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 = 7.5Gc/s	380	410	V
f = 11.5Gc/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
$I_{h(surge)}$ max.	4.0	A

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

CAPACITANCES

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

TYPICAL OPERATION

f	7.5	9.0	11	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.

BA9-20 BACKWARD-WAVE OSCILLATOR

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

ABSOLUTE MAXIMUM RATINGS

$V_{delay\ structure}$ max.	1.8	kV
$V_{delay\ structure}$ min.	300	V
$P_{delay\ structure}$ 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	lb
	5.9	kg
SB–1, SB–2	11	lb
	5.0	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

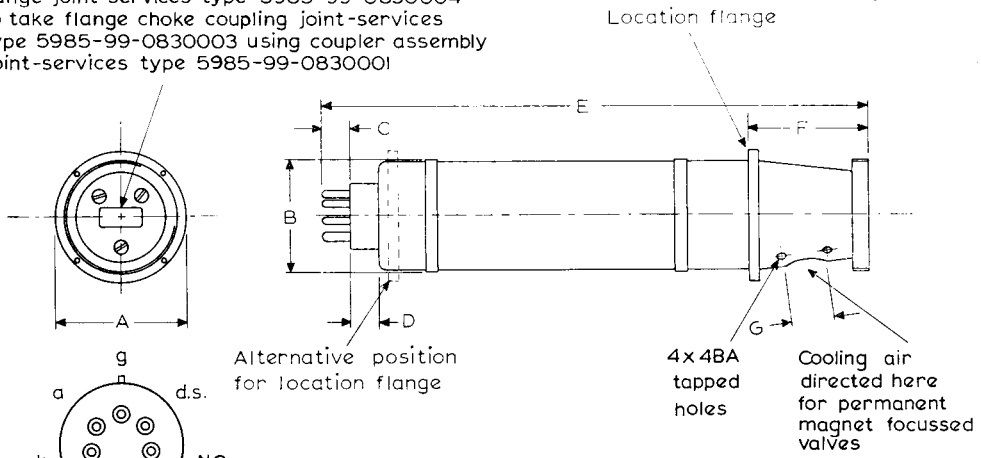
The three types are intended for constant current operation.

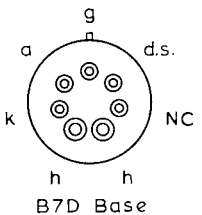
	SB–1	SB–2	
Current	7.5	13	A
Voltage	26	17	V
T_{amb}	25	25	°C
Cooling	Forced-air	Forced-air	

BA9-20

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

9483



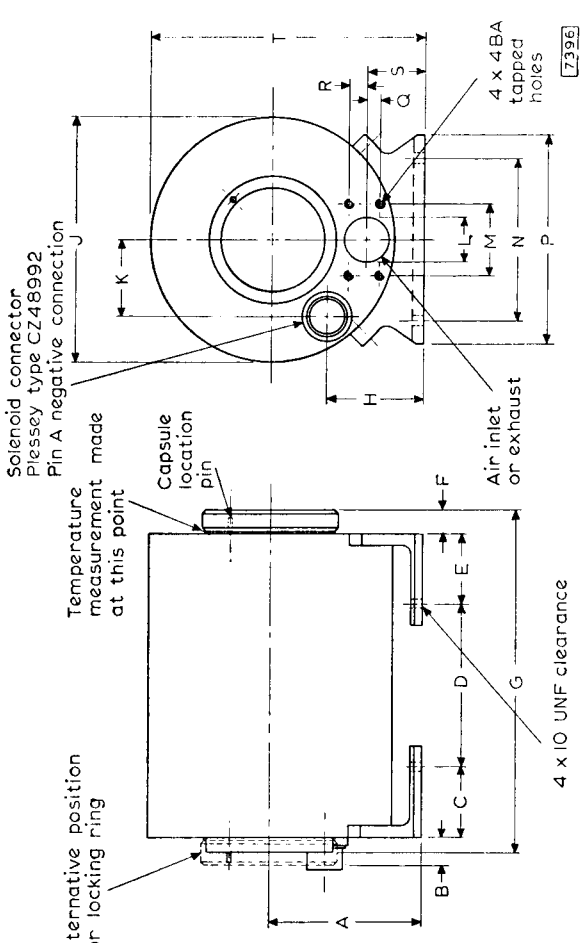


B7D Base

DIMENSIONS

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

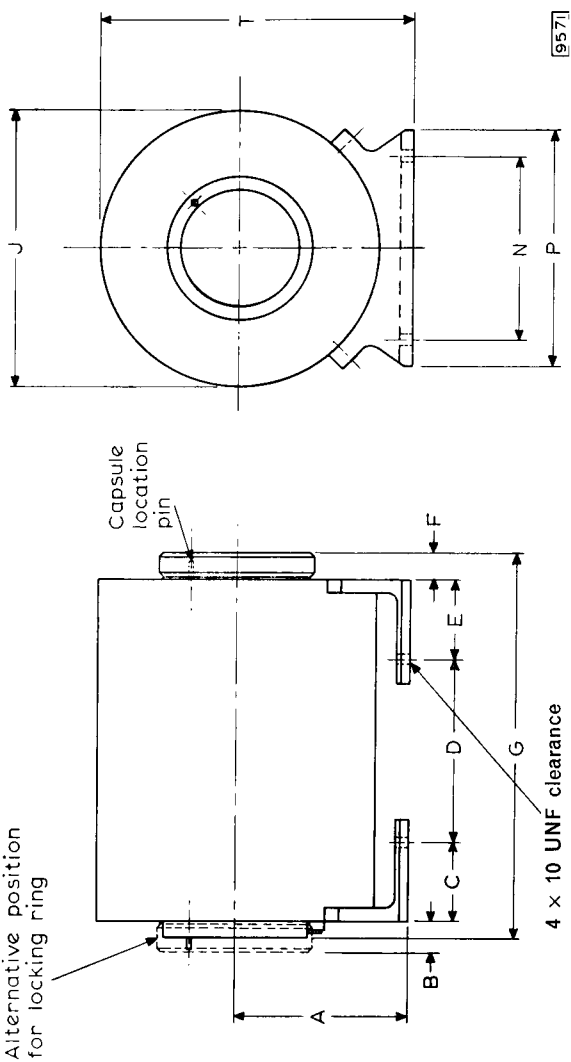
OUTLINE AND DIMENSIONS OF MOUNTS SB-1 AND SB-2



DIMENSIONS

	Inches	Millimetres		Inches	Millimetres		Inches	Millimetres
A	3.248 ± 0.197	82.5 ± 5	G	7.520 ± 0.079	191 ± 2	N	3.543 ± 0.008	90.0 ± 0.2
B	0.591 ± 0.039	15 ± 1	H	2.283 ± 0.197	58 ± 5	P	4.606 ± 0.020	117.0 ± 0.5
C	1.535 ± 0.039	39 ± 1	J	5.354	136 max.	Q	0.276 ± 0.004	7.0 ± 0.1
D	3.543 ± 0.008	90.0 ± 0.2	K	1.772 ± 0.197	45 ± 5	R	0.394 ± 0.004	10.0 ± 0.1
E	1.535 ± 0.039	39 ± 1	L	1.000 ± 0.008	25.4 ± 0.2	S	1.260 ± 0.079	32 ± 2
F	0.591 ± 0.039	15 ± 1	M	1.575 ± 0.004	40.0 ± 0.1	T	6.043	153.5 max.

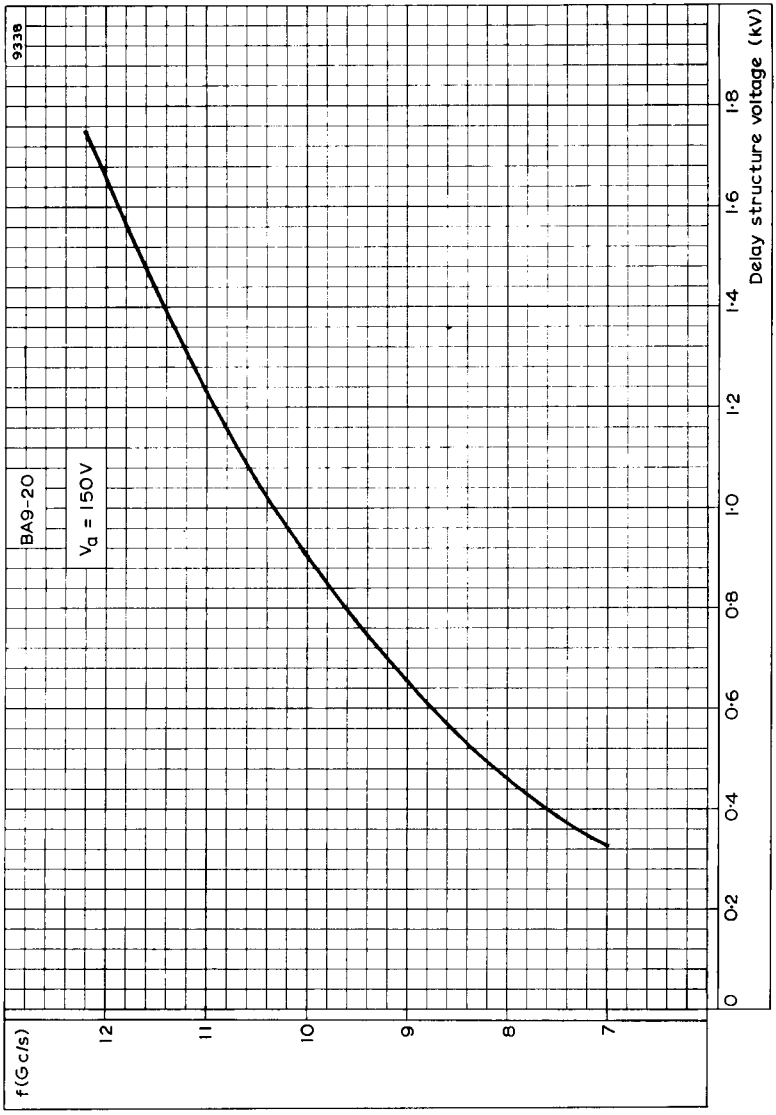
OUTLINE AND DIMENSIONS OF MOUNT PB-1



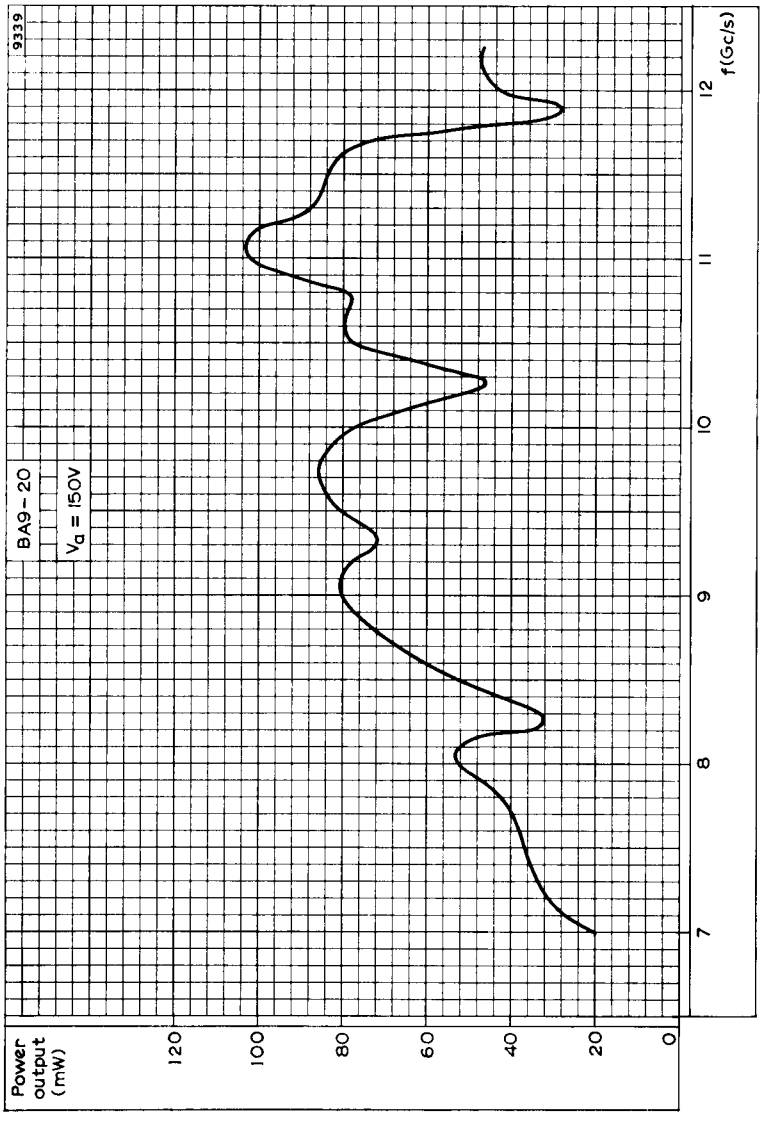
DIMENSIONS

	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 ± 0.2
E	1.535 ± 0.039	39 ± 1
F	0.591 ± 0.039	15 ± 1

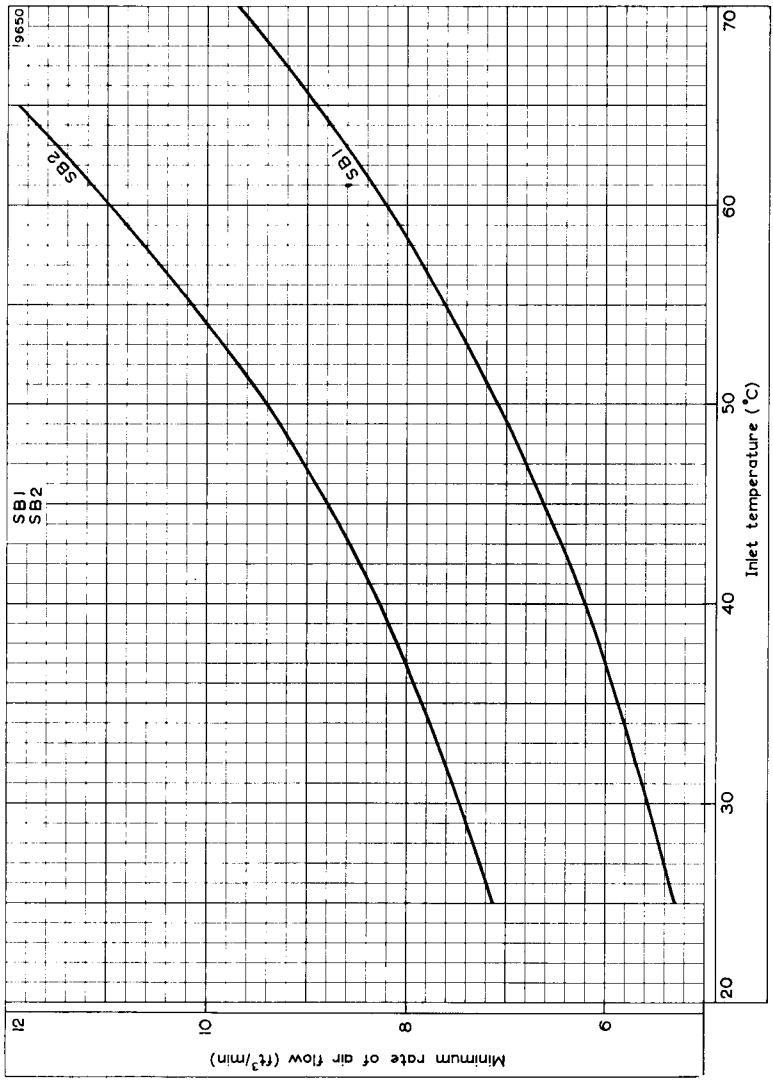
	Inches	*Millimetres*
G	7.520 ± 0.079	191 ± 2
J	5.354	136 max.
N	3.543 ± 0.008	90 ± 0.2
P	4.606 ± 0.020	117 ± 0.5
T	6.043	153.5 max.



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_{mount} max = 120°C