

BACKWARD-WAVE OSCILLATOR

BA9-20

Frequency: 'X' band, electronically tunable.

Power output: 20mW minimum.

Construction: Demountable, prefocused capsule, with d.c. voltage isolation between the output connection and delay structure.

Modulation: Amplitude, pulse or frequency.

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS – MICROWAVE DEVICES: INTRODUCTION and BACKWARD-WAVE OSCILLATORS which precede this section of the handbook.

CHARACTERISTICS

	Min.	Max.	←
Frequency electronically tunable over the range	7.5	12	Gc/s
Delay structure voltage			
$f = 7.5\text{Gc/s}$	380	410	V
$f = 11.5\text{Gc/s}$	1.3	1.5	kV
Sensitivity over frequency range	2.0	10	Mc/s per V
Power output over frequency range	20	—	mW
Grid voltage for maximum output	—	0	V
for zero output	—	-100	V
Signal to noise ratio per c/s of bandwidth	160	—	dB per c/s

CATHODE

Indirectly heated

V_h	6.3	V
I_h	1.7	A
$I_{h(\text{surge})}$ max.	4.0	A

The cathode must be heated for at least 2 minutes before the application of h.t. voltage.

CAPACITANCES

$C_{h,k}$ - all	< 10	pF
C_g - all	< 13	pF
C_a - all	< 6.0	pF
$C_{\text{delay structure}}$ - all	< 8.0	pF

TYPICAL OPERATION

	7.5	9.0	11	←
f				Gc/s
$V_{\text{delay structure}}$	0.39	0.64	1.2	kV
$I_{\text{delay structure}}$	20	21	22	mA
V_a	150	150	150	V
I_a	4.0	4.0	4.0	mA
V_g	0	0	0	V
P_{out}	30	75	75	mW

OPERATING SEQUENCE

See appropriate section in General operational recommendations – microwave devices: backward-wave oscillators.

COOLING

Forced-air.

The cooling air requirements for the tube in the mounts SB-1 and SB-2 are given in the curve on page C3.

When the mount PB-1 is used a minimum flow of cooling air of 3ft³/min. should be directed as shown on the outline drawing on page D3.

T_{mount} max. (at specified point)	120	°C
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ABSOLUTE MAXIMUM RATINGS

$V_{\text{delay structure}}$ max.	1.8	kV
$V_{\text{delay structure}}$ min.	300	V
$P_{\text{delay structure}}$ max.	50	W
I_k max.	35	mA
V_a max.	200	V
I_a max.	10	mA
$+V_g$ max.	0	V
$-V_g$ max.	250	V
$V_{h-k(pk)}$ max.	± 100	V

MOUNTING POSITION

Any

PHYSICAL DATA

Weight (mount only) PB-1	{ 13 5.9	lb kg
SB-1, SB-2	{ 11 5.0	lb kg

OUTPUT CONNECTION

Rectangular waveguide WG16 with screwed ring flange 5985-99-0830003.

ACCESSORIES

Permanent magnet mount	PB-1
Mount with aluminium foil solenoid for operation at low ambient temperatures	SB-1
Mount with aluminium foil solenoid for operation at high ambient temperatures	SB-2

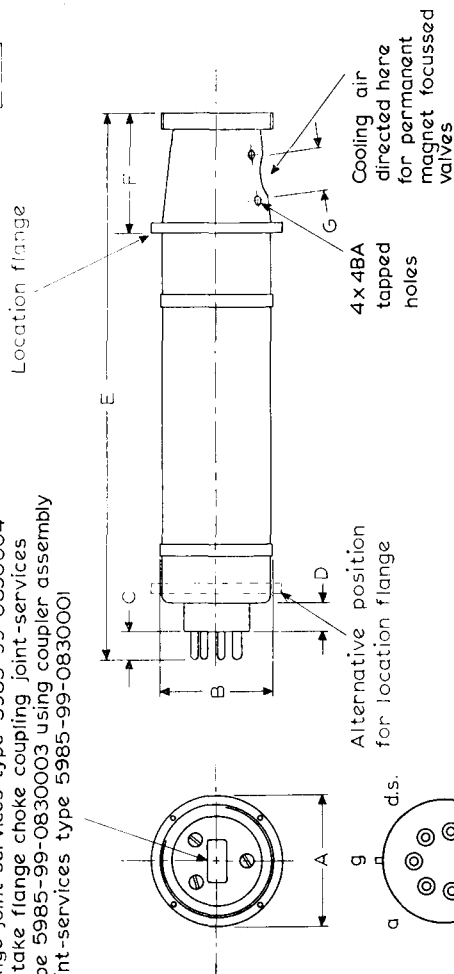
SOLENOID OPERATING CONDITIONS

The three types are intended for constant current operation.

	SB-1	SB-2	
Current	7.5	13	A
Voltage	26	17	V
T_{amb}	25	25	°C
Cooling	Forced-air	Forced-air	

Outlet via waveguide WG16 with screwed ring flange joint-services type 5985-99-0830004 to take flange choke coupling joint-services type 5985-99-0830003 using coupler assembly joint-services type 5985-99-0830001

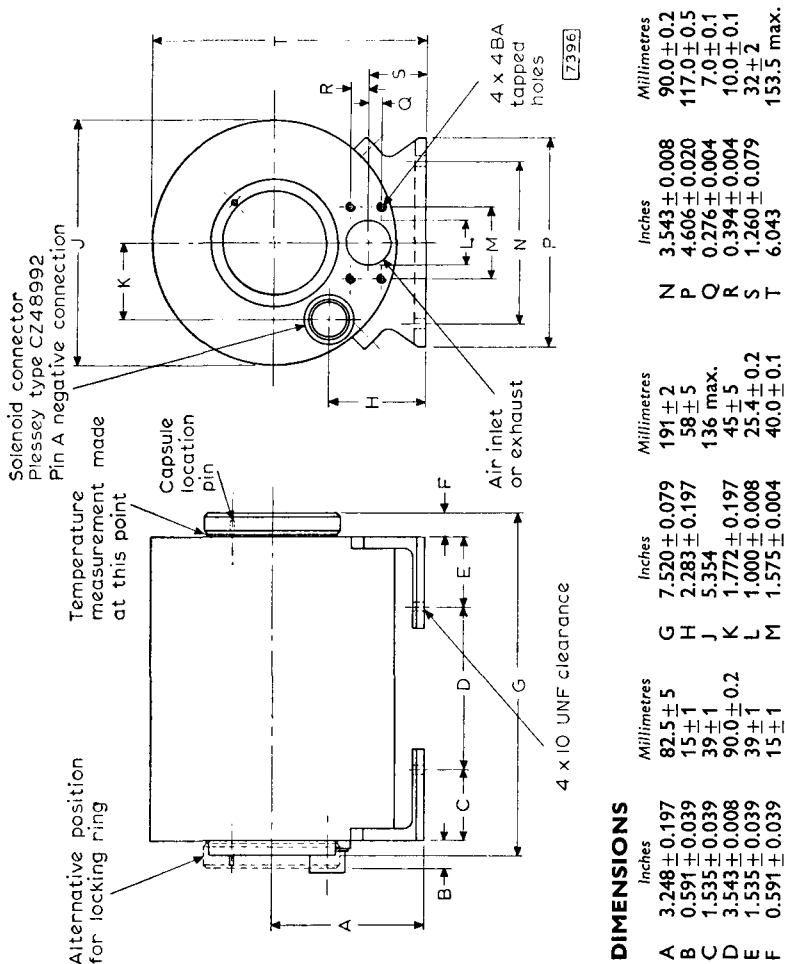
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DIMENSIONS

	Inches	Millimetres
A	2.717 ± 0.020	69.0 ± 0.5
B	2.284 ± 0.002	58.00 ± 0.05
C	0.591	15 max.
D	0.591 + 0.000 - 0.197	15 + 0 - 5
E	11.142 + 0.000 - 0.394	283 + 0 - 10
F	2.461 ± 0.039	62.5 ± 1.0
G	1.000 ± 0.008	25.4 ± 0.2

OUTLINE AND DIMENSIONS OF MOUNTS SB-1 AND SB-2



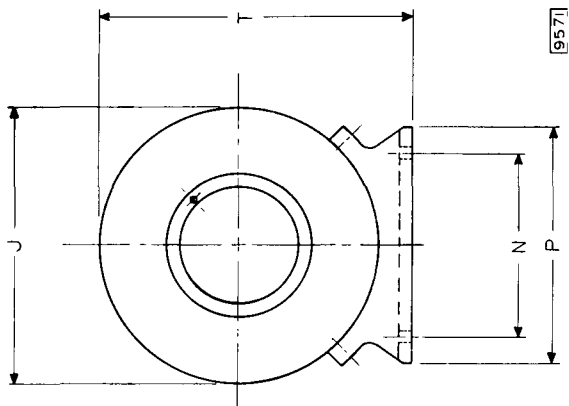
DIMENSIONS

	Inches	Millimetres
A	3.248 ± 0.197	82.5 ± 5
B	0.591 ± 0.039	15 ± 1
C	1.535 ± 0.039	39 ± 1
D	3.543 ± 0.008	90.0 ± 0.2
E	1.535 ± 0.039	39 ± 1
F	0.591 ± 0.039	15 ± 1

	Inches	Millimetres
N	3.543 ± 0.008	90.0 ± 0.2
P	4.606 ± 0.020	117.0 ± 0.5
Q	0.276 ± 0.004	7.0 ± 0.1
R	0.394 ± 0.004	10.0 ± 0.1
S	1.260 ± 0.079	32 ± 2
T	6.043	153.5 max.

	Inches	Millimetres
G	7.520 ± 0.079	191 ± 2
H	2.283 ± 0.197	58 ± 5
J	5.354	136 max.
K	1.772 ± 0.197	45 ± 5
L	1.000 ± 0.008	25.4 ± 0.2
M	1.575 ± 0.004	40.0 ± 0.1

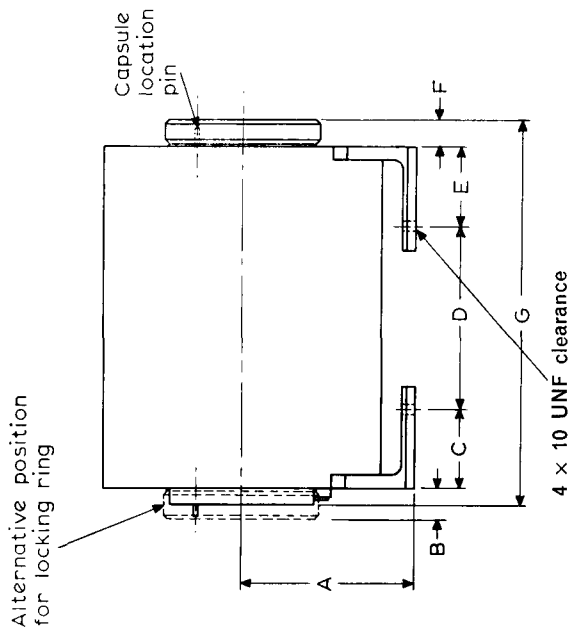
OUTLINE AND DIMENSIONS OF MOUNT PB-1



Millimetres
 191 ± 2
 136 max.
 90 ± 0.2
 117 ± 0.5
 153.5 max.

Inches
 7.520 ± 0.079
 5.354
 3.543 ± 0.008
 4.606 ± 0.020
 6.043

G J N P T

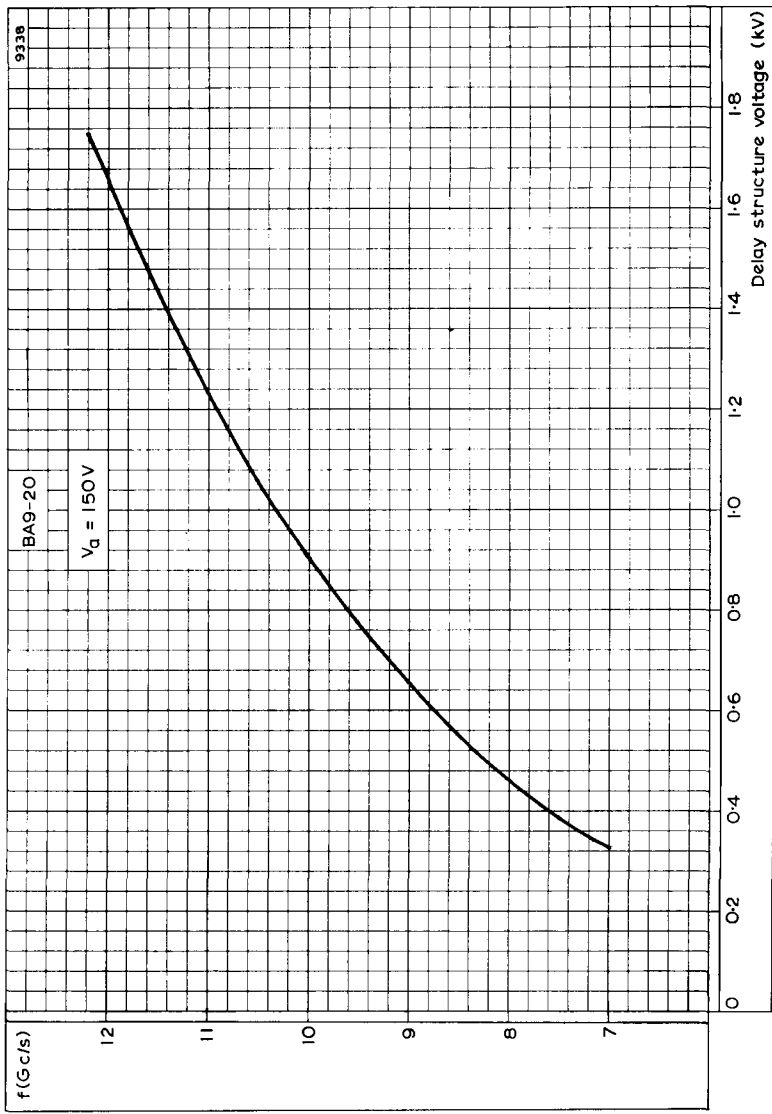


Millimetres
 82.5 ± 5
 15 ± 1
 39 ± 1
 90 ± 0.2
 39 ± 1
 15 ± 1

Inches
 3.248 ± 0.197
 0.591 ± 0.039
 1.535 ± 0.039
 3.543 ± 0.008
 1.535 ± 0.039
 0.591 ± 0.039

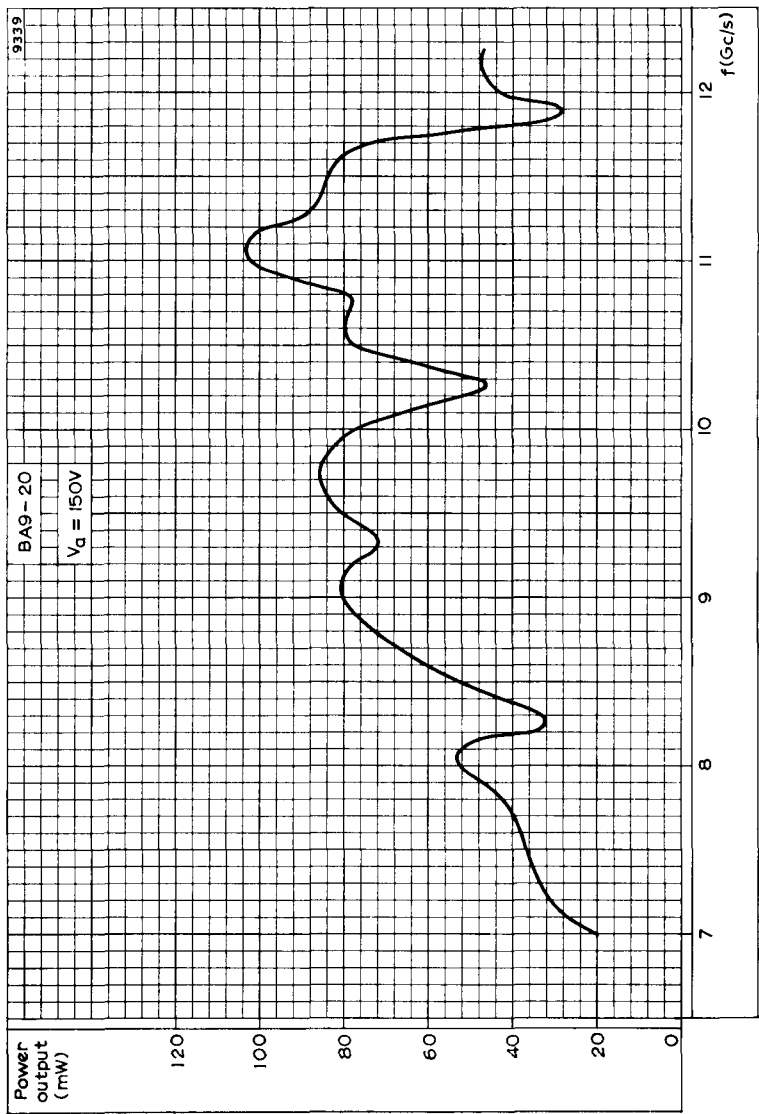
DIMENSIONS

A B C D E F

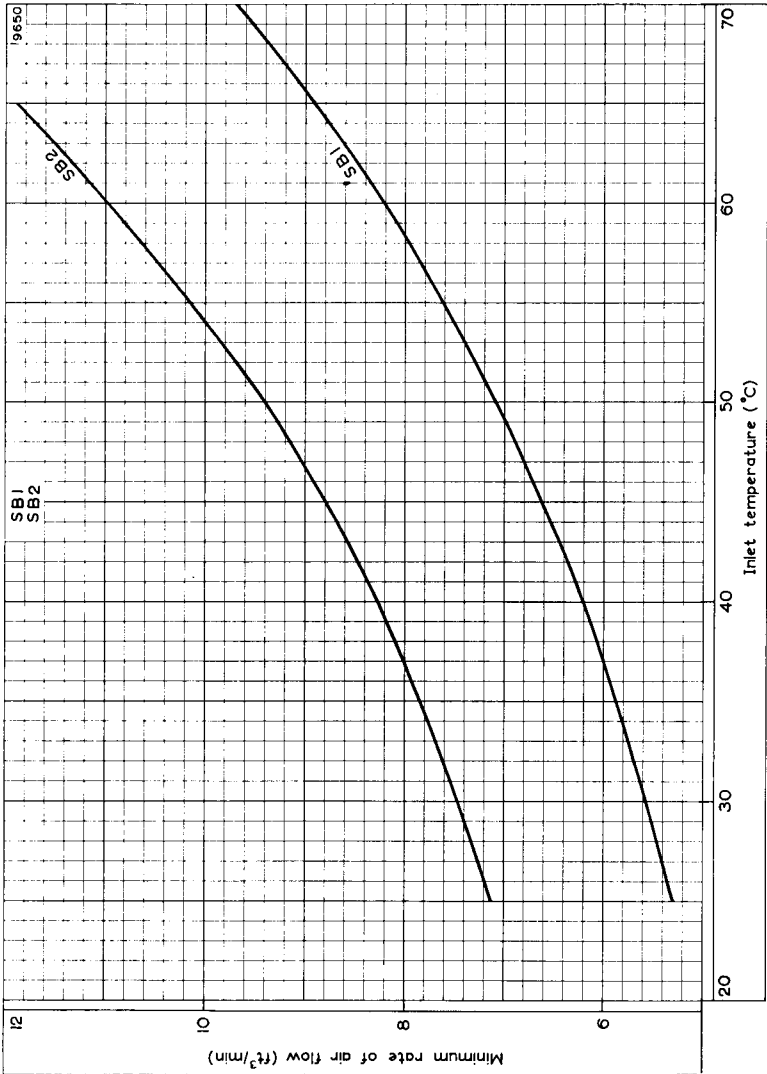


FREQUENCY PLOTTED AGAINST DELAY STRUCTURE VOLTAGE





TYPICAL POWER OUTPUT PLOTTED AGAINST FREQUENCY



MINIMUM RATE OF AIR FLOW PLOTTED AGAINST INLET TEMPERATURE
FOR MOUNTS SB-1 AND SB-2 FOR $T_{\text{mount max}} = 120^{\circ}\text{C}$

