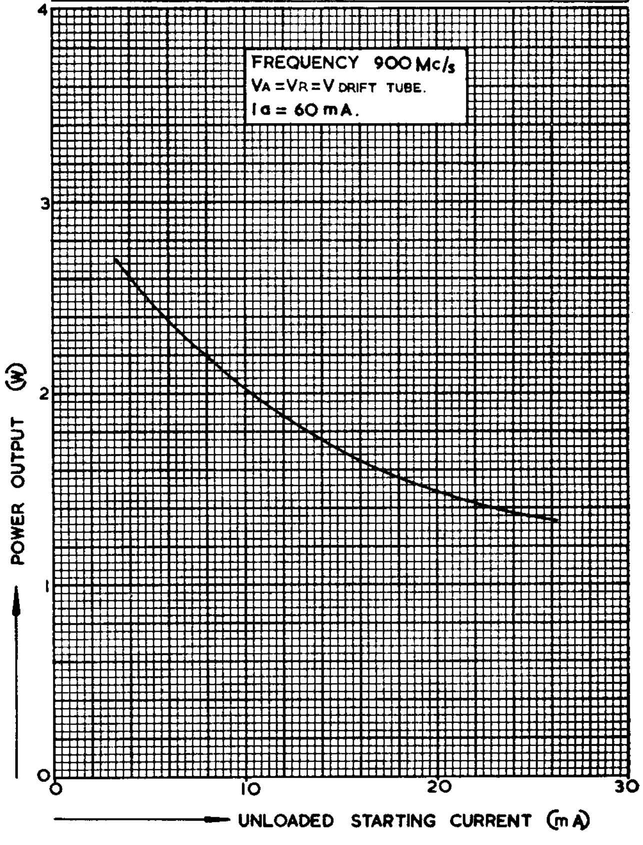
V19OC/IM.	POWER OUTPUT AS A FUNCTION OF UNLOADED STARTING-CURRENT.	FIG:6.
VL 2836-1.		



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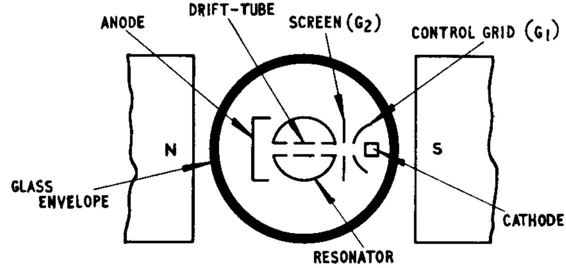

CROSS SECTION OF VALVE ASSEMBLY FIG. 7

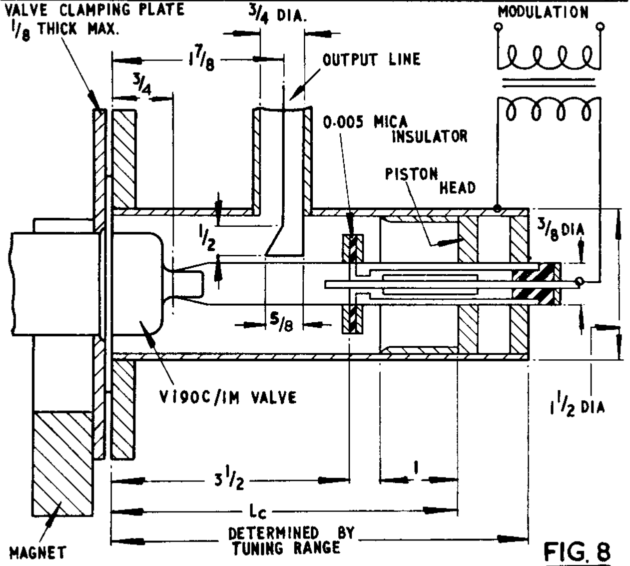

FIG. 8

Ref.: V190C/1M

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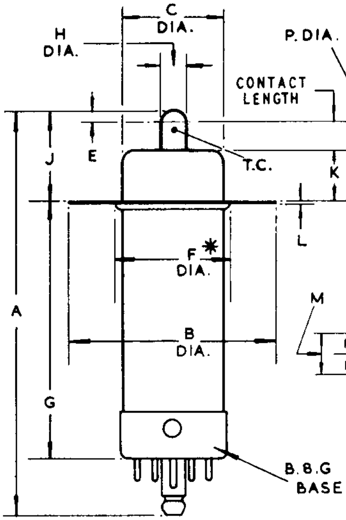

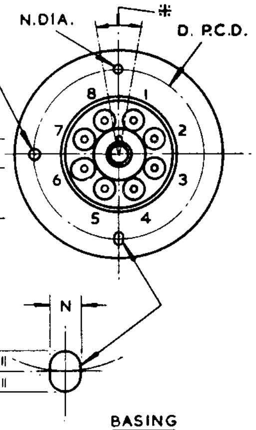

BASING

1. HEATER.
2. CATHODE.
3. RESONATOR.
4. SCREEN GRID.
5. NO CONNEXION.
6. ANODE
7. GRID.
8. HEATER.

T.C. DRIFT TUBE.

(double-cross) DENOTES:- KEY ON BASE SPIGOT MAY BE ±10° FROM ℄ OF LOCATING HOLES IN DISC.

* DENOTES:- ALSO MIN. CLAMPING DIA.

DIM	MILLIMETRES	INCHES	DIM	MILLIMETRES	INCHES
A	114·3 MAX.	4 1/2 MAX.	K	12·7 $^{+0·0}_{-3·2}$	1/2 $^{+0}_{-1/8}$
B	58·42 MAX.	2·3 MAX.	L	0·30 MAX.	0·012 MAX.
C	31·8 MAX.	1 1/4 MAX.	M	3·2 $^{+0·13}_{-0·00}$	0·125 $^{+0·005}_{-0·000}$
D	46·0 ± 0·06	1·812 ± 0·002			
E	3·2 MAX.	1/8 MAX.	N	2·36 $^{+0·06}_{-0·00}$	0·093 $^{+0·002}_{-0·000}$
F	38·1 MAX.	1 1/2 MAX.			
G	73·0 MAX.	2 7/8 MAX.	P	2·79 $^{+0·13}_{-0·00}$	0·110 $^{+0·005}_{-0·000}$
H	6·81 ± 0·13	0·268 ± 0·005	NOTE:- BASIC FIGURES ARE INCHES		
J	25·4 ± 0·8	1" ± 1/32			