

**1. HEATER**

The heater voltage unless otherwise specified in individual data sheets must be set within  $\pm 7\%$  of the nominal value and temporary fluctuations must be within  $\pm 10\%$ . Where freedom from undesirable modulation is important a d.c. stabilised heater supply should be used.

**2. CONTROL GRID**

This electrode when incorporated is used to control the resonator current and the nominal voltage is specified in the data for individual types.

The control grid must never be allowed to become positive with respect to the cathode.

**3. RESONATOR**

This electrode is usually connected to the body of the valve and is normally operated at earth potential.

**4. REFLECTOR**

To avoid damage to the valve the reflector potential must never become positive with respect to the cathode and for this reason it is essential that the reflector connection be made at all times during operation.

If a high impedance reflector voltage supply is used, the time constant should be such that the resonator voltage is not applied before the reflector has become negative with respect to the cathode.

**5. MODES OF OSCILLATION**

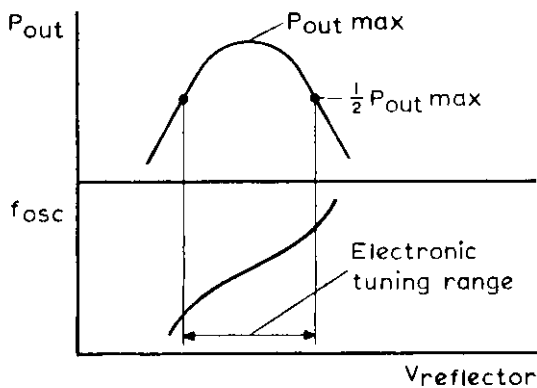
A reflex klystron may be operated in several modes which are determined by transit time effects and are dependent upon the reflector voltage. The mode of operation is chosen for optimum power output and for the maximum electronic tuning range.

**6. TUNING****6.1. Electronic tuning**

The frequency of oscillation within a mode may be varied by adjusting the reflector voltage. The frequency change between the frequencies at which the power output has fallen to half the maximum value is defined as the electronic tuning range.

**6.2. Mechanical tuning**

Generally klystrons can be mechanically tuned over a wide frequency range but it is necessary to optimise the reflector voltage for maximum power output at the required frequency.



7664

## 7. MODULATION

### 7.1. Frequency modulation

Frequency modulation may be achieved by applying a modulating voltage to the reflector electrode. To minimise distortion, the amplitude of the modulation signal should be small compared with the voltage required to achieve the electronic tuning range. The most linear frequency modulation characteristic is normally obtained with the reflector voltage optimised for maximum power output at the required carrier frequency.

### 7.2. Pulse modulation

The output of a reflex klystron may be pulsed by modulating the reflector or control electrode voltage. To minimise frequency modulation effects the modulating signal should be as near rectangular as possible.

The reflector voltage is adjusted so that the valve is not oscillating and the amplitude of the modulating signal should be the difference between this voltage and the reflector voltage required to give optimum power output at the required frequency. The amplitude of the modulating voltage must not cause the valve to oscillate in more than one mode and the static reflector voltage should be chosen accordingly.

## 8. FREQUENCY STABILITY

The frequency of oscillation is primarily dependent upon the applied voltage between the reflector and resonator and the valve should be operated from a well regulated power supply.

Variations of the ambient temperature, load, atmospheric pressure, and heater voltage have a secondary effect.

## 9. LOAD MISMATCH

Care must be taken to minimise load reflections, as a change of phase of the mismatch will cause frequency pulling and variation in the power output. A severe mismatch may cause the valve to cease oscillating over portions of the tuning range.

**10. TUNING MECHANISM**

Information on the number of turns of the tuning mechanism required to cover the prescribed tuning range is given in the individual data sheets.

Adjustment of the tuning mechanism beyond the stated frequency limits must not be attempted. Where the mechanical tuning is achieved by adjustment of a cavity within the evacuated envelope by means of a flexible diaphragm the number of tuning cycles may be limited to avoid damage to the diaphragm.

**11. SHIELDING**

The resonator and reflector leads should be screened to shield the valve from induced modulation.

**12. COOLING**

Adequate cooling to prevent the maximum temperature limits being exceeded is required particularly when the valve is enclosed in a protective shield.

**13. MOUNT**

The performance quoted in the individual data sheets for those valves which have a coaxial lead output is dependent upon the use of the specified coaxial to waveguide transition unit.

Frequency: 7Gc/s. band. Mechanical tuning.  
 Power output: 50mW minimum.  
 Construction: All metal, coaxial output probe.  
 Application: Local oscillator, signal generator.

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS—MICROWAVE DEVICES: INTRODUCTION and REFLEX KLYSTRONS which precede this section of the handbook.

## CHARACTERISTICS

	Min.	Max.	
Mechanical tuning range	6.5	7.5	Gc/s
Electronic tuning range, between half power points at any frequency in the mechanical tuning range	25	—	Mc/s
Power output at 7Gc/s $\pm$ 20Mc/s (principal mode)	85	—	mW
Power output at any other frequency in the band	50	—	mW
Reflector voltage for maximum power output at 7Gc/s $\pm$ 20Mc/s	-100	-175	V
Reflector voltage range, inclusive of electronic tuning range	-60	-215	V
Frequency change with temperature	—	500	kc/s per °C

## CATHODE

Indirectly heated

$V_h$		6.3	V
$I_h$		500	mA

## OPERATING CONDITIONS IN SPECIFIED MOUNT

$f$		7.0	Gc/s
$V_{\text{resonator}}$		300	V
$I_{\text{resonator}}$		24	mA
$V_{\text{reflector}}$		-140	V
$I_{\text{reflector}}$		1.0	$\mu$ A
Electronic tuning range between half power points		38	Mc/s
$P_{\text{out}}$		100	mW

## COOLING

Natural

## ABSOLUTE RATINGS

$V_{\text{resonator max.}}$		350	V
$I_{\text{resonator max.}}$		37	mA
$V_{\text{reflector max.}}$		-1.0 to -400	V
$V_{h k \text{ max.}}$		-150	V
$T_{\text{amb (shell) max.}}$		110	°C
$T_{\text{coaxial line max.}}$		90	°C

## OPERATING NOTE

The prescribed tuning range is covered by five turns of the mechanical tuning screw. ←

	<i>Inches</i>	<i>Millimetres</i>
A	0.370 ± 0.005	9.398 ± 0.127
B	0.045	1.143
C	0.315	8.001
D	0.333	8.458
E	0.5625	14.287
F	0.5	12.7
G	0.390	9.90
H	0.25	6.350
J	0.145	3.683
K	0.475	12.065
L	0.568	14.427
M	1.5	38.1
N	0.5	12.7
O	0.375	9.525
P	0.125	3.175
Q	0.314	7.976
R	0.468	11.887
S	0.250	6.350
T	0.375	9.525
U	1.000	25.4
V	0.281	7.137
W	0.15	3.81
X	0.1	2.54
Y	0.53	13.462
Z	0.125	3.175
AA	0.020	0.508
BB	0.250	6.350
CC	0.250	6.350
DD	0.312	7.925
EE	0.136	3.454
FF	0.015 × 0.313	0.381 × 7.950
GG	0.438	11.131
HH	0.468	11.887
JJ	0.230	5.842
KK	0.292	7.417
LL	0.062	1.575
MM	0.375	9.525
NN	0.088	2.235
OO	0.750	19.05
PP	0.325	8.255
QQ	0.040	1.016
RR	0.040 × 0.186	1.016 × 4.724
SS	0.010 × 0.180	0.254 × 4.572
TT	0.095	2.413

# LOCAL OSCILLATOR KLYSTRON

# KS7-85

*Mechanically tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 6250 to 7060 Mc/s.*

## PRELIMINARY DATA

### CATHODE

Indirectly heated

$V_h$	6.3	V
$I_h$	500	mA

### MOUNTING POSITION

Any

### CHARACTERISTICS

Minimum electronic tuning range between half power tuning points at 6660 Mc/s $\pm 0.3\%$	32	Mc/s
Minimum electronic tuning range between half power tuning points at any other frequency	28	Mc/s
Minimum power output at 6660 Mc/s $\pm 0.3\%$ (principal mode)	80	mW
Minimum power output at any other frequency	50	mW
Maximum change of frequency with temperature	0.5	Mc/s per °C
Reflector voltage range inclusive of electronic tuning range	-35 to -165	V

### TYPICAL OPERATION AT 6660 Mc/s - Principal mode with waveguide size WG14

D.C. resonator voltage	300	V
D.C. reflector voltage range	-65 to -120	V
D.C. resonator current	25	mA
D.C. reflector current	7.0	$\mu$ A
Electronic tuning range between half power tuning points	40	Mc/s
Power output	100	mW

### LIMITING VALUES (absolute ratings)

Maximum resonator voltage	330	V
Maximum resonator current	35	mA
Maximum reflector voltage	-350	V
Mechanical tuning range	6250 to 7060	Mc/s
Maximum heater to cathode voltage	50	V
Maximum ambient temperature of air around shell	110	°C
Maximum temperature of coaxial line	90	°C



# KS7-85

## LOCAL OSCILLATOR KLYSTRON

*Mechanically tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 6250 to 7060Mc s.*

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### OPERATING NOTES

1. The performance depends upon the use of the correct mount.
2. When the valve is enclosed in a protective shield, adequate ventilation must be provided. For the best frequency stability the KS7-85 should be operated at nearly constant ambient temperature and with a stabilised power supply.
3. The resonator and reflector leads should be screened to shield the valve from induced modulation. To avoid damage to the valve the reflector potential must never become positive with respect to the cathode. For this reason it is essential that the reflector connection be made at all times during operation.
4. The prescribed tuning range is covered by five turns of the mechanical tuning screw. Adjustment beyond the stated frequency limits must not be attempted.

### ACCESSORIES

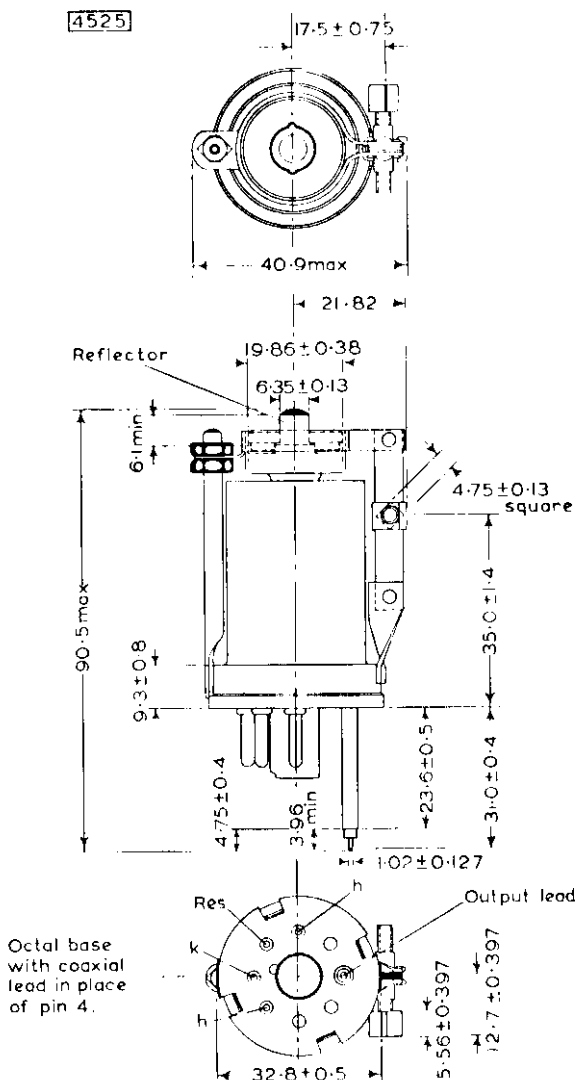
Information on these items can be obtained from the Industrial Technical Service Department, Mullard Ltd.



# LOCAL OSCILLATOR KLYSTRON

# KS7-85

Mechanically tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 6250 to 7060 Mc/s.



All dimensions in mm



*Mechanically tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 6250 to 7425 Mc/s.*

**PRELIMINARY DATA**

**HEATER**

Indirectly heated

$V_h$	6.3	V
$I_h$	500	mA

**MOUNTING POSITION**

Any

**CHARACTERISTICS**

Minimum electronic tuning range between half power tuning points at 6750 Mc/s $\pm 0.3\%$	32	Mc/s
Minimum electronic tuning range between half power tuning points at any other frequency	25	Mc/s
Minimum power output at any frequency	70	mW
Maximum change of frequency with temperature	0.5	Mc/s per °C
Reflector voltage range inclusive of electronic tuning range	-35 to -205	V

**TYPICAL OPERATION AT 6750 Mc/s** - Principal mode with waveguide size WG14

D.C. resonator voltage	300	V
D.C. reflector voltage range	-78 to -158	V
D.C. resonator current	24	mA
D.C. reflector current	~ 7.0	$\mu$ A
Electronic tuning range between half power tuning points	49	Mc/s
Power output	110	mW

**LIMITING VALUES** (absolute ratings)

Maximum resonator voltage	330	V
Maximum resonator current	35	mA
Maximum reflector voltage	-350	V
Maximum positive reflector voltage	0	V
Mechanical tuning range limits	6250 to 7425	Mc/s
Maximum heater to cathode voltage	50	V
Maximum ambient temperature of air around shell	110	°C
Maximum temperature of coaxial line	90	°C

# KS7-85A

## LOCAL OSCILLATOR KLYSTRON

*Mechanically tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 6250 to 7425Mc's.*

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### OPERATING NOTES

1. The performance depends upon the use of the correct mount.
2. When the valve is enclosed in a protective shield, adequate ventilation must be provided. For the best frequency stability the KS7-85A should be operated at nearly constant ambient temperature and with a stabilised power supply.
3. The resonator and reflector leads should be screened to shield the valve from induced modulation. To avoid damage to the valve the reflector potential must never become positive with respect to the cathode. For this reason it is essential that the reflector connection be made at all times during operation.
4. The prescribed tuning range is covered by five turns of the mechanical tuning screw. Adjustment beyond the stated frequency limits must not be attempted.

### ACCESSORIES

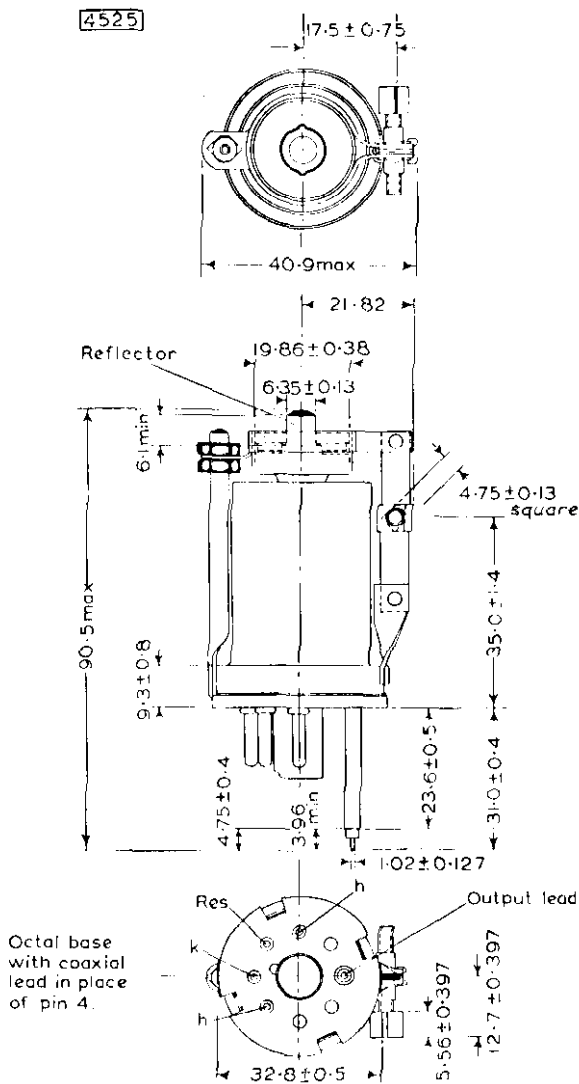
Information on these items can be obtained from The Industrial Technical Service Department, Mullard Ltd.



# LOCAL OSCILLATOR KLYSTRON

# KS7-85A

Mechanically tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 6250 to 7425 Mc s.



All dimensions in mm

# LOCAL OSCILLATOR KLYSTRON

# KS9-20

Mechanically-tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 8702 to 9548 Mc/s.

(723A/B)

## PRELIMINARY DATA

### HEATER

Indirectly Heated

$V_h$	6.3	V
$I_h$	0.6	A

### MOUNTING POSITION

Any

### CHARACTERISTICS

Minimum electronic tuning range at 9370 $\pm 0.3\%$ Mc/s and between half power tuning points	35	Mc/s
Minimum power output at 9370 Mc/s. Mode A	20	mW
Minimum power output at all other frequencies	10	m
Maximum change of frequency with temperature	0.25 Mc/s per °C	

### TYPICAL OPERATION AT 9370 Mc/s—Mode A

With Waveguide size W16

D.C. resonator voltage	300	V
D.C. reflector voltage range	-130 to -185	V
D.C. resonator current	22	mA
D.C. reflector current	3.0	$\mu$ A
Electronic tuning range between half power tuning points	40	Mc/s
Power output	25	mW

### LIMITING VALUES

Maximum resonator voltage (absolute)	330	V
Maximum resonator current (absolute)	32	mA
*Maximum reflector voltage (absolute)	-400	V
Mechanical tuning range limits	8702 to 9548	Mc/s
Maximum heater to cathode voltage	50	V
Maximum ambient temperature of shell	110	°C
Maximum temperature of coaxial line	90	°C

\*Reflector voltage for maximum power output in principle mode -85 to -200V.

### OPERATING NOTES

1. The above performance depends upon the use of the specified mount. (See pages 3 and 4.)
2. When the valve is enclosed in a protective shield, adequate ventilation must be provided. For the best frequency stability the KS9-20 should be operated at nearly constant ambient temperature and with a well-regulated power supply.
3. The resonator and reflector leads should be screened to shield the valve from induced modulation. To avoid damage to the valve the reflector potential must never become positive with respect to the cathode. For this reason it is essential that the reflector connection be made at all times during operation.
4. The prescribed tuning range is covered by three turns of the mechanical-tuning screw. Adjustment beyond the stated frequency limits must not be attempted.

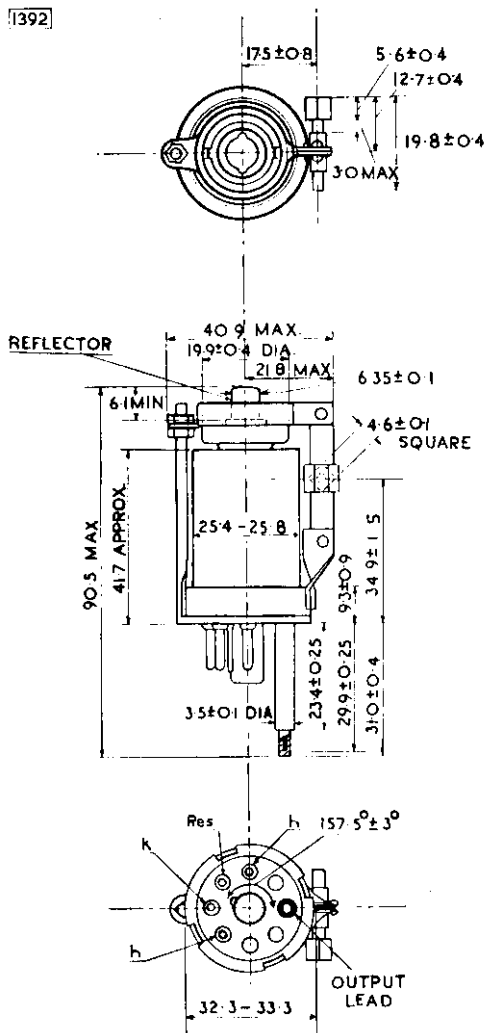
# KS9-20

(723A/B)

## LOCAL OSCILLATOR KLYSTRON

Mechanically-tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 8702 to 9548 Mc/s.

1392



All dimensions in mm.



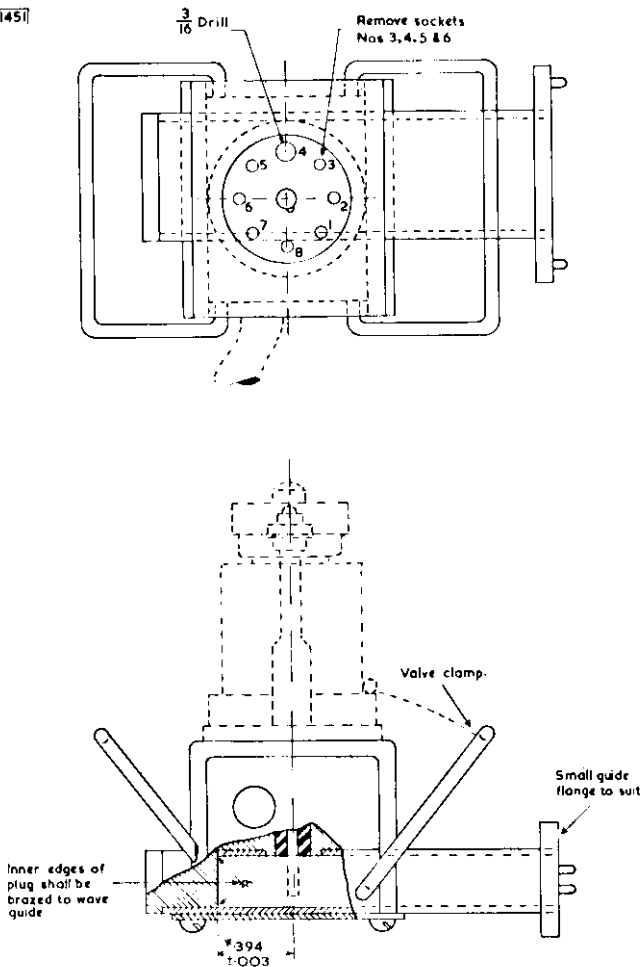
# LOCAL OSCILLATOR KLYSTRON

# KS9-20

Mechanically-tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 8702 to 9548 Mc/s.

(723A/B)

[45]



Dimensions indicated by \* determine the broad band characteristics of the coupler and should be held to tolerances shown

All high frequency surfaces to be silver or gold plated.

All dimensions in inches

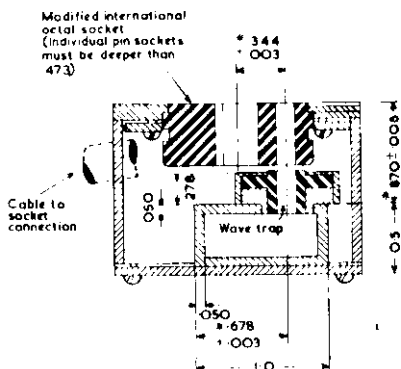
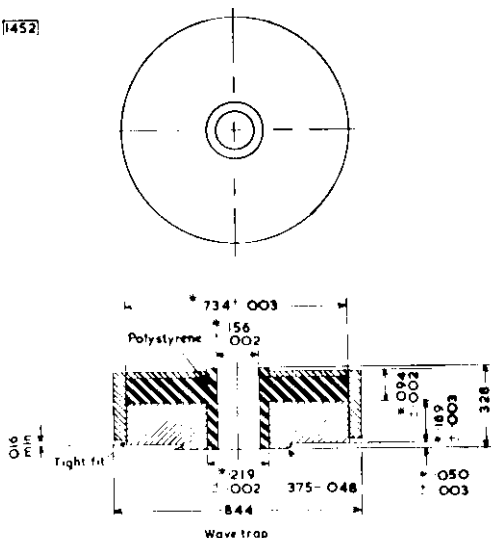
# KS9-20

(723A/B)

## LOCAL OSCILLATOR KLYSTRON

Mechanically-tuned klystron of all-metal construction designed for use as a local oscillator over the frequency range 8702 to 9548 Mc/s.

1452



Dimensions indicated by \* determine the broad band characteristics of the coupler and should be held to tolerances shown.

All high frequency surfaces to be silver or gold plated

All dimensions in inches

QUICK REFERENCE DATA

Mechanically tuned klystron for local oscillator applications.

Frequency	8.50 to 9.66	Gc/s
Power output	30	mW

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

TYPICAL OPERATION IN RECOMMENDED MOUNT - PRINCIPAL MODE

f	9.37	Gc/s
Vresonator	300	V
Iresonator	22	mA
Vreflector	-130 to -190	V
Electronic tuning range between half-power points	40	Mc/s
Pout	50	mW

ABSOLUTE MAXIMUM RATINGS

Vresonator max.	330	V
Iresonator max.	37	mA
Vreflector max.	-400	V
Vh-k max.	$\pm 50$	V
Tshell max.	110	$^{\circ}\text{C}$
v. s. w. r.	2.5	

CATHODE

Indirectly heated

Vh	6.3	V
Ih	450	mA



## CHARACTERISTICS

	Min.	Max.	
Mechanical tuning range	8.50	9.66	Gc/s
Electronic tuning range between half-power points			
(a) at 9.37 Gc/s	35	-	Mc/s
(b) at all other frequencies	28	-	Mc/s
Reflector voltage for maximum power output at 9.37 Gc/s in principal mode ( $V_{\text{resonator}} = 300V$ )	-130	-190	V
Frequency temperature coefficient	-	0.2	Mc/s per °C

## END OF LIFE PERFORMANCE

Electronic tuning range at 9.37 Gc/s between half-power points ( $V_{\text{resonator}} = 300V$ )		32	Mc/s
Power output at any frequency in the mechanical tuning range with reflector voltage optimised ( $V_{\text{resonator}} = 300V$ )		16	mW

COOLING Natural

MOUNTING POSITION Any

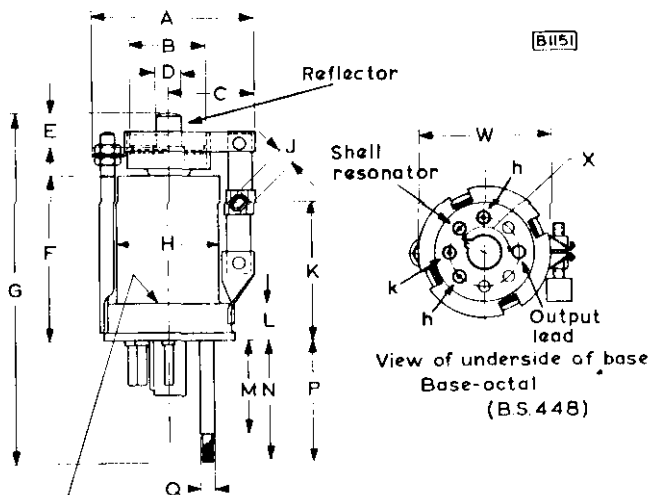
## OPERATING NOTES

1. The impedance of the reflector supply should not exceed 100kΩ.
2. Adjustment beyond the stated frequency limits must not be attempted.

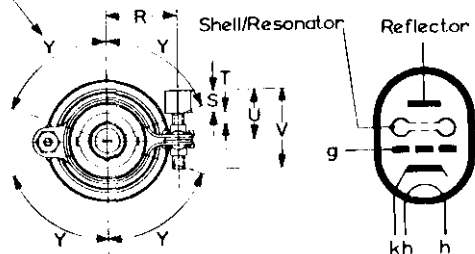
## PHYSICAL DATA

Weight of klystron	2.29	oz
	65	g
Weight of klystron plus carton	4.59	oz
	130	g
Dimensions of storage carton	3.75 x 2 x 2	in
	95 x 51 x 51	mm



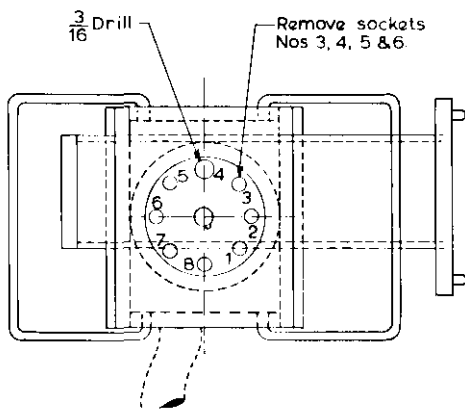


Area free for mounting

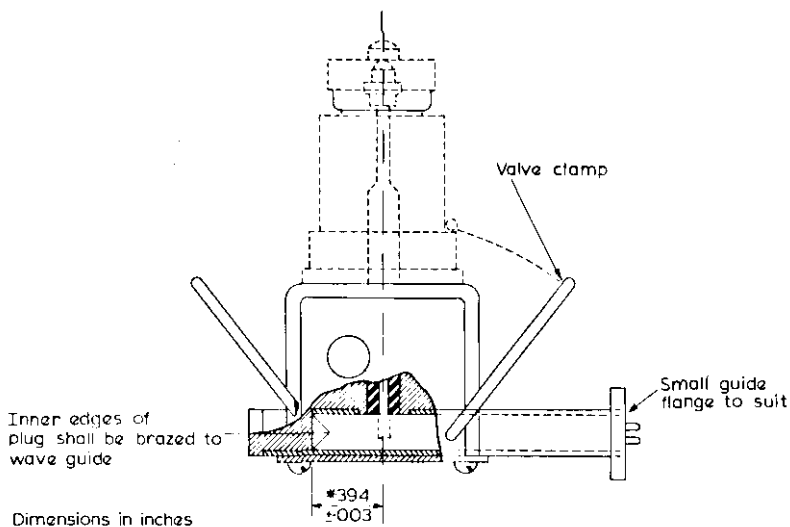


### DIMENSIONS

	<u>Inches</u>	<u>Millimetres</u>			<u>Inches</u>	<u>Millimetres</u>	
A	1.610	40.9	max	N	1.177 ± 0.010	29.90 ± 0.25	
B	0.783 ± 0.016	19.9 ± 0.4		P	1.221 ± 0.016	31 ± 0.4	
C	0.860	21.8	max	Q	0.122 ± 0.004	3.1 ± 0.1	dia
D	0.252 ± 0.004	6.35 ± 0.1		R	0.302 ± 0.032	7.5 ± 0.8	
E	0.240	6.1	min	S	0.224 ± 0.016	5.6 ± 0.4	
F	1.642	41.7	nominal	T	0.118	3.0	max
G	3.563	90.5	max	U	0.500 ± 0.016	12.7 ± 0.4	
H	1.008 ± 0.008	25.6 ± 0.2	dia	V	0.780 ± 0.016	19.8 ± 0.4	
J	0.180 ± 0.001	4.55 ± 0.05		W	1.292 ± 0.020	32.8 ± 0.5	
K	1.374 ± 0.059	34.9 ± 1.5		X	157.5° ± 3°		
L	0.366 ± 0.035	9.3 ± 0.9		Y	70°		max
M	0.917 ± 0.010	23.40 ± 0.25					

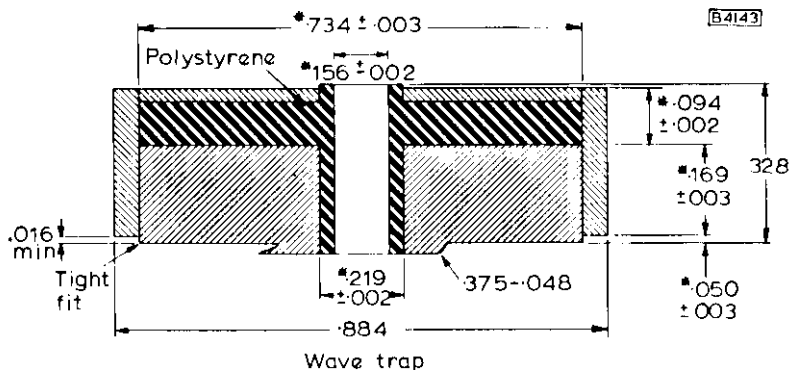


B 3806

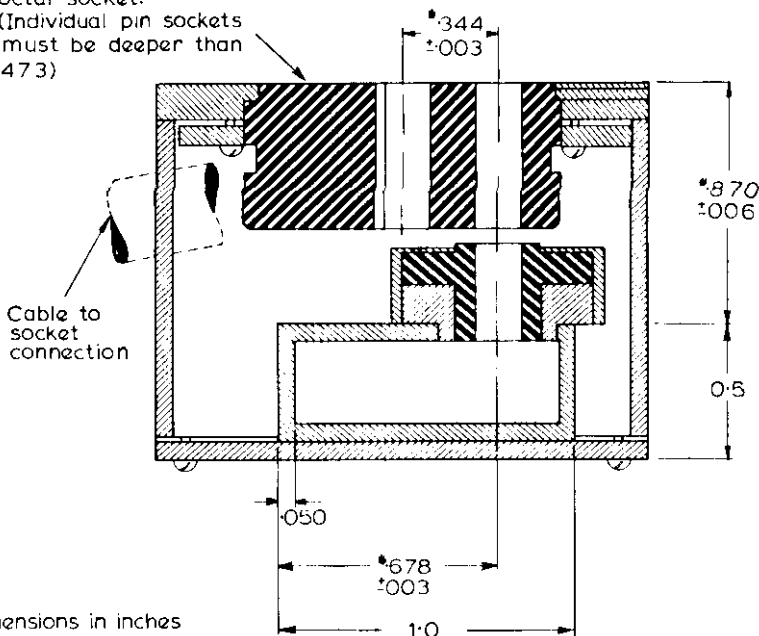


Dimensions indicated by \* determine the broad band characteristics of the coupler and should be held to tolerances shown.

All high frequency surfaces to be silver or gold plated.

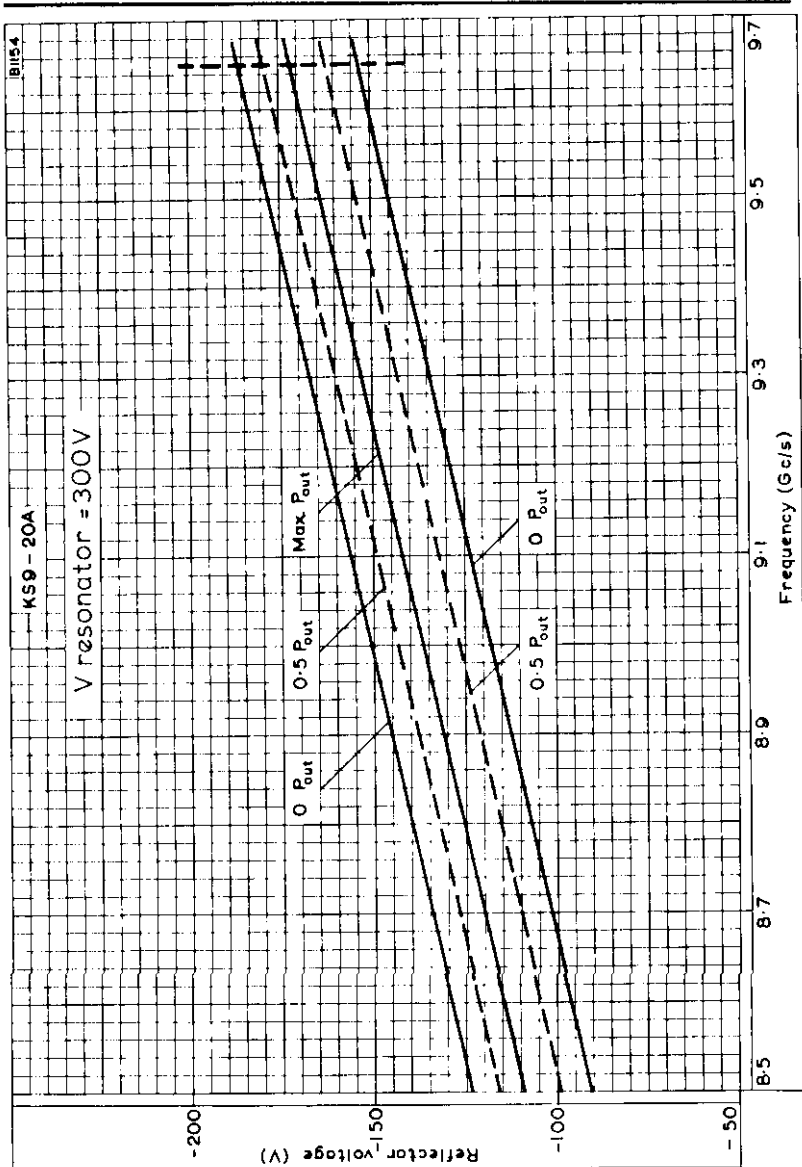


Modified international octal socket.  
(Individual pin sockets must be deeper than .473)

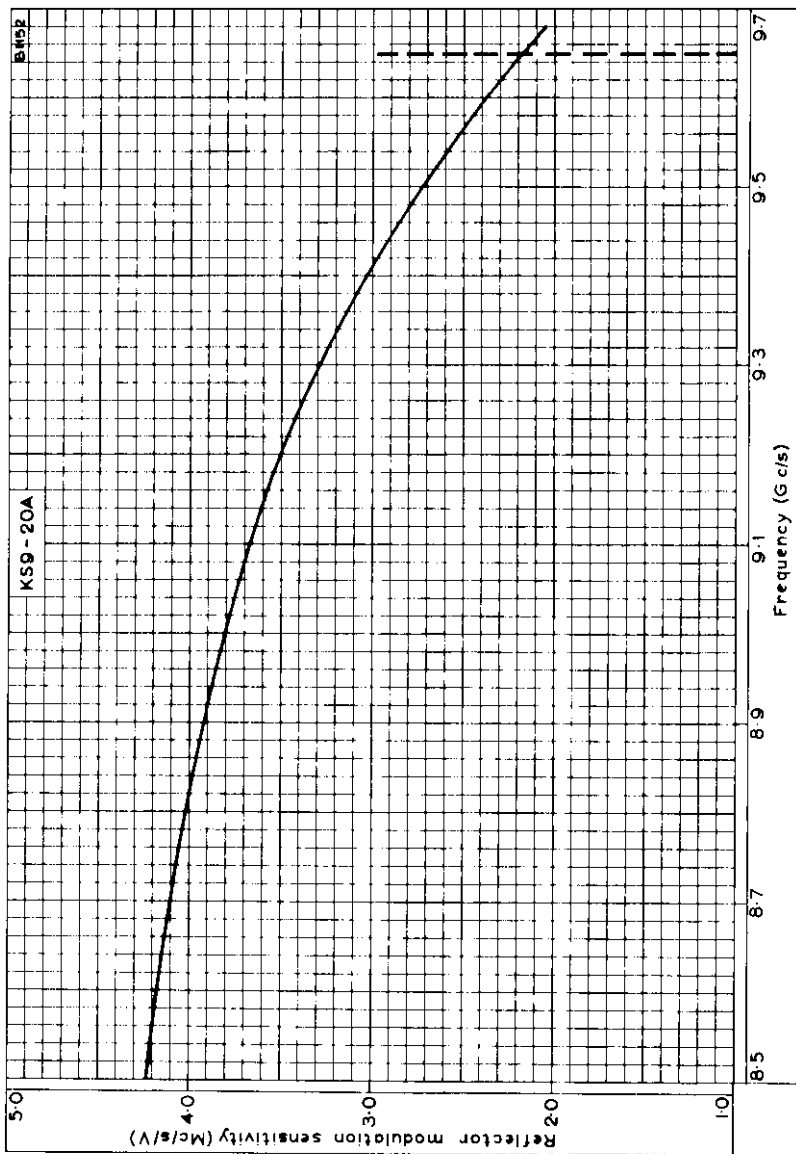


Dimensions indicated by \* determine the broad band characteristics of the coupler and should be held to tolerances shown.

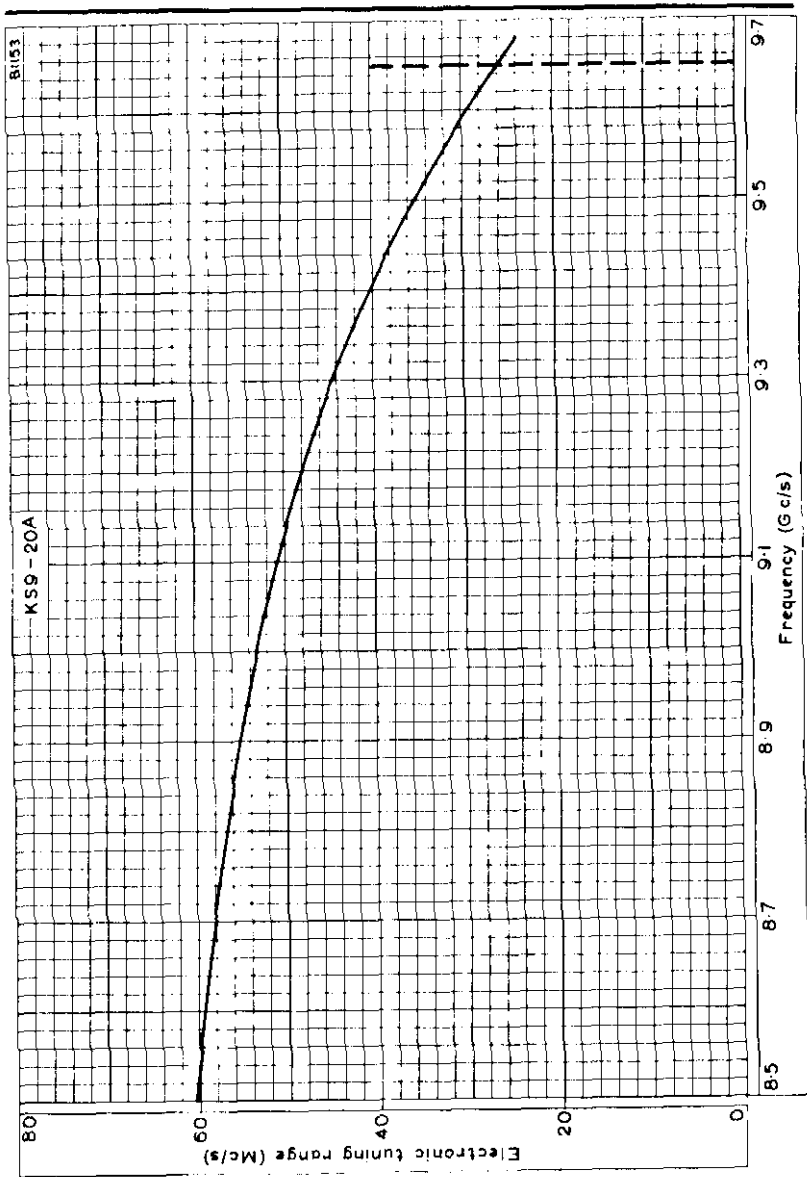
All high frequency surfaces to be silver or gold plated.



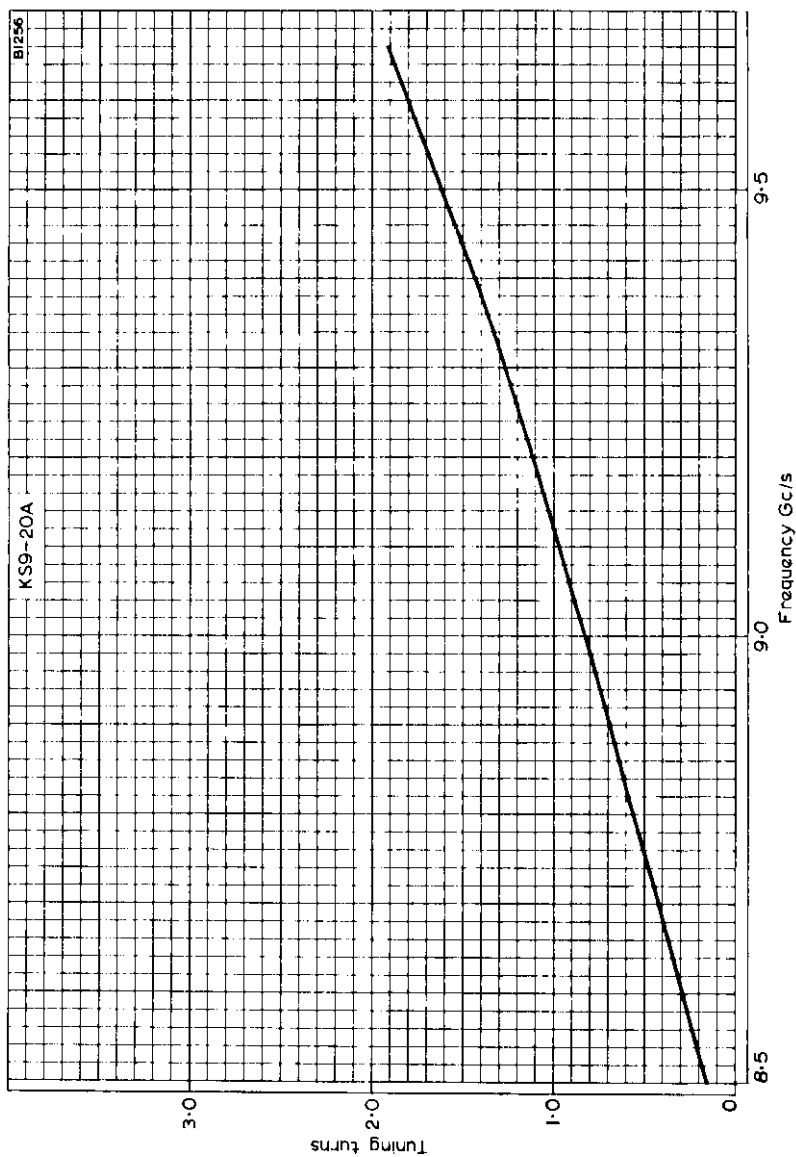
REFLECTOR VOLTAGE PLOTTED AGAINST FREQUENCY



REFLECTION MODULATION SENSITIVITY PLOTTED AGAINST FREQUENCY



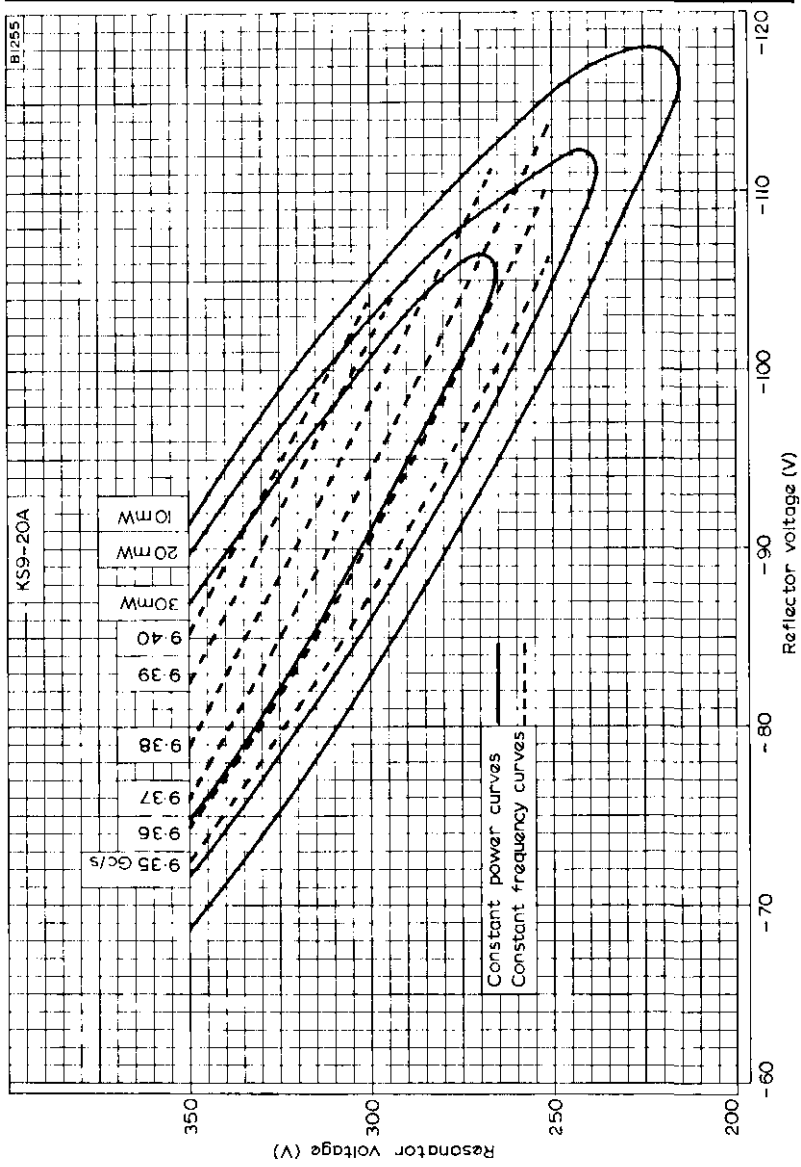
ELECTRONIC TUNING RANGE PLOTTED AGAINST FREQUENCY.



TUNING TURNS PLOTTED AGAINST FREQUENCY

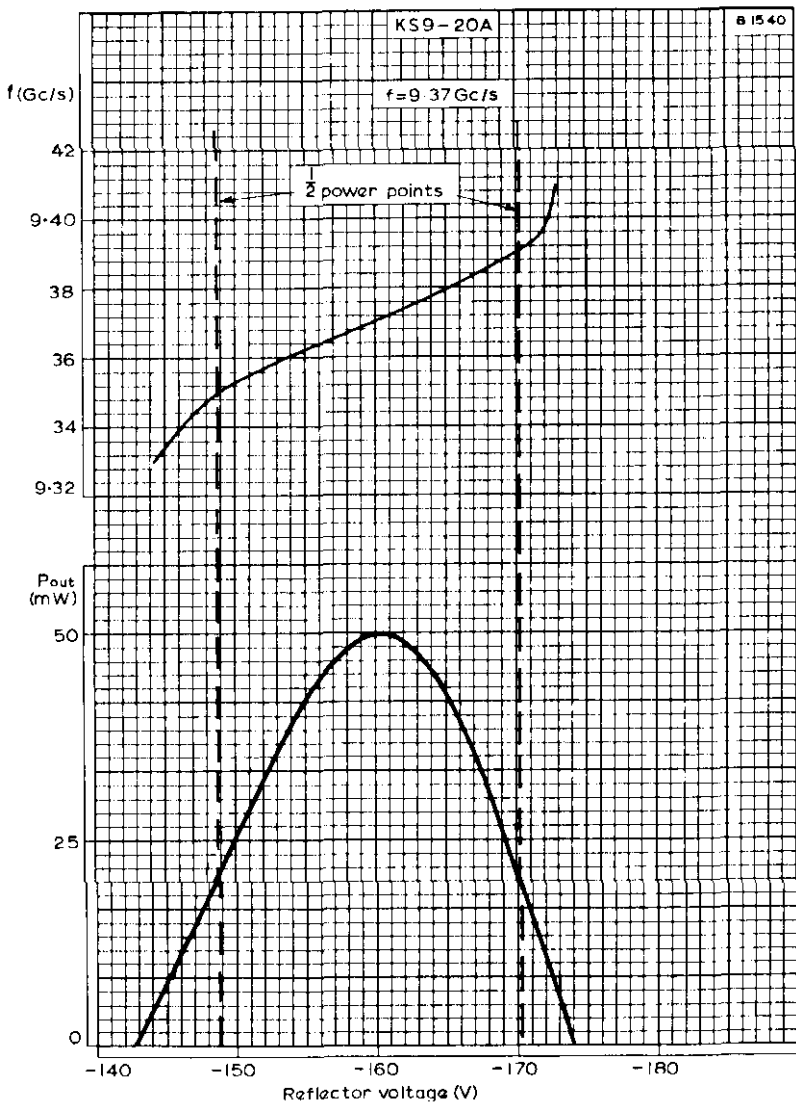




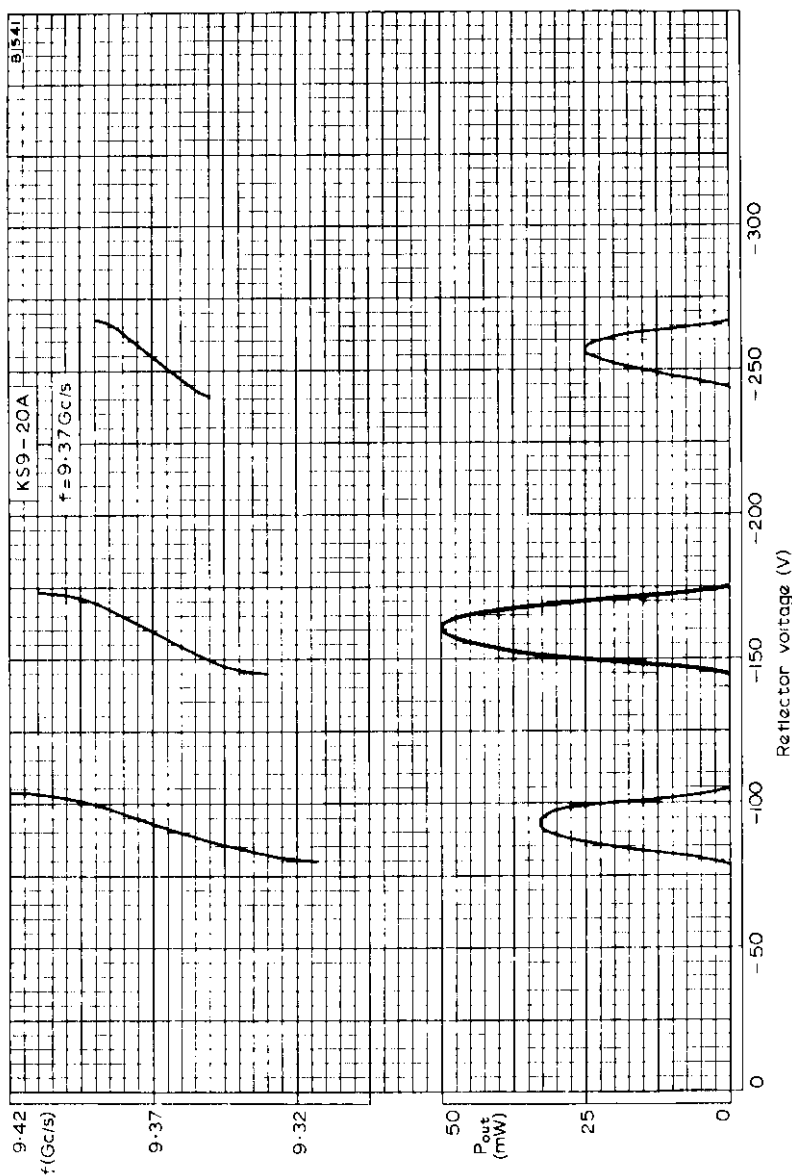


RESONATOR VOLTAGE PLOTTED AGAINST REFLECTOR VOLTAGE.





FREQUENCY AND OUTPUT POWER PLOTTED AGAINST REFLECTOR VOLTAGE



FREQUENCY AND OUTPUT POWER PLOTTED AGAINST REFLECTOR VOLTAGE

## QUICK REFERENCE DATA

Mechanically tunable 'X' band reflex klystron with integral external cavity.

Frequency	8.5 to 9.6	GHz
Power output	35	mW
Construction	Waveguide output with coupled cavity	

To be read in conjunction with  
GENERAL OPERATIONAL RECOMMENDATIONS - MICROWAVE DEVICES

OPERATING CONDITIONS ( $6\frac{3}{4}$  Mode) ←

f	8.5	9.6	GHz
V <sub>res</sub>	300	300	V
I <sub>res</sub>	30	30	mA
V <sub>refl</sub>	-95	-145	V ←
*I <sub>refl</sub>	1.0	1.0	μA
Electronic tuning range between half power points	50	45	MHz
P <sub>out</sub>	35	30	mW
Electronic tuning rate	2.0	1.5	MHz per V ←

\*The internal resistance of the reflector power supply should not exceed 1MΩ.

## CATHODE

Indirectly heated

V <sub>h</sub>	6.3	V
I <sub>h</sub> max. (at V <sub>h</sub> = 6.3V)	500	mA

## COOLING

Natural

Shell temperature max. 200 °C

## MOUNTING POSITION

Any

## PHYSICAL DATA

Weight of klystron	g	oz
	140	5.0

## CHARACTERISTICS

	Min.	Max.	
Mechanical tuning range	8.5	9.6	GHz
Mechanical tuning rate	190	275	MHz per turn
Electronic tuning range, between half-power points at any frequency in the mechanical tuning range	30	-	MHz
Output power at any frequency in the mechanical tuning range with reflector voltage optimised ( $V_{res} = 300V$ )	20	-	mW
Reflector voltage for maximum power output ( $V_{res} = 300V$ )	-85	-150	V←-
Frequency change with temperature	-	-200	kHz per degC rise
Frequency modulation under vibration of 10g applied to flange (50Hz to 1.0kHz)	-	1.0	MHz←-
Electronic tuning rate	1.0	2.0	MHz per←- volt

## RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Min.	Max.	
$V_{res}$ max.	-	350	V
$I_{res}$ max.	-	52	mA
$V_{refl}$	-20	-500	V←-

## OPERATING NOTES

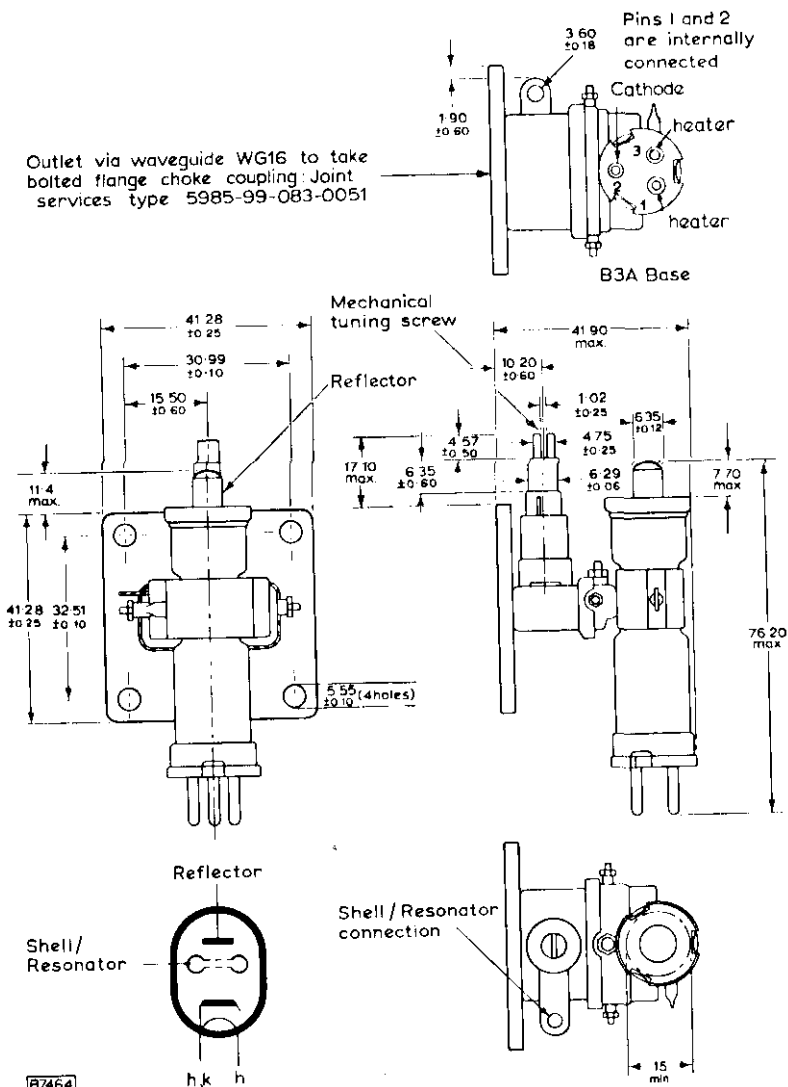
1. The mechanical tuning range is covered by 4 to  $5\frac{3}{4}$  turns of the tuning screw.
2. To avoid damage to the klystron the reflector potential must never become positive with respect to the cathode. The resonator voltage should be applied only after the reflector connection has been made.

## ACCESSORIES

Socket	E2 555 37
Connector for reflector	55316



## OUTLINE DRAWING

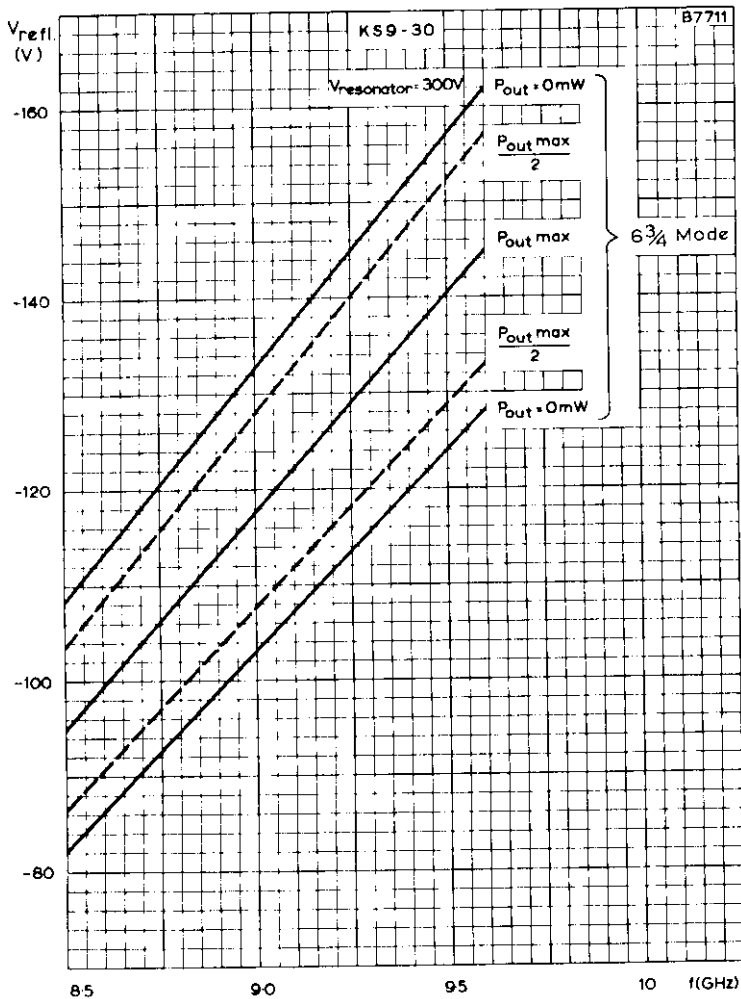


Millimetre dimensions derived from original inch dimensions  
(conversions overleaf)

## DIMENSION CONVERSION TABLE

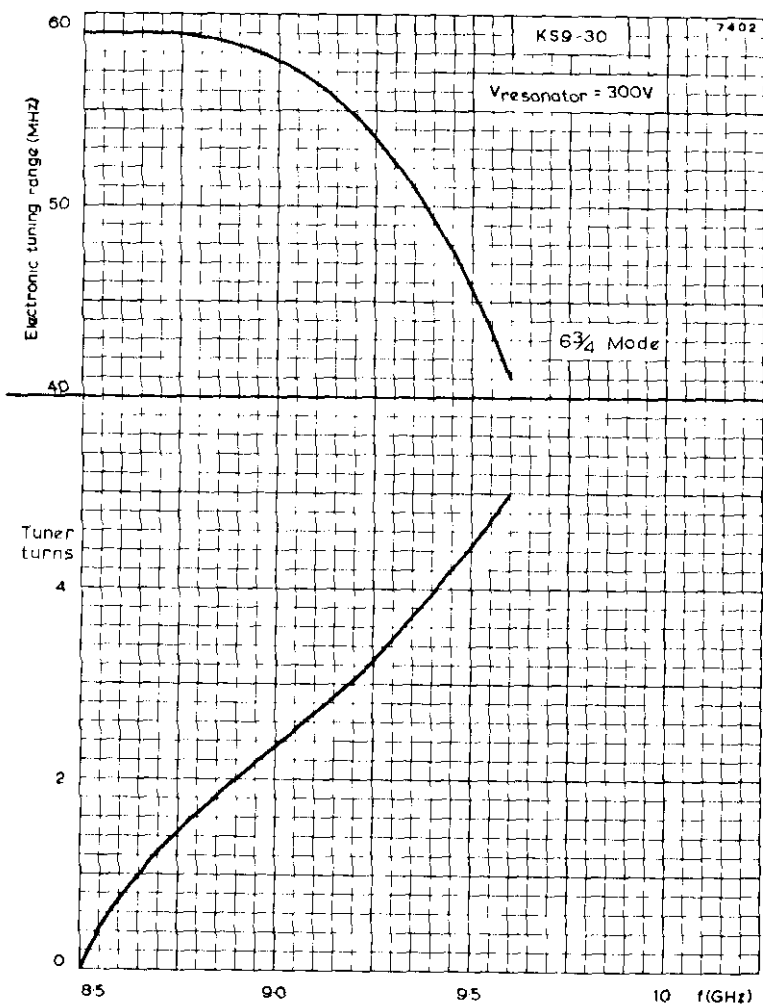
Millimetres	Inches	
1.02 ± 0.25	0.040 ± 0.010	
1.90 ± 0.60	0.075 ± 0.024	
3.60 ± 0.18	0.142 ± 0.007	
4.57 ± 0.50	0.180 ± 0.020	
4.75 ± 0.25	0.187 ± 0.010	
5.55 ± 0.10	0.219 ± 0.004	
6.29 ± 0.06	0.248 ± 0.002	
6.35 ± 0.12	0.250 ± 0.005	
6.35 ± 0.60	0.250 ± 0.024	
7.70	0.303	max.
10.20 ± 0.60	0.402 ± 0.024	
11.40	0.449	max.
15.00	0.591	min.
15.50 ± 0.60	0.610 ± 0.024	
17.10	0.673	max.
30.99 ± 0.10	1.220 ± 0.004	
32.51 ± 0.10	1.280 ± 0.004	
41.28 ± 0.25	1.625 ± 0.010	
41.90	1.650	max.
76.20	3.000	max.



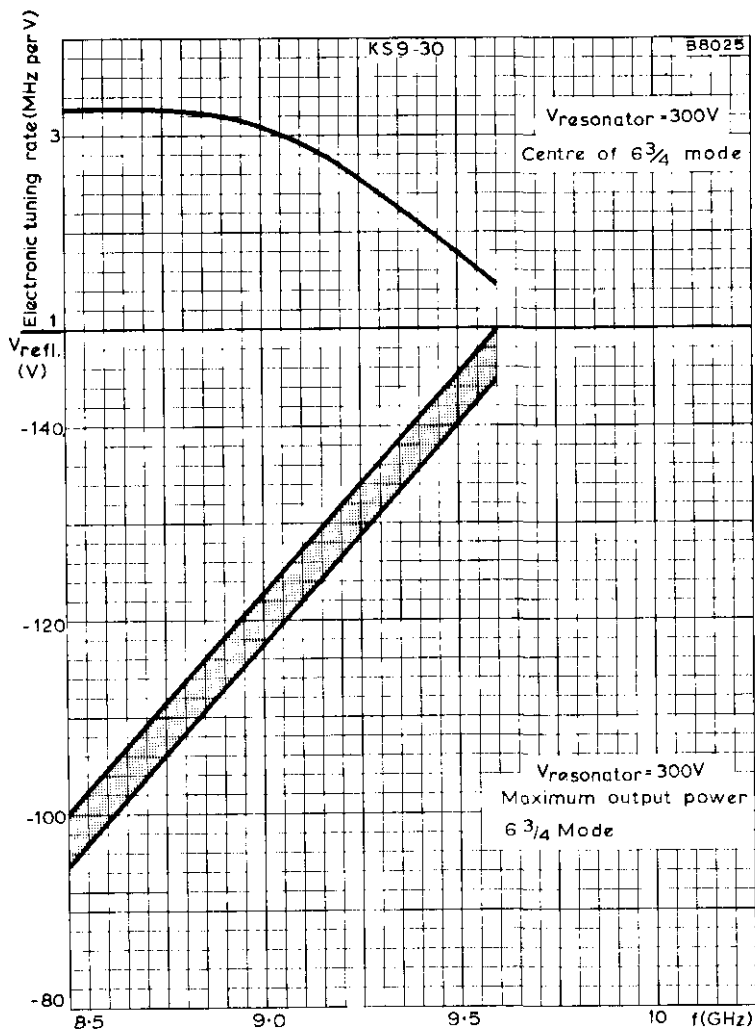


REFLECTOR VOLTAGE PLOTTED AGAINST FREQUENCY





ELECTRONIC TUNING RANGE AND TUNER TURNS  
PLOTTED AGAINST FREQUENCY



ELECTRONIC TUNING RATE AND REFLECTOR VOLTAGE RANGE FOR MAXIMUM OUTPUT POWER PLOTTED AGAINST FREQUENCY.

### QUICK REFERENCE DATA

*Light-weight mechanically tunable klystron for local oscillator applications.*

Frequency	9.3 to 9.5 Gc/s
Power output	40 mW
Construction	Waveguide output with coupled cavity

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS—MICROWAVE DEVICES: INTRODUCTION and REFLEX KLYSTRONS which precede this section of the handbook.

### TYPICAL OPERATION

$f$	9.4 Gc/s
$V_{\text{resonator}}$	300 V
$I_{\text{resonator}}$	33 mA
$V_{\text{reflector}}$	-85 V
$P_{\text{out}}$	40 mW
Electronic tuning range between half-power points	45 Mc/s

### ABSOLUTE MAXIMUM RATINGS

	Min.	Max.	
$V_{\text{resonator}}$	—	350	V
$I_{\text{resonator}}$	—	45	mA
$V_{\text{reflector}}$	-10	-400	V
$Z_{\text{reflector}}$		100	k $\Omega$
$V_{\text{h k}}$	—	$\pm 50$	V
$T_{\text{shell}}$	—	150	$^{\circ}\text{C}$
v.s.w.f.	—	1.5	

### CATHODE

Indirectly heated

$V_{\text{h}}$	6.3	V
$I_{\text{h max.}}$	700	mA
$t_{\text{h k}}$	60	s

## CHARACTERISTICS

	Min.	Max.	
Mechanical tuning range	9.3	9.5	Gc/s
Mechanical tuning rate (average over range)	—	150	Mc/s per turn
Electronic tuning range, between half-power points at any frequency in the mechanical tuning range ( $V_{\text{resonator}} = 300\text{V}$ )	28	—	Mc/s
Reflector modulation sensitivity at mode centre	2.0	3.0	Mc/s per volt
Power output at any frequency in the mechanical tuning range with reflector voltage optimised ( $V_{\text{resonator}} = 300\text{V}$ )	25	—	mW
Reflector voltage for maximum power output at 9.4Gc/s in principal mode ( $V_{\text{resonator}} = 300\text{V}$ )	-70	-110	V
Reflector voltage range over mechanical tuning range for optimum power output ( $V_{\text{resonator}} = 300\text{V}$ )	-65	-115	V
Frequency drift after first 5 minutes of operation	—	3.0	Mc/s
Temperature coefficient ( $T_{\text{ambient}} = -50^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ )	—	-0.2	Mc/s per $^{\circ}\text{C}$
Frequency change with atmospheric pressure change equivalent to operation 0 to 30,000 ft altitude	—	1.0	Mc/s
Frequency modulation under vibration of 10g applied to flange (30 to 1,000c/s)	—	2.0	Mc/s

## END OF LIFE PERFORMANCE

Electronic tuning range, between half-power points at any frequency in the mechanical tuning range ( $V_{\text{resonator}} = 300\text{V}$ )	25	Mc/s
Power output at any frequency in the mechanical tuning range with reflector voltage optimised ( $V_{\text{resonator}} = 300\text{V}$ )	20	mW

## COOLING

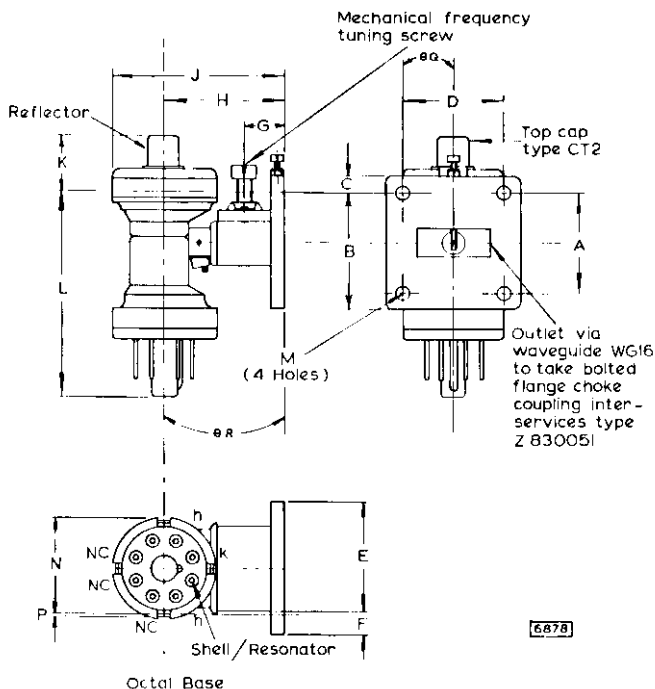
Natural

## MOUNTING POSITION

Any

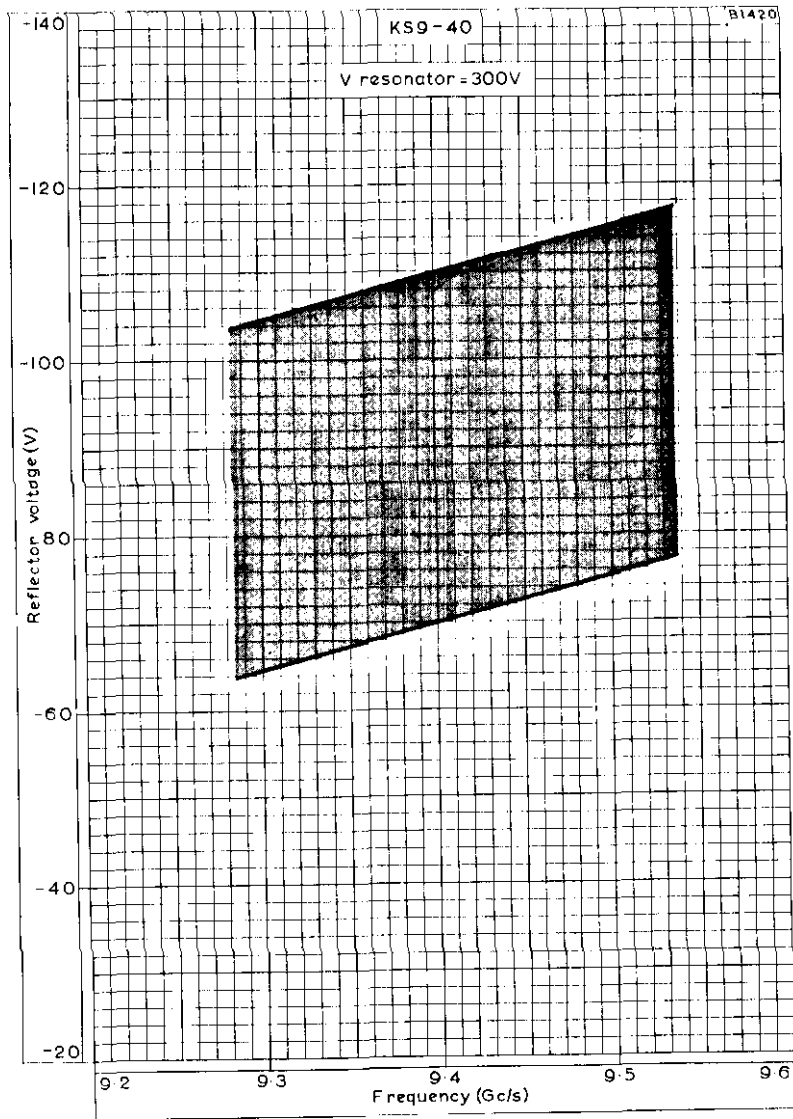
## PHYSICAL DATA

Weight of klystron	{ 5.6 150	oz g
Weight of klystron carton	{ 9 255	oz g
Dimensions of storage carton	{ 5.5 × 4.48 × 4.84 140 × 114 × 123	in mm

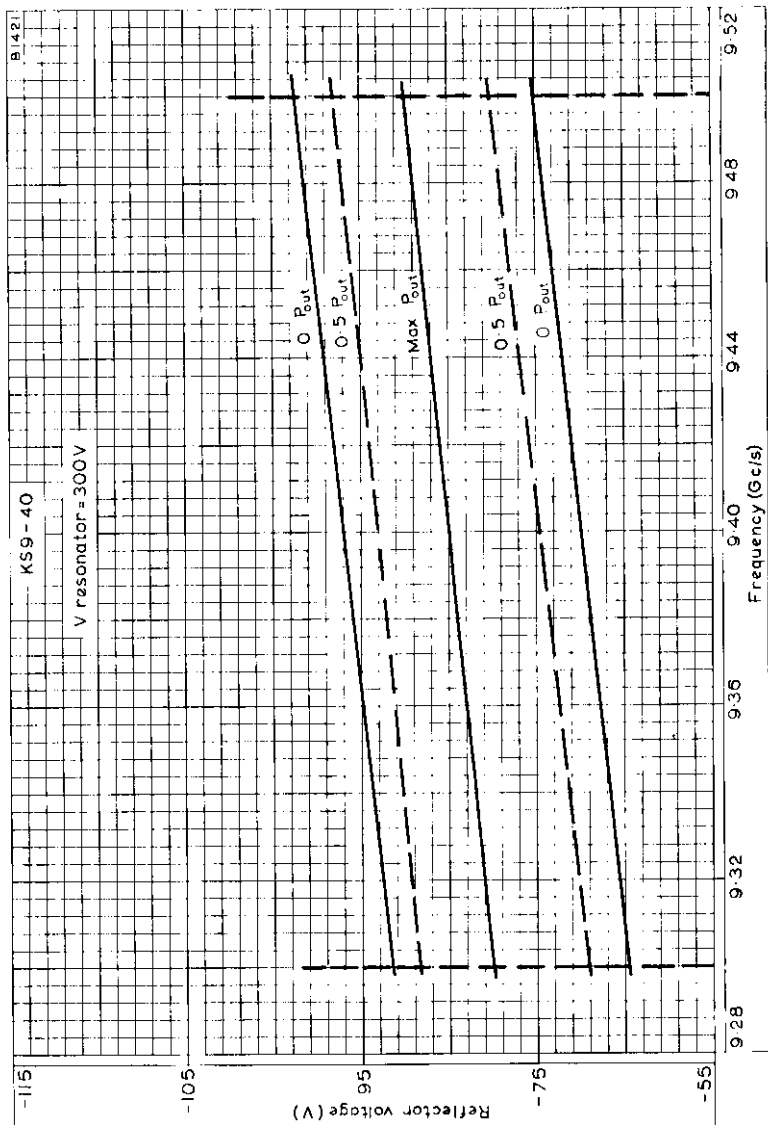


## DIMENSIONS

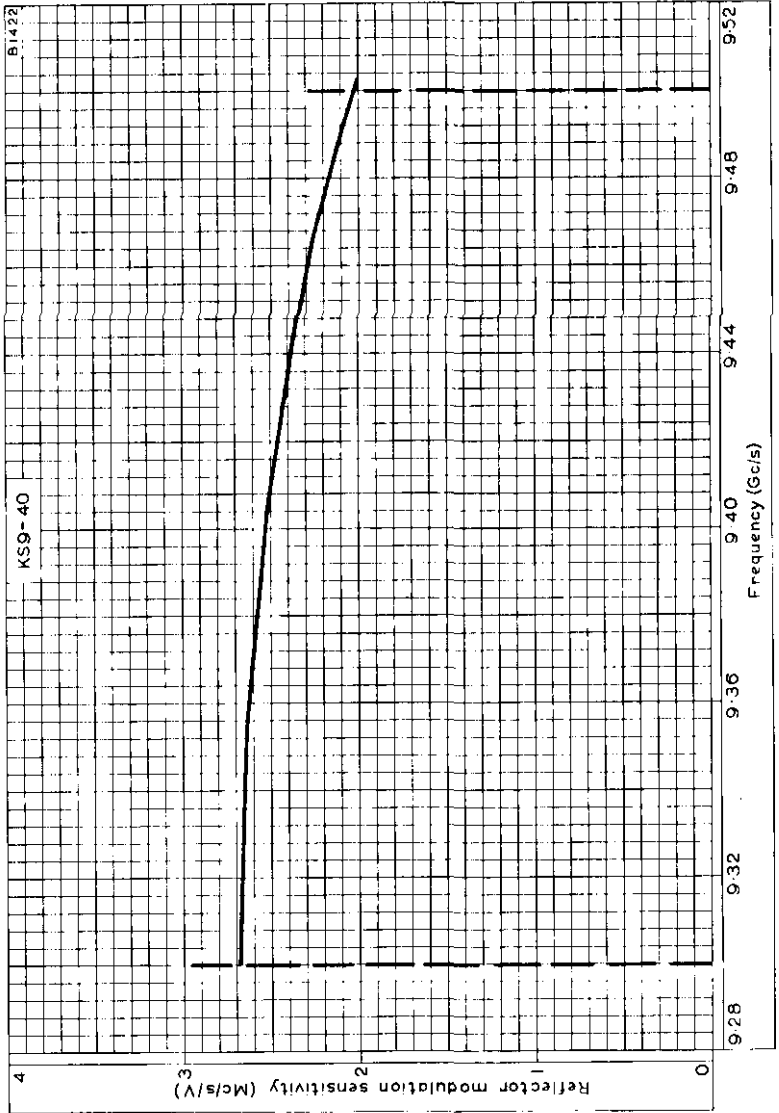
	Inches	Millimetres	
A	$1.282 \pm 0.004$	$32.54 \pm 0.1$	
B	1.461	37.10	max.
C	0.177	4.50	max.
D	$1.220 \pm 0.004$	$30.97 \pm 0.1$	
E	1.429	36.30	max.
F	0.209	5.30	max.
G	$0.354 \pm 0.039$	$9 \pm 1$	
H	$1.437 \pm 0.099$	$36.5 \pm 2.5$	
J	2.126	54	max.
K	0.866	22	max.
L	2.520	64	max.
M	$0.168 \pm 0.003$	$4.275 \pm 0.075$	
N	1.280	32.5	max.
P	0.059	1.5	max.
θQ		1°	max.
θR		1°	max.



REFLECTOR VOLTAGE RANGE PLOTTED AGAINST FREQUENCY

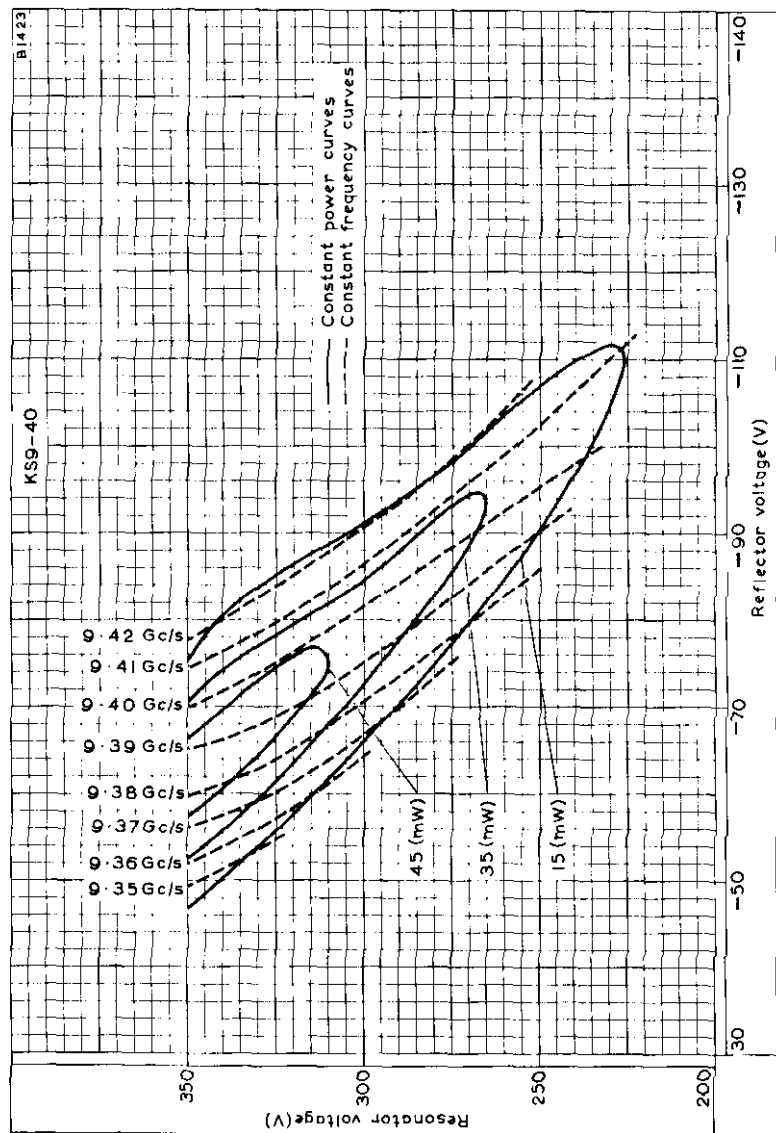


REFLECTOR VOLTAGE PLOTTED AGAINST FREQUENCY

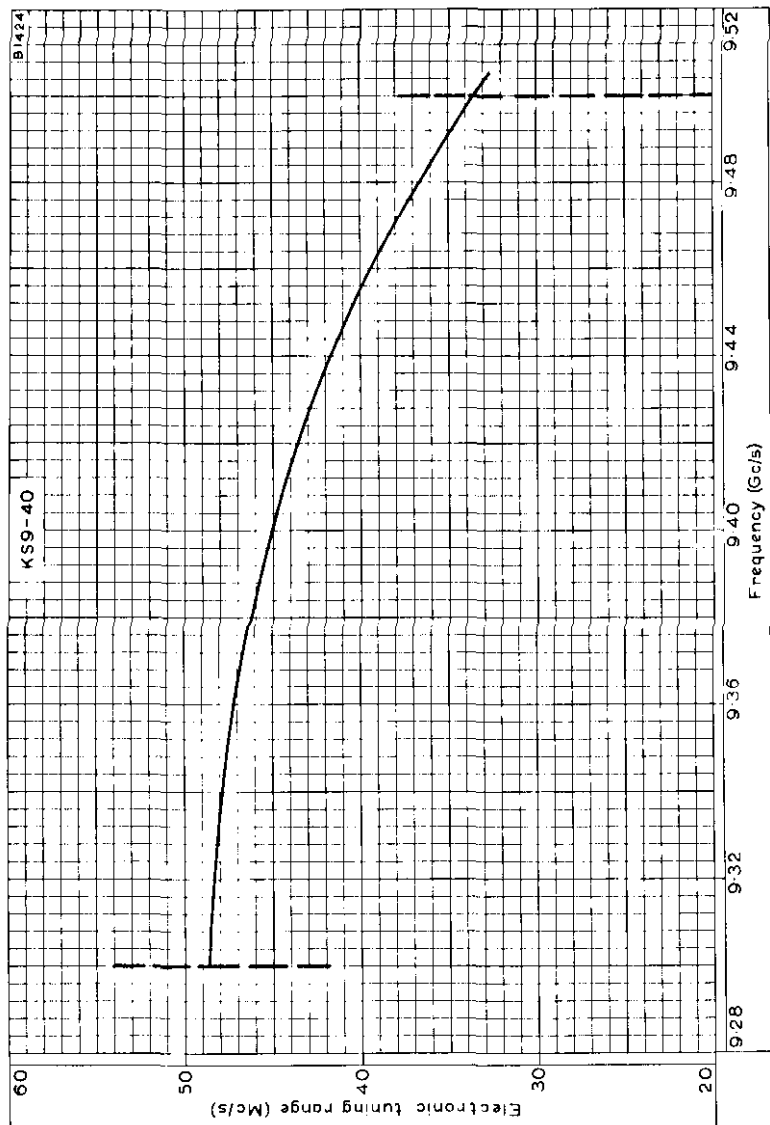


REFLECTION MODULATION SENSITIVITY PLOTTED AGAINST FREQUENCY

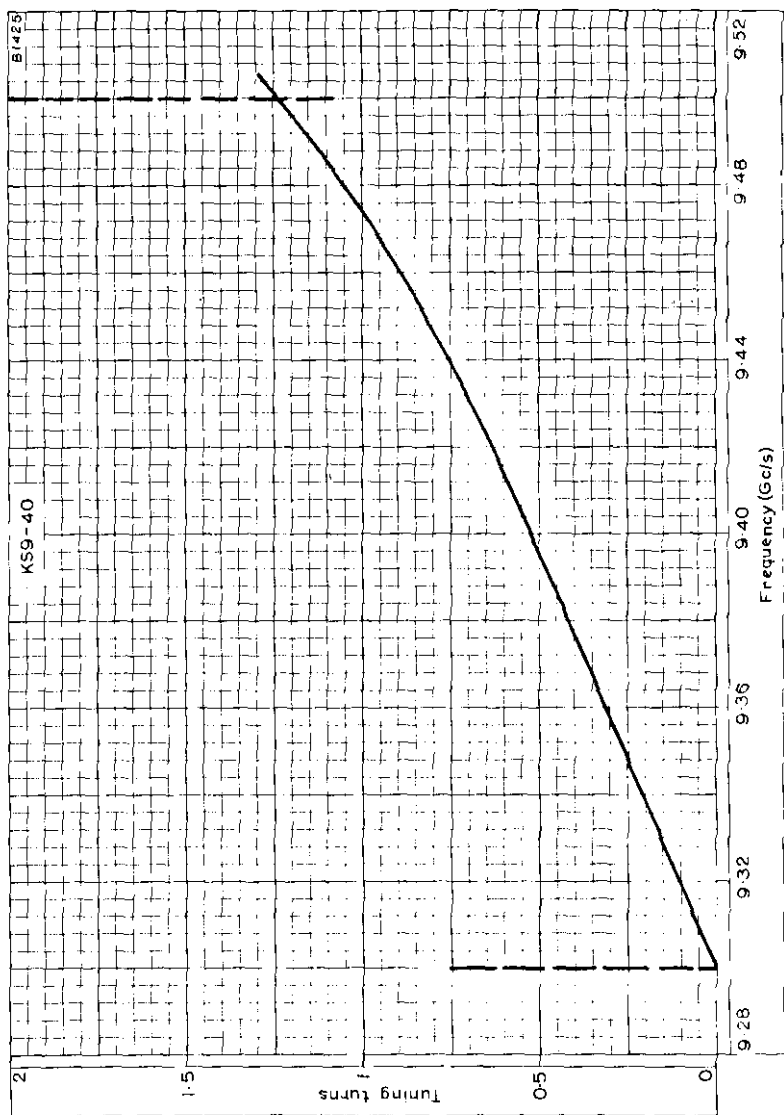




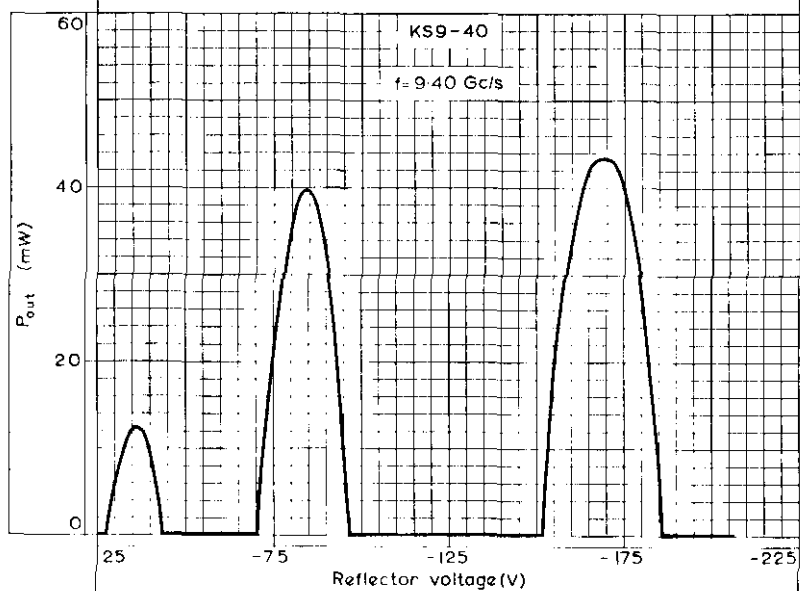
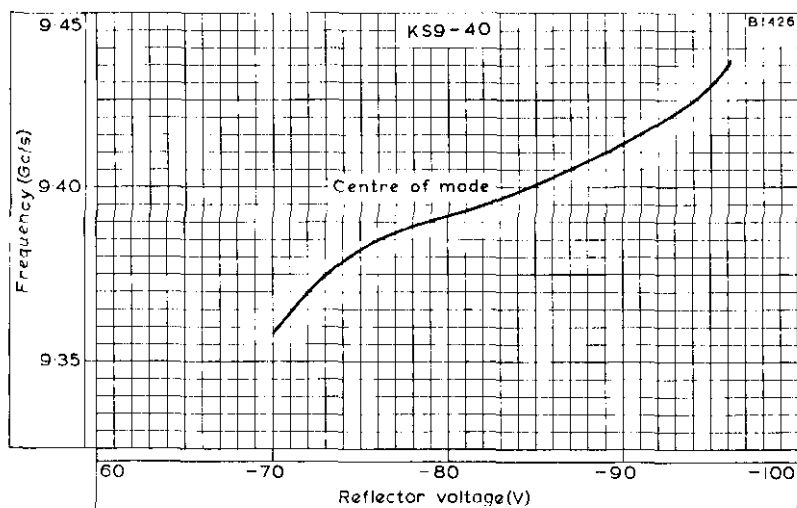
RESONATOR VOLTAGE PLOTTED AGAINST REFLECTOR VOLTAGE



ELECTRONIC TUNING RANGE PLOTTED AGAINST FREQUENCY



TUNING TURNS PLOTTED AGAINST FREQUENCY



FREQUENCY AND OUTPUT POWER PLOTTED AGAINST NEGATIVE REFLECTOR VOLTAGE

## TENTATIVE DATA

## QUICK REFERENCE DATA

Lightweight, mechanically tunable klystron for local oscillator applications.

Frequency	9.35 to 9.55	GHz
Power output	40	mW
Construction	Waveguide output, flying lead connections	

To be read in conjunction with  
GENERAL OPERATIONAL RECOMMENDATIONS - MICROWAVE DEVICES

## OPERATING CONDITIONS (Typical at 9.45GHz)

Resonator voltage	300	V
Resonator current	22	mA
Reflector voltage	-90	V
Load v.s.w.r.	1.1	
Electronic tuning range (see note 1)	35	MHz
Power output	40	mW

## CHARACTERISTICS

### Conditions

Heater voltage	6.3	V
Resonator voltage	300	V
Reflector voltage	Adjust	
v. s. w. r.	< 1.1	

### Limits

	Min.	Max.	
Frequency range	9.35	9.55	GHz
Mechanical tuning rate (see note 3)	-	150	MHz/turn
Electronic tuning range (see note 1)	20	50	MHz
Electronic tuning rate at mode centre	2.0	3.0	MHz/V
Power output (see note 4)	30	-	mW
Reflector voltage (see note 4)	-60	-115	V
Warm-up frequency drift (see note 5)	-	3.0	MHz
Frequency change with temperature (see note 6)	-	-0.2	MHz/degC
Frequency change with atmospheric pressure change equivalent to operation from 0 to 30 000ft altitude	-	1.0	MHz
Peak frequency deviation under vibration of 10g applied to the flange (30 to 1000Hz)	-	2.0	MHz
Resonator current	-	25	mA

### RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Min.	Max.	
Resonator voltage	-	350	V
Resonator current	-	35	mA
Reflector voltage	-10	-100	V
Heater to cathode voltage	-	+50	V
v. s. w. r.	-	1.5	
Reflector impedance (see note 2)	-	-	



## END OF LIFE PERFORMANCE

	Min.	Max.	
Electronic tuning range (see note 4)	-	25	MHz
Power output	20	-	mW

## CATHODE

Indirectly heated

	Min.	Typ.	Max.	
Heater voltage	-	6.3	-	V
Heater current	410	460	550	mA

## COOLING

	Convection and conduction		
Shell temperature max.	150		°C

## MOUNTING POSITION

Any

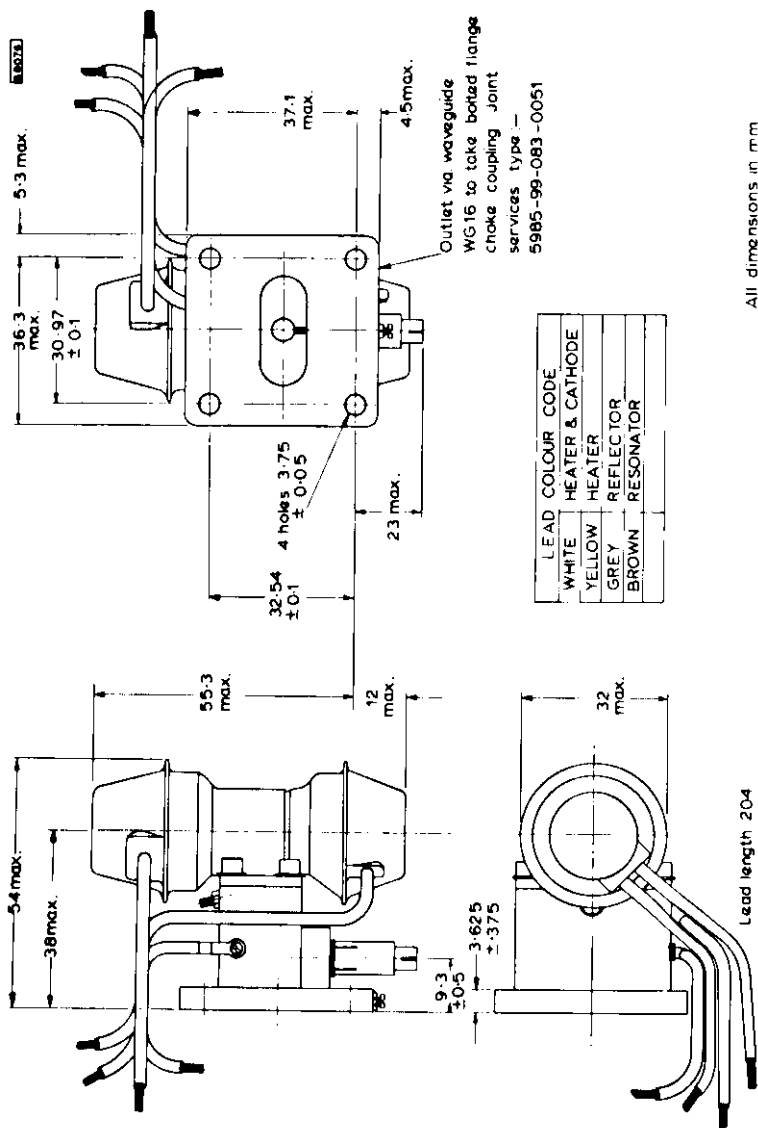
## PHYSICAL DATA

Weight of klystron	188	g
--------------------	-----	---

## OPERATING NOTES

1. Measured at half-power points
2. The time constant should be such that the resonator voltage is not applied before the reflector has become negative with respect to the cathode.
3. Average over the frequency range.
4. Reflector voltage adjusted for maximum power output.
5. Measured after the first five minutes of operation.
6. Over the ambient temperature range of  $-50$  to  $+70^{\circ}\text{C}$ .

OUTLINE DRAWING



All dimensions in mm



## PRELIMINARY DATA

## QUICK REFERENCE DATA

*Light-weight mechanically tunable klystron for local oscillator applications.*

Frequency	9.38 to 9.51 Gc/s
Power output	35 mW
Construction	Waveguide output with coupled cavity

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

## TYPICAL OPERATION

$f$	9.45 Gc/s
$V_{\text{resonator}}$	300 V
$I_{\text{resonator}}$	33 mA
$V_{\text{reflector}}$	-88 V
$P_{\text{out}}$	35 mW
Electronic tuning range between half-power points	40 Mc/s

## ABSOLUTE MAXIMUM RATINGS

	Min.	Max.	
$V_{\text{resonator}}$	—	350	V
$I_{\text{resonator}}$	—	45	mA
$V_{\text{reflector}}$	-10	-400	V
$Z_{\text{reflector supply}}$	—	100	k $\Omega$
$V_{\text{h k}}$	—	$\pm 50$	V
$T_{\text{shell}}$	—	150	$^{\circ}\text{C}$
v.s.w.r.		1.5	

## CATHODE

Indirectly heated

$V_{\text{h}}$	6.3	V
$I_{\text{h max.}}$	700	mA
$t_{\text{h k}}$	60	s

## CHARACTERISTICS

	Min.	Max.	
Mechanical tuning range	9.38	9.51	Gc/s
Mechanical tuning rate (average over range)	—	150	Mc/s per turn
Electronic tuning range, between half-power points at any frequency in the mechanical tuning range ( $V_{\text{resonator}} = 300\text{V}$ )	30	—	Mc/s
Electronic tuning rate at mode centre	2.0	3.0	Mc/s per volt
Power output at any frequency in the mechanical tuning range with reflector voltage optimised ( $V_{\text{resonator}} = 300\text{V}$ )	25	45	mW
Reflector voltage for maximum power output at 9.45Gc/s in principal mode ( $V_{\text{resonator}} = 300\text{V}$ )	-70	-115	V
Reflector voltage range over mechanical tuning range for optimum power output ( $V_{\text{resonator}} = 300\text{V}$ )	-60	-120	V
Frequency drift after first 5 minutes of operation	—	3.0	Mc/s
Temperature coefficient ( $T_{\text{ambient}} = -50^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ )	—	-0.2	Mc/s per $^{\circ}\text{C}$
Frequency change with atmospheric pressure change equivalent to operation 0 to 30,000ft altitude	—	1.0	Mc/s
Frequency modulation under vibration of 10g applied to flange (30 to 1,000c/s)	—	2.0	Mc/s
Resonator current ( $V_{\text{resonator}} = 300\text{V}$ )	—	40	mA
Signal-to-noise ratio $>160\text{dB}$ per cycle of i.f. bandwidth. A.M. noise on a typical sample with reflector voltage optimised for maximum power at frequency of measurement and with receiver intermediate frequency $>25\text{Mc/s}$ .			

## END OF LIFE PERFORMANCE

Electronic tuning range, between half-power points at any frequency in the mechanical tuning range ( $V_{\text{resonator}} = 300\text{V}$ )	25	Mc/s
Power output at any frequency in the mechanical tuning range with reflector voltage optimised ( $V_{\text{resonator}} = 300\text{V}$ )	20	mW

## COOLING

Natural

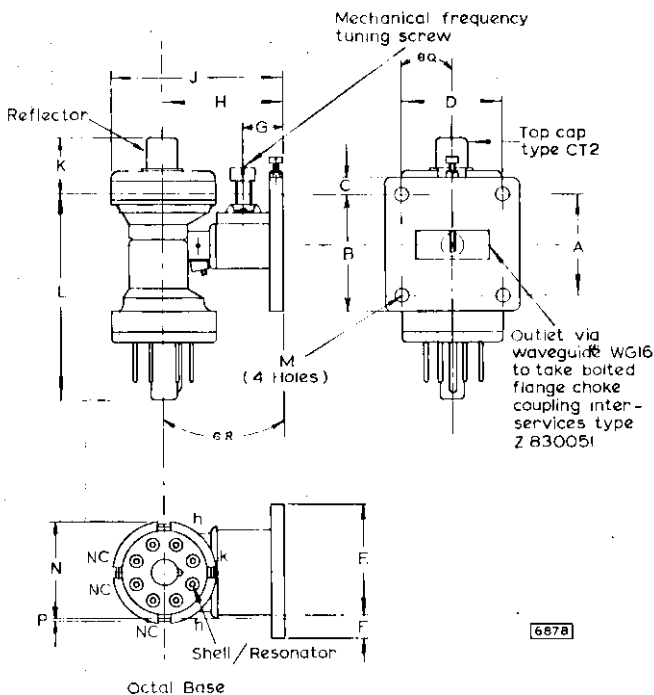
## MOUNTING POSITION

Any

## PHYSICAL DATA

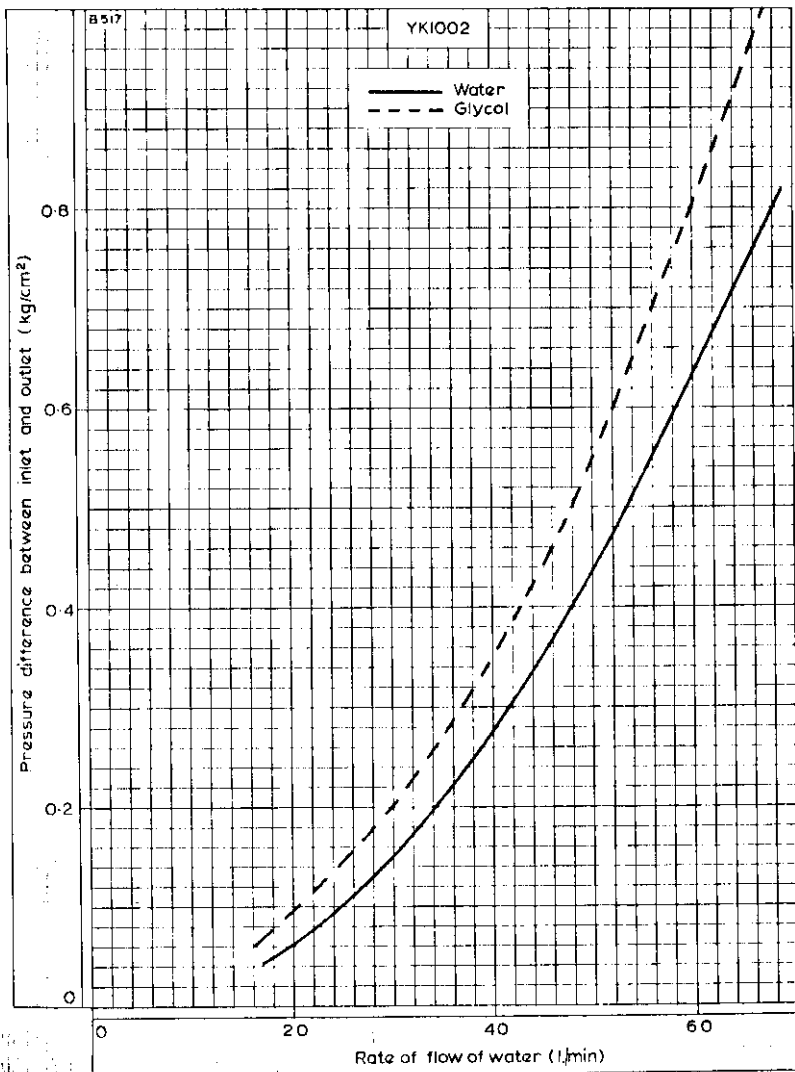
Weight of klystron	{ 5.6 oz 150 g
Weight of klystron carton	{ 9 oz 255 g
Dimensions of storage carton	{ 5.5 x 4.48 x 4.84 in 140 x 114 x 123 mm





**DIMENSIONS**

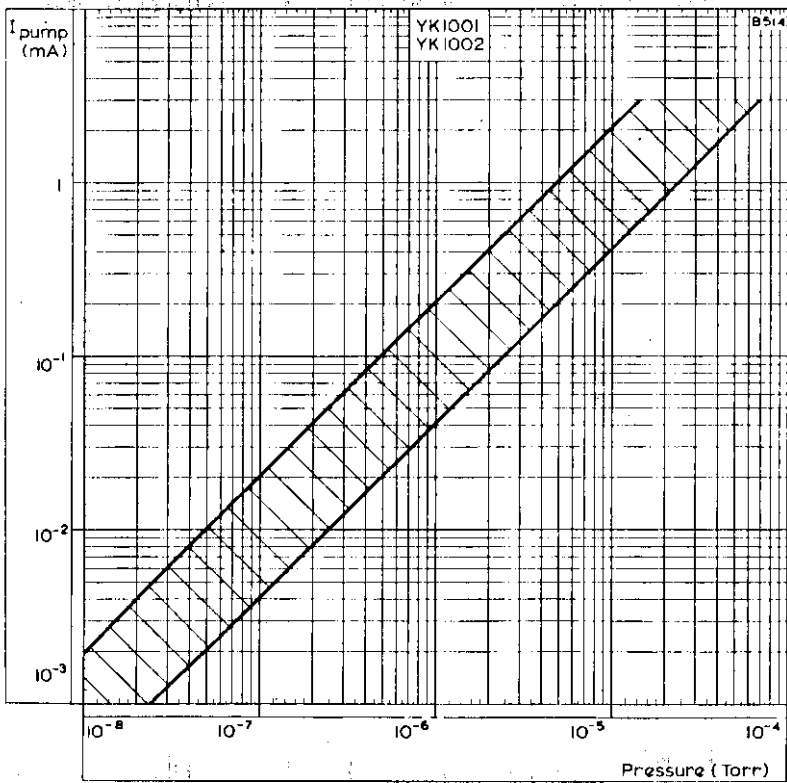
	<i>Inches</i>	<i>Millimetres</i>	
A	1.282 ± 0.004	32.54 ± 0.1	
B	1.461	37.10	max.
C	0.177	4.50	max.
D	1.220 ± 0.004	30.97 ± 0.1	
E	1.429	36.30	max.
F	0.209	5.30	max.
G	0.354 ± 0.039	9 ± 1	
H	1.437 ± 0.099	36.5 ± 2.5	
J	2.126	54	max.
K	0.866	22	max.
L	2.520	64	max.
M	0.168 ± 0.003	4.275 ± 0.075	
N	1.280	32.5	max.
P	0.059	1.5	max.
∅Q		1°	max.
∅R		1°	max.



COOLING CURVE FOR YK1002

# YK1001 YK1002

## POWER KLYSTRON



### ION PUMP CHARACTERISTICS



## PRELIMINARY DATA

## QUICK REFERENCE DATA

The YK1001 is a forced-air cooled power klystron for vision and sound transmitters at bands IV and V. The YK1002 is electrically identical but has a water-cooled collector.

f	470 to 790	Mc/s
P <sub>out</sub>	10	kW
Construction:	Permanent magnet focusing, unpackaged	

This data should be read in conjunction with GENERAL OPERATIONAL RECOMMENDATIONS - MICROWAVE DEVICES which precede this section of the handbook.

*Unless otherwise shown, data are applicable to both types.*

## TYPICAL OPERATION

## Linear amplifier for television service (negative modulation)

	Normal collector voltage	Depressed collector voltage	
Collector voltage	18	13	kV
Collector current	1.85	1.85	A
Drift tube No. 5 voltage	18	18	kV
Drift tube current (total)	25	40	mA
Focusing electrode voltage	-300	-300	V
Drive power (sync)		10	W
Output power (sync)		11	kW
Gain		30	dB

## Tuning of resonant cavities for C.C.I.R. system

Cavity 1	+2.0	Mc/s
Cavity 2	-0.5	Mc/s
Cavity 3	+4.5	Mc/s
Cavity 4	±0	Mc/s

Cavity damping at black level (P<sub>out (sync)</sub> = 11kW)

Cavity 1	2.0	W
Cavity 2	50	W
Cavity 3	80	W

### ABSOLUTE MAXIMUM RATINGS

Peak collector voltage ( $I_{beam} = 0A$ )	21	kV
Collector voltage max.	18.5	kV
Peak drift tube No. 5 voltage ( $I_{beam} = 0A$ )	21	kV
Drift tube No. 5 voltage max.	18.5	kV
Focusing electrode voltage max. (negative)	500	V
Collector current max.	2.0	A
Drift tube current max. (total)		
depressed collector operation ( $V_{coll} < V_{cavity 5}$ )	150	mA
normal collector operation ( $V_{coll} = V_{cavity 5}$ )	100	mA
Collector dissipation max.	35	kW
Cathode seal temperature max.	125	°C
First anode temperature max.	125	°C
Drift tubes Nos. 1, 2 and 3 temperature max.	80	°C
Drift tubes Nos. 4 and 5 temperature max.	150	°C
Output cavity temperature max.	125	°C
Collector temperature max.	260	°C
Ion pump voltage max.	4.0	kV
Ion pump current max.	10	mA

### CATHODE

Indirectly heated, dispenser type

$V_h$	$7.5 \pm 3\% V$
$I_h$	32 A
$I_h$ surge max.	80 A
$r_h$ cold	28 mΩ
$t_{h-k}$ min.	3.0 min

### GETTER

Ion pump

Ion pump voltage	3.0	kV
Ion pump current	See curve on page C4	

### COOLING

A low velocity airflow should be directed at the cathode and accelerating anode. A flow of air of  $1m^3/min$  ( $35.3ft^3/min$ ) directed at cavities Nos. 1, 2 and 3 and  $2m^3/min$  ( $70.6ft^3/min$ ) at cavity No. 4 is sufficient to keep the temperature below the permitted maximum.

Cavity No. 5 and output cavity should be cooled by a flow of air of  $2m^3/min$  ( $70.6ft^3/min$ ) at a pressure of 90mm  $H_2O$ .

The collector of YK1001 is forced-air cooled, see curve on page C1.

The collector of YK1002 is water cooled, see curve on page C2.

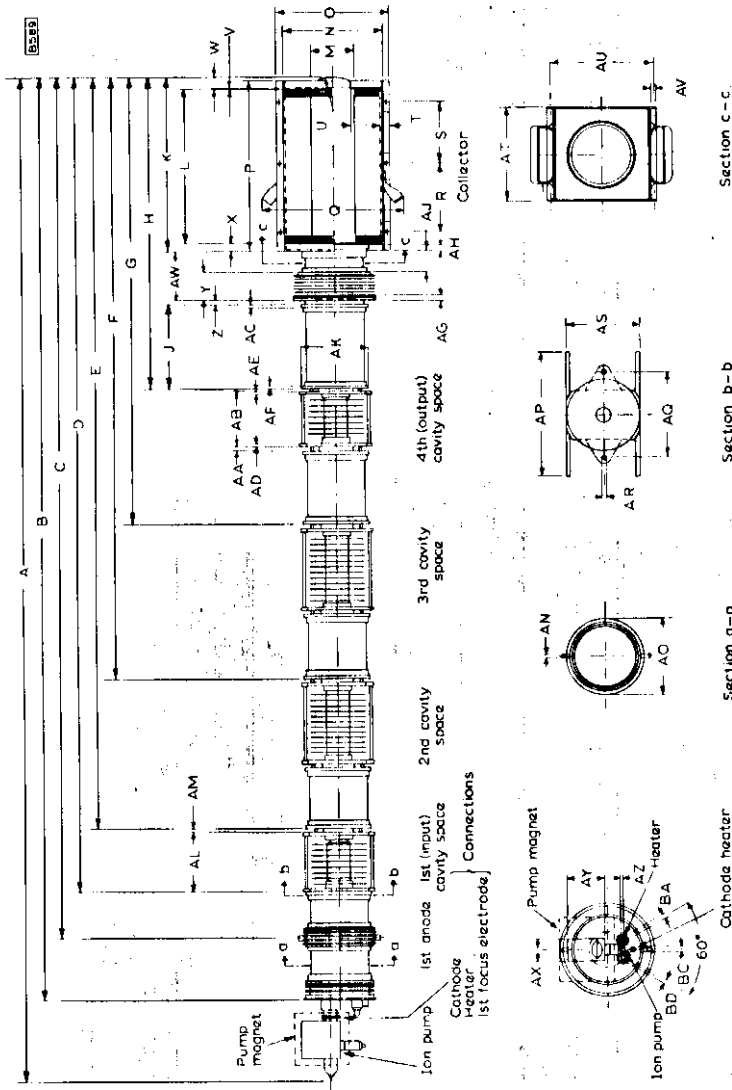
### MOUNTING POSITION

Vertical, cathode uppermost

### OPERATING NOTE

For optimum performance, the electron beam should be focused for minimum cavity current.

OUTLINE DRAWING OF YK1001



DIMENSIONS OF YK1001

The inch dimensions are derived from the original millimetre dimensions.

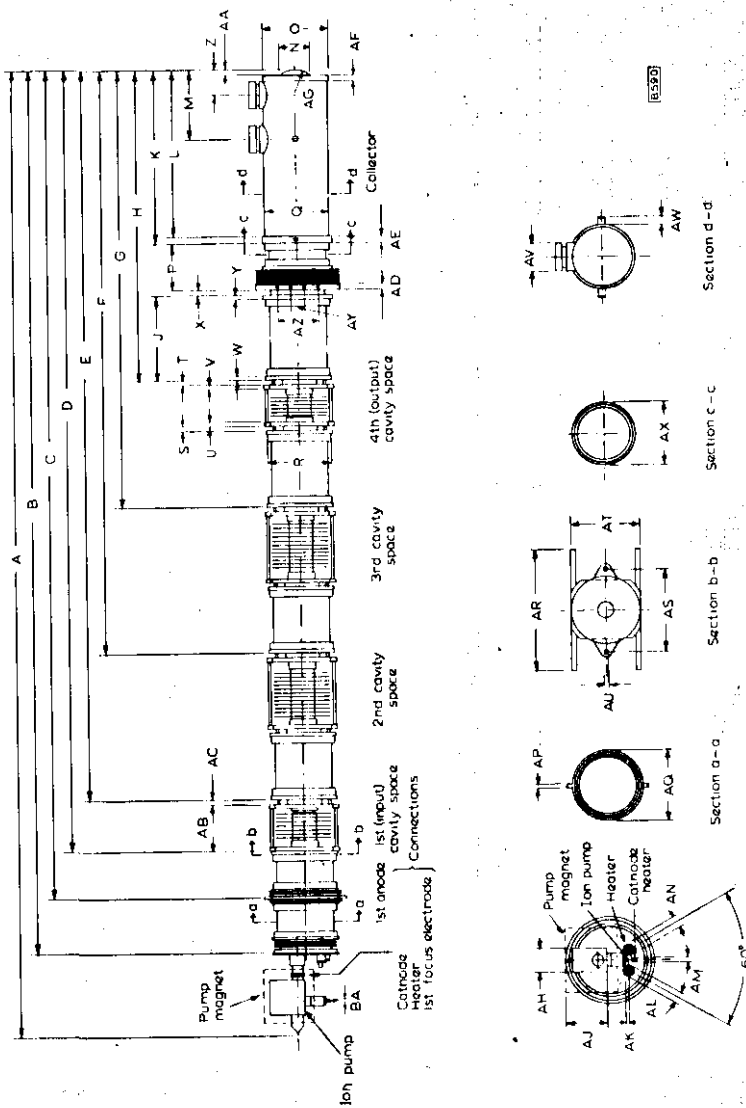
	Millimetres	Inches	Millimetres	Inches	Millimetres	Inches	Millimetres	Inches
A	1642	64.6	T	12	0.47	AL	80	3.15
B	1499	59	U	60	2.36	AM	7.0	0.28
C	1393	54.8	V	1.5	0.06	AN	9.0	0.35 dia.
D	1306	51.4	W	17	0.67	AO	130	5.12
E	1219	48	X	12	0.47	AP	200	7.9
F	963	37.9	Y	40.5	1.6	AQ	150	5.9
G	707	27.8	Z	7.0 ± 0.5	0.28 ± 0.02	AR	8.5	0.33
H	496	19.53	AA	7.0	0.28	AS	120	4.7
J	117 ± 0.5	4.60 ± 0.02	AB	80	3.15	AT	161	6.34
K	295	11.6	AC	6.3 ± 0.2	0.248 ± 0.008	AU	174	6.85
L	265	10.4	AD	8.0	0.315	AV	10	0.39
M	69	2.72	AE	8.0	0.315	AW	77.5	3.05
N	161	6.34	AF	6.3 ± 0.2	0.248 ± 0.008	AX	38	1.5
O	184	7.2	AG	8.0	0.315	AY	75	2.95
P	288	11.34	AH	10	0.39	AZ	6.0	0.24
Q	250	9.84	AJ	39	1.54	BA	10.5	0.59
R	114	4.5	AK	117 ± 0.1	4.606 ± 0.004	BC	10.5	0.59
S	114	4.5		-0.2	-0.008	BD	9.0	0.35



# YK1001 YK1002

POWER KLYSTRON

## OUTLINE DRAWING OF YK1002



### DIMENSIONS OF YK1002

The inch dimensions are derived from the original millimetre dimensions.

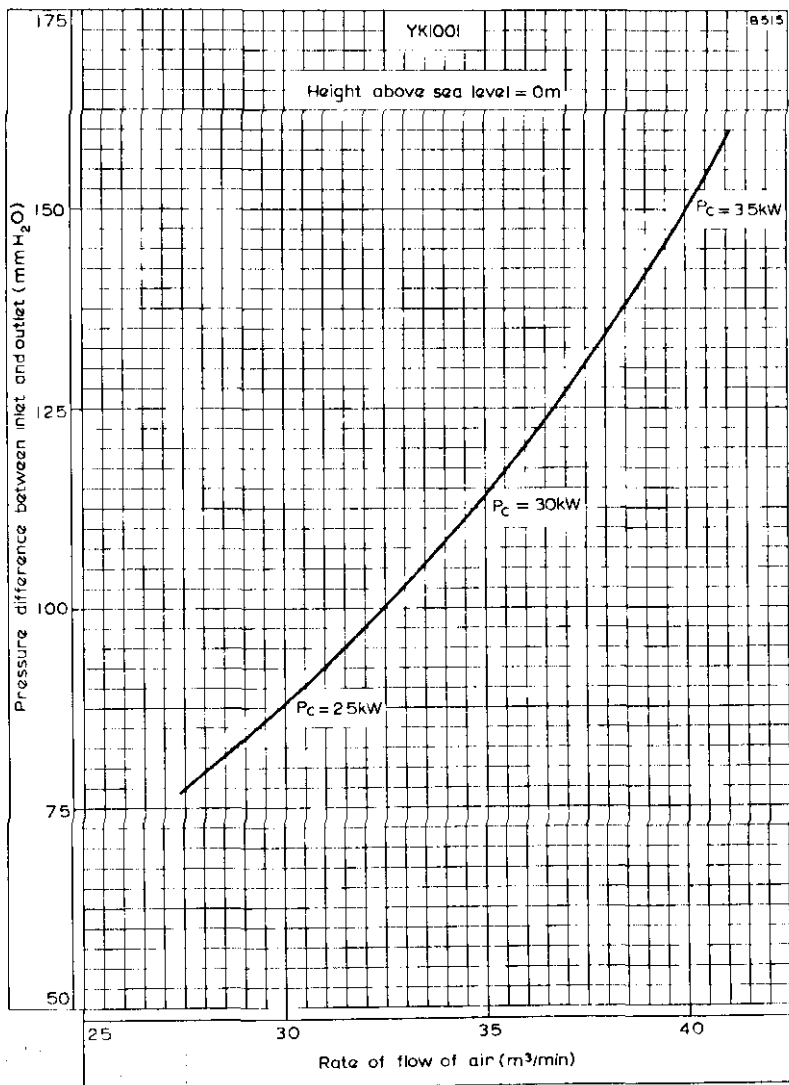
	Millimetres	Inches	Millimetres	Inches	Millimetres	Inches	
A	1642	64.6	R	117 ± 0.1	4.606 ± 0.004	AH	1.5
B	1499	59	S	7.0	-0.2	AJ	2.95
C	1393	54.8	T	7.0 ± 0.5	0.28	AK	0.24
D	1306	51.4	U	8.0	0.28 ± 0.02	AL	0.35
E	1219	48	V	8.0	0.315	AM	0.59
F	963	37.9	W	6.3 ± 0.2	0.315	AN	0.59
G	707	27.8	X	7.0 ± 0.5	0.248 ± 0.008	AO	0.35
H	496	19.53	Y	6.3 ± 0.2	0.28 ± 0.02	AP	9.0
I	117 ± 0.5	4.60 ± 0.02	Z	40	1.58	AQ	5.12
J	295	11.6	AA	10	0.39	AR	7.9
K	285	11.2	AB	80	3.15	AS	5.9
L	122	4.8	AC	7.0	0.28	AT	4.72
M	122	4.8	AD	8.0	0.315	AU	8.5
N	60	2.36	AE	10	0.39	AV	1.5
O	117.5	4.6	AF	5.0	0.2	AW	0.6
P	77.5	3.05	AG	55	2.17	AX	4.6
Q	115	4.53			rad.	AY	0.79
						AZ	2.36

## PHYSICAL DATA

Weight of klystron	YK1001	{ 126	lb
		{ 57	kg
	YK1002	{ 126	lb
		{ 57	kg
Weight of accessories		{ 265	lb
		{ 120	kg

## ACCESSORIES

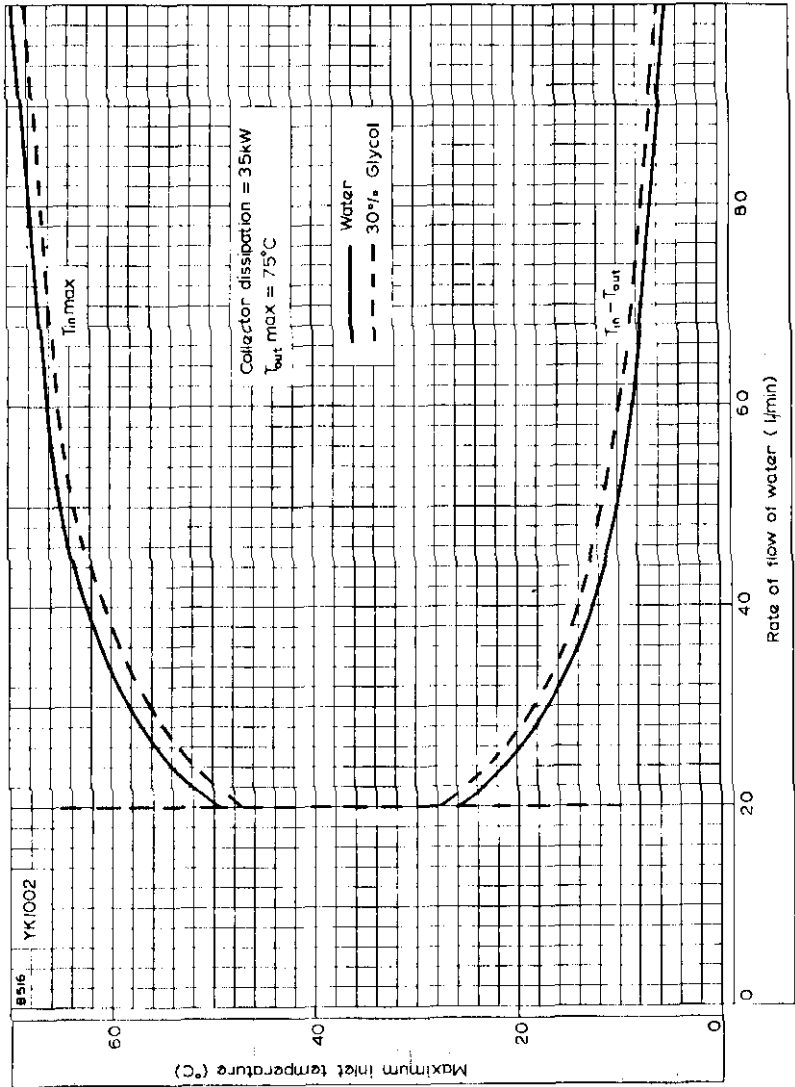
Heater connector	40649
Cathode connector	40649
Focusing electrode connector	40634
First anode connector	40634
Collector connector	40634
Ion pump connector	55351
Ion pump magnet	TE1053
5 focusing magnets	TE1065
4 resonant cavities	TE1066



COOLING CURVE FOR YK1001

# YK1001 YK1002

## POWER KLYSTRON



COOLING CURVE FOR YK1002

## TENTATIVE DATA

## QUICK REFERENCE DATA

Permanent magnet focused power amplifier klystron, suitable for depressed collector operation. Intended for use as vision and sound amplifier for bands IV and V.

Frequency	470 to 860	MHz
Power output	11	kW
Construction	Ceramic-metal, unpackaged	

To be read in conjunction with  
GENERAL OPERATIONAL RECOMMENDATIONS - MICROWAVE DEVICES

## OPERATING CONDITIONS

Typical vision amplifier operation with depressed collector voltage C. C. I. R. system with negative modulation. Bandwidth (-1dB) = 6MHz.

Frequency	470	790	MHz
Cathode to collector voltage (see note 1)	-13.5	-16	kV
Collector to drift tube voltage	-4.0	-4.0	kV
Accelerator to drift tube voltage (see note 2)	0	0	V
Focus electrode to cathode voltage	-240	-600	V
Drift tube current			
static (focused for minimum)	30	30	mA
black level (see note 3)	80	60	mA
Cathode current	2.0	1.85	A
Output power	11	11	kW
Drive power (see curve page 8 and note 4)	2.0	1.0	W
Power gain	38	40	dB
Linearity (without compensation, see note 5)	80	80	%
Max. sync compression (see note 6)	45/25	45/25	
Max. sideband suppression (see note 7)	-20	-20	dB
Max. noise (referred to black level, see note 8)	-46	-46	dB
Differential phase (without compensation)	5.0	5.0	deg



## OPERATING CONDITIONS (cont'd)

### Typical operation as sound amplifier (with depressed collector)

Frequency	470	790	MHz
Cathode to collector voltage (see note 1)	-13.5	-13.5	kV
Collector to drift tube voltage	-5.0	-5.0	kV
Accelerator to drift tube voltage (see note 2)	-7.5	-5.5	kV
Focus electrode to cathode voltage	-400	-400	V
Drift tube current	50	70	mA
Cathode current	0.7	1.0	A
Output power	2.2	4.4	kW
Max. drive power	0.5	0.5	W

### Tuning of cavities with respect to carrier frequency (approx.)

Cavity 1	+3.0	MHz
Cavity 2	-0.5	MHz
Cavity 3	-4.5	MHz
Cavity 4	0	MHz

### Max. cavity damping at black level for $P_{out\ sync} = 11kW$

Cavity 1	5.0	W
Cavity 2	100	W
Cavity 3	200	W

### RATINGS (ABSOLUTE MAXIMUM SYSTEM)

Max. drift tube to cathode voltage	22	kV
Max. drift tube to cathode voltage at zero current	25	kV
Max. drift tube to collector voltage	7.0	kV
Max. cathode to focus electrode voltage (see note 9)	700	V
Min. cathode to focus electrode voltage	100	V
Max. drift tube to accelerator voltage	25	kV
Max. accelerator voltage source resistance	20	k $\Omega$
Min. accelerator voltage source resistance	10	k $\Omega$
Max. drift tube current	150	mA
Max. cathode current	2.2	A
Max. collector dissipation	40	kW
Max. voltage standing wave ratio	1.5	

## NOTES

1. In operation, a cathode voltage fluctuation of  $\pm 3\%$  will not damage the tube, but should not exceed  $\pm 1\%$  for good transmission quality.
2. If the accelerator electrode voltage is obtained by means of a potential divider from the cathode supply voltage, then the divider must pass a quiescent current of at least 3mA.
3. To be focused for minimum drift tube current at black level. A maximum deviation of 10% from the minimum current is permitted, if necessary, to obtain the required signal transfer quality but the limiting value must not be exceeded.
4. A circulator must be used between driver stage and input cavity. The drive power is measured between the circulator and first cavity at a 50 $\Omega$  resistance and represents the sum of the forward and the reflected power in the first cavity. A pre-correction is required in the preamplifier for the level dependency of the band pass curve caused by non linearity of the klystron.
5. Measured with a sawtooth voltage of amplitude between 17 and 75% of the peak sync value, on which is superimposed a 4.43MHz sine wave with a 10% peak to peak value.
6. A picture/sync ratio of 75/25 for the outgoing signal of the klystron requires a ratio of 55/45 for the incoming signal.
7. Measured with a 10 to 75% modulation without compensation and a vestigial sideband filter between driver and klystron.
8. Produced by the klystron itself, without hum from power supplies.
9. The focus voltage power supply should be pre-loaded by a minimum current of 10mA at 700 volts.

## Supply failure

In the case of a failure, all electrode voltages for the klystron except the pump and heater voltages should be switched off and reduced to less than 5% of the nominal value within 250ms after the failure has occurred.





## COOLING (cont'd)

## Maximum temperatures

Cathode base	125	°C
Accelerator electrode	125	°C
Drift tubes 1, 2 and 3	80	°C
Drift tubes 4 and 5	150	°C
Collector seal	200	°C
*Collector body	300	°C
Output resonator	125	°C

\*To safeguard this temperature limit it is recommended to measure the air outlet temperature at least at two places, one at 50mm and the other at 150mm from the upper collector plate and at a distance of 50mm from the cooling fins.

## PRESSURISING

Altitude max.	3000	m
---------------	------	---

## MOUNTING POSITION

*Vertical, cathode uppermost*

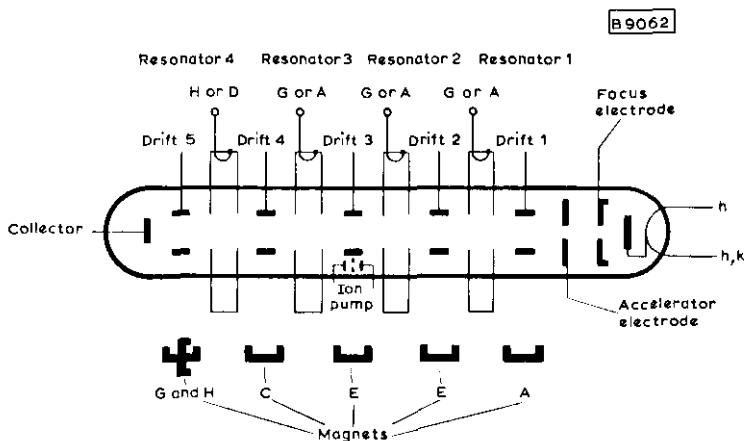
In order to prevent distortion of the magnetic focusing field ferromagnetic material should not be placed within a radius of 350mm from the tube axis. All connections should be free from strain.

## PHYSICAL DATA

Weight of klystron (approx.)	60	kg
Weight of accessories (approx.)	130	kg

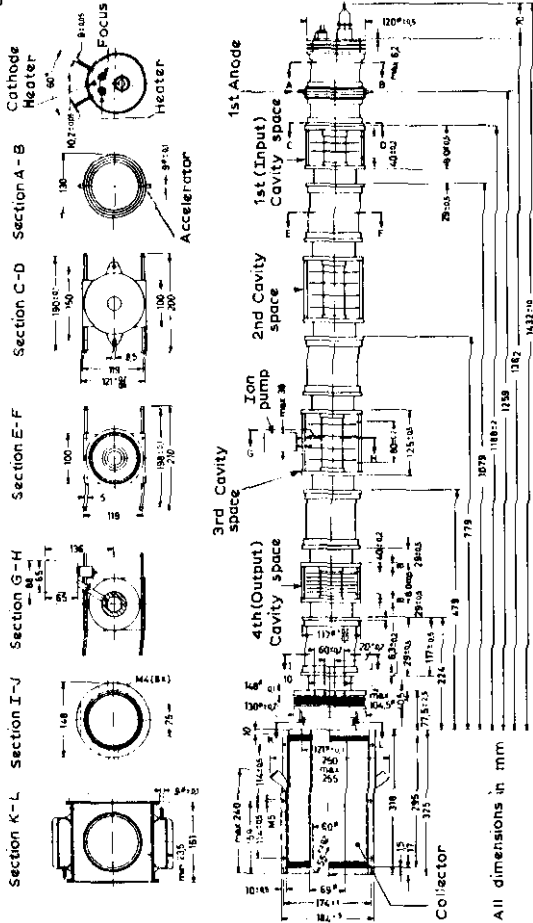
## ACCESSORIES

Heater connector	40649	
Heater/cathode connector	40649	
Focusing electrode connector	40634	
Accelerating electrode connector	40634	
Collector connector	40634	
Ion pump connector	55351	
Resonators for 470 to 615MHz	3 × TE1056G 1 × TE1056H	
Resonators for 615 to 860MHz	3 × TE1067A 1 × TE1067D	
Permanent magnet assemblies	2 × TE1065A	
	2 × TE1065C	
	4 × TE1065E	
	2 × TE1065G	
	2 × TE1065H	
Air duct	TE1071	
Magnetic screen	TE1075	
Circulators (temperature compensated)		
	for 470 to 600MHz	4322 020 50090
	for 590 to 720MHz	4322 020 50110
	for 710 to 860MHz	4322 020 50120
	for 608 to 790MHz	4322 020 50150



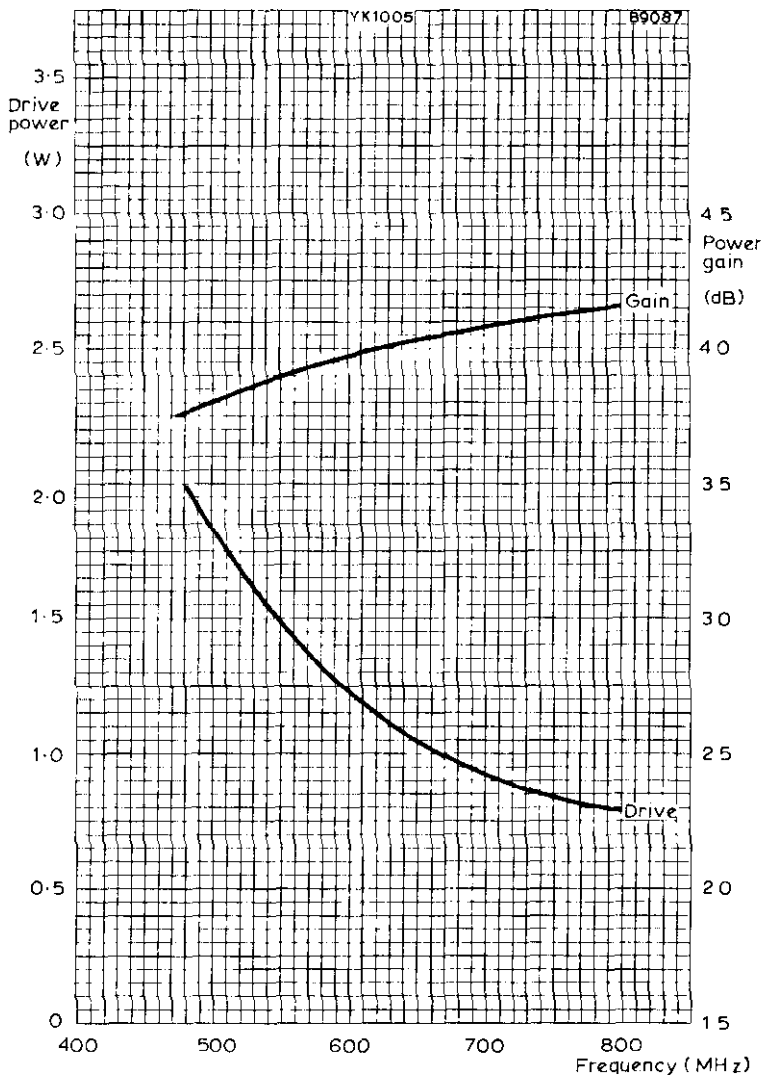
## OUTLINE DRAWING

B9Q21

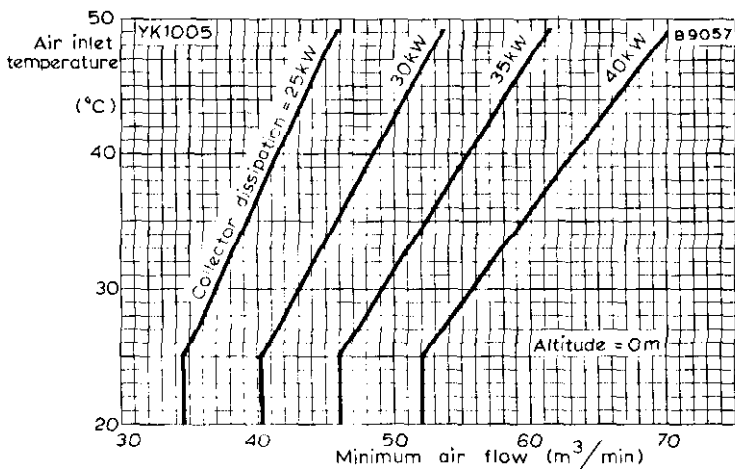


YK1005

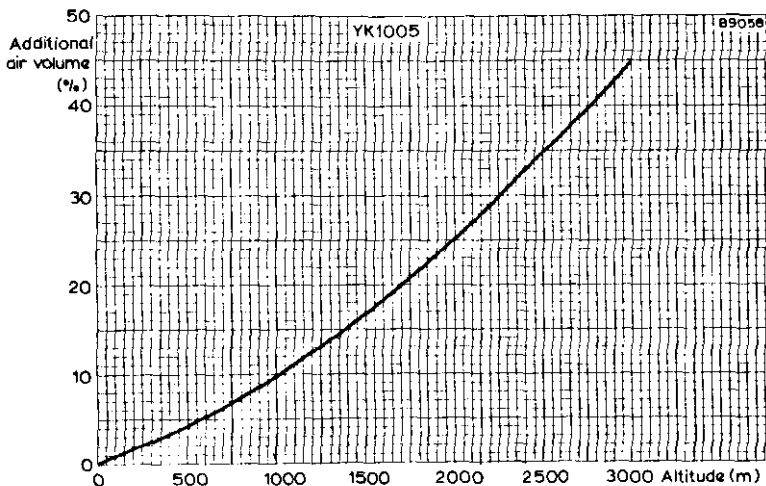
69087



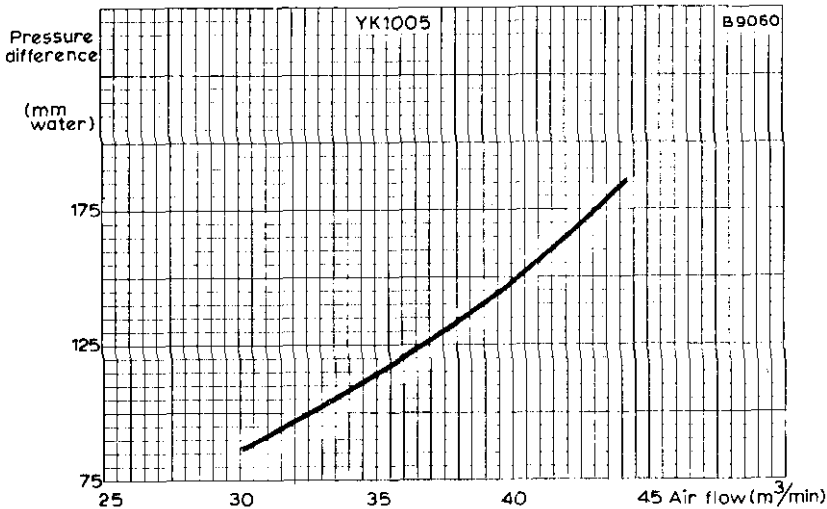
DRIVE POWER AND POWER GAIN PLOTTED AGAINST  
OPERATING FREQUENCY



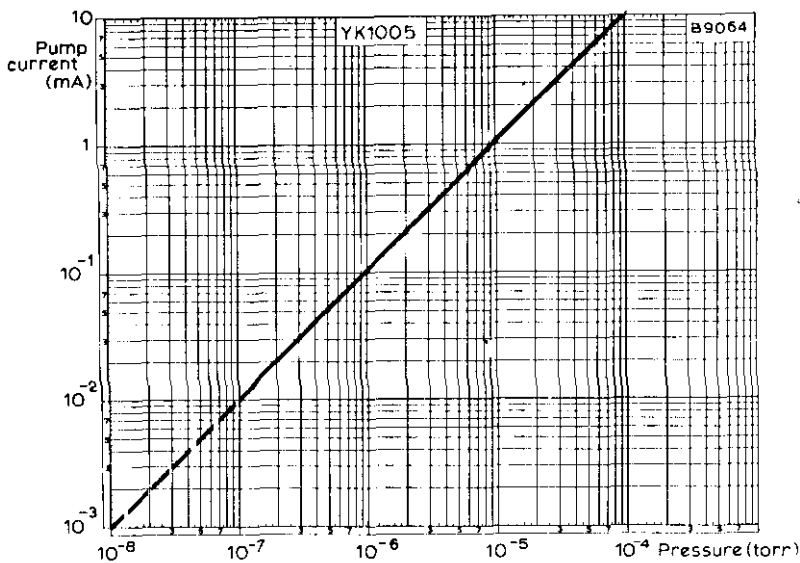
AIR INLET TEMPERATURE PLOTTED AGAINST MINIMUM AIR FLOW WITH COLLECTOR DISSIPATION AS PARAMETER



ADDITIONAL AIR VOLUME REQUIRED FOR INCREASED ALTITUDE



AIR FLOW CHARACTERISTICS



PUMP CURRENT AS A FUNCTION OF PRESSURE

### QUICK REFERENCE DATA

Mechanically tunable reflex klystron intended for transmitter service in microwave relay systems. Contact cooled version of the YK1140 Series.

Frequency range	5.925 to 8.1	GHz
Power output	1.2	W
Construction	Metal, waveguide output	

Unless otherwise shown, data is applicable to all types

To be read in conjunction with  
**GENERAL OPERATIONAL RECOMMENDATIONS - MICROWAVE DEVICES**

### OPERATING CONDITIONS (Typical at 7.0GHz)

Resonator voltage	750	V
Resonator current	70	mA
Reflector voltage	-350	V
Power output	1.2	W
Electronic tuning range	35	MHz
Modulation sensitivity	300	kHz/V

### MECHANICAL TUNING RANGE

	Min.	Max.	
YK1070	7.750	8.1	GHz
YK1071	7.425	7.750	GHz
YK1072	7.125	7.425	GHz
YK1073	6.875	7.125	GHz
YK1074	6.575	6.875	Gffz
YK1075	6.425	6.575	GHz
YK1076	6.125	6.425	GHz
YK1077	5.925	6.225	GHz

CHARACTERISTICS (load v.s.w.r. 1.1:1)

	Min.	Max.	
Reflector voltage	-250	-400	V
Resonator current	55	80	mA
Electronic tuning range between half-power points			
YK1070	21	-	MHz
YK1071	25	-	MHz
YK1072 to YK1077	28	-	MHz
Reflector modulation sensitivity	225	525	kHz/V
Frequency change with temperature			
YK1070	-125	+100	kHz/degC
YK1071 to YK1077	-100	+100	kHz/degC
Power output			
YK1070	0.5	-	W
YK1071 to YK1077	0.7	-	W

TUNING

External cavity, single screw

Tuner turns (average) 3.0

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Min.	Max.	
Resonator voltage	-	775	V
Resonator current	-	80	mA
* Reflector voltage	-50	-1000	V

\*Care should be taken in the design of the power supply to ensure that the reflector potential never becomes positive with respect to the cathode, as destruction of the klystron could result.

CATHODE

Oxide coated, unipotential

	Min.	Nom.	Max.	
Heater voltage	5.7	6.3	7.0	V
Heater current (at $V_h = 6.3V$ )	-	800	-	mA
Heater to cathode voltage (pk)	-	-	+45	V



## COOLING

For power inputs exceeding 10W it is recommended that a radiator of at least 930cm<sup>2</sup> (1 ft<sup>2</sup>) total area be screwed to the heatsink. For maximum valve life the operating temperature should be less than the maximum operating temperature.

### Temperatures

Body temperature max. (see page 4)	150	°C
Operating temperature max.	100	°C

## MOUNTING POSITION

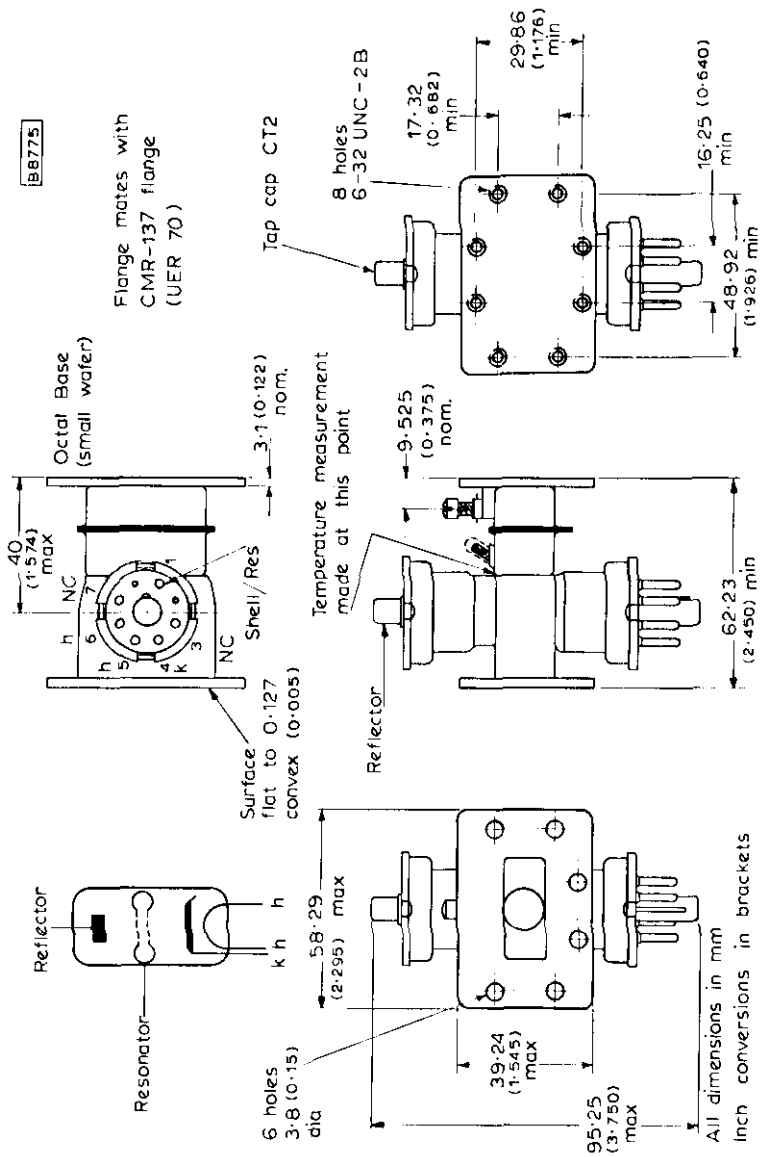
Any

## PHYSICAL DATA

	gm	oz
Weight	330	11.7

OUTLINE DRAWING OF YK1070

BB775



## TENTATIVE DATA

### QUICK REFERENCE DATA

Lightweight mechanically tunable reflex klystron. Suitable for high altitude operation. The YK1090 is a rugged version of the YK1091.

Frequency	10.5 to 12.2	Gc/s
Power output	400	mW
Construction	Integral cavity, waveguide output	
YK1090	Flying leads	
YK1091	Three pin base	

Unless otherwise stated data applies to both types.

To be read in conjunction with

### GENERAL OPERATIONAL RECOMMENDATIONS - MICROWAVE DEVICES

#### TYPICAL OPERATION

f	10.5	11.5	12.2	Gc/s
V <sub>res</sub>	400	400	400	V
I <sub>res</sub>	65	65	65	mA
-V <sub>refl</sub>	190	260	315	V
Electronic tuning range between half power points	58	52	47	Mc/s
Reflector modulation sensitivity	1.0	1.0	1.0	Mc/s per V
P <sub>out</sub> (matched load)	150	270	370	mW
(optimised load)	320	400	420	mW
f	10.5	11.5	12.2	Gc/s
V <sub>res</sub>	200	200	200	V
I <sub>res</sub>	23	23	23	mA
-V <sub>refl</sub>	60	90	110	V
Electronic tuning range between half power points	60	50	38	Mc/s
P <sub>out</sub> (matched load)	10	22	27	mW
(optimised load)	25	30	27	mW

## ABSOLUTE MAXIMUM RATINGS

	Min.	Max.	
$V_{res}$	-	450	V
$I_{res}$	-	70	mA
$-V_{refl}$	20	1000	V
$T_{Body}$	-	200	°C

## CATHODE

Indirectly heated, oxide coated

$V_h$		6.3	V
$I_h$		1.2	A
$t_{hk}$ min.		15	s

## CHARACTERISTICS

	Min.	Typ.	Max.	
Electronic tuning range between half-power points at any frequency in the mechanical tuning range ( $V_{res} = 400V$ )	30	-	-	Mc/s
Reflector modulation sensitivity over complete frequency range	0.8	-	2.0	Mc/s per V
Power output at any frequency in the mechanical tuning range with reflector voltage optimised ( $V_{res} = 400V$ )	50	-	-	mW
Reflector negative voltage for maximum power output at centre frequency in principal mode ( $V_{res} = 400V$ )	-	-	260	V
Reflector negative voltage range for maximum power output over the mechanical tuning range ( $V_{res} = 400V$ )	100	-	400	V
Frequency drift after first 5 minutes of operation	-	-	0.5	Mc/s
Frequency change with temperature ( $T_{amb} = -10$ to $+40$ °C)	-	-	0.25	Mc/s per deg C



	Min.	Typ.	Max.	
*Frequency change with atmospheric pressure change equivalent to operation 0 to 66 000ft 0 to 98 000ft		1.0 2.0	3.0 10	Mc/s Mc/s
*Peak frequency deviation under vibration of 5g applied to the flange (50 to 5000c/s in all three planes)		-	4.0	Mc/s
*YK1090 only				

## COOLING

Natural and forced-air

Forced-air cooling is necessary for resonator input powers greater than 10W in order to maintain the body temperature below 200°C. For maximum life it is recommended that the temperature of the body should not exceed 100°C.

## MOUNTING POSITION

Any

## PHYSICAL DATA

	oz	g
Weight of klystron	7.0	200

## CONNECTIONS YK1090 Wire colour code

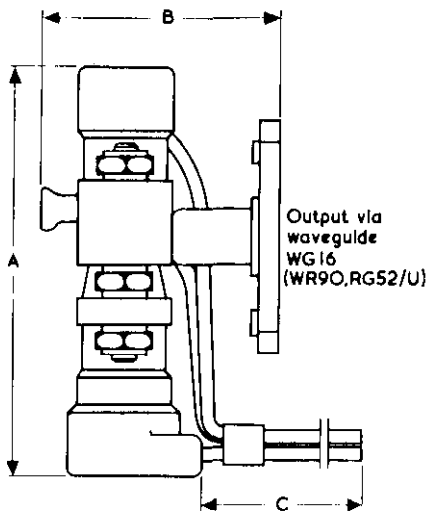
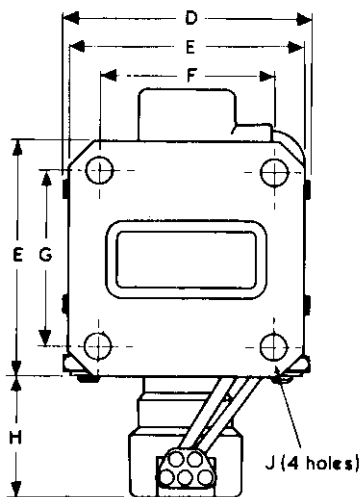
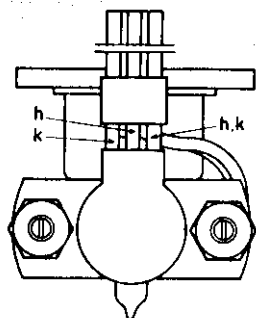
Colour	Coding
White	Heater and cathode
Yellow	Heater
Green	Cathode
Grey	Reflector
Red	Resonator

## YK1091 Pin connections

See outline drawing on page D5.

The heater voltage must never be applied to the green (cathode) lead on the YK1090 or the cathode pin on the YK1091.

# OUTLINE DRAWING OF YK1090



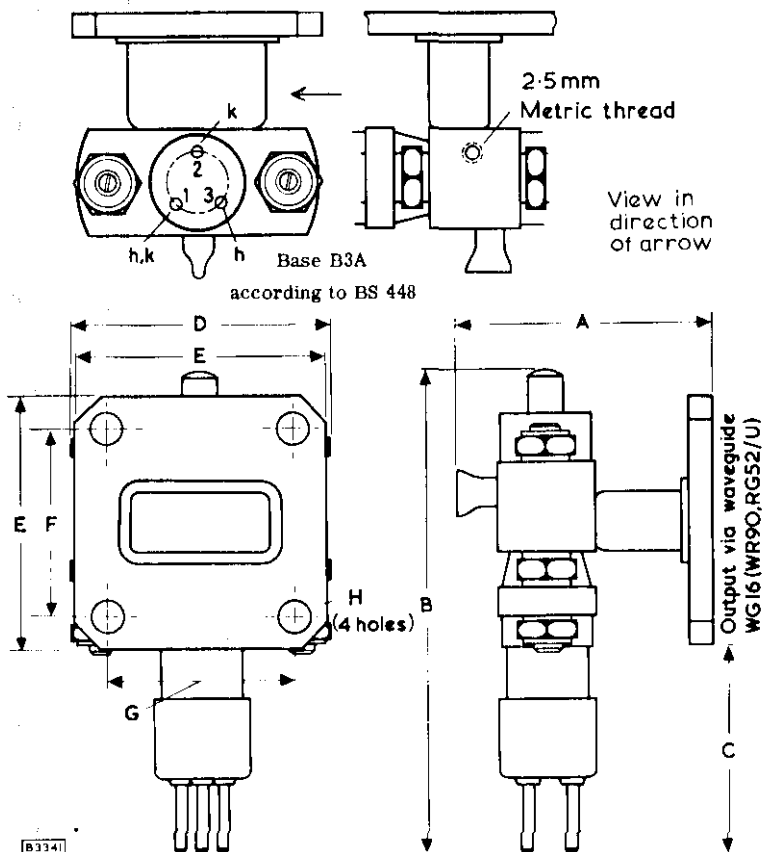
83340

## DIMENSIONS

	Inches	Millimetres	
A	2.992	76	max.
B	1.811	46	max.
C	15.748	400	min.
D	1.717 ± 0.094	43.6 ± 2.4	
E	1.657 ± 0.012	42.1 ± 0.3	
F	1.220 ± 0.004	31 ± 0.1	
G	1.280 ± 0.004	32.5 ± 0.1	
H	1.000	25.4	max.
J	0.185 ± 0.008	4.7 ± 0.2	dia.

Inch dimensions derived from original millimetre dimensions.

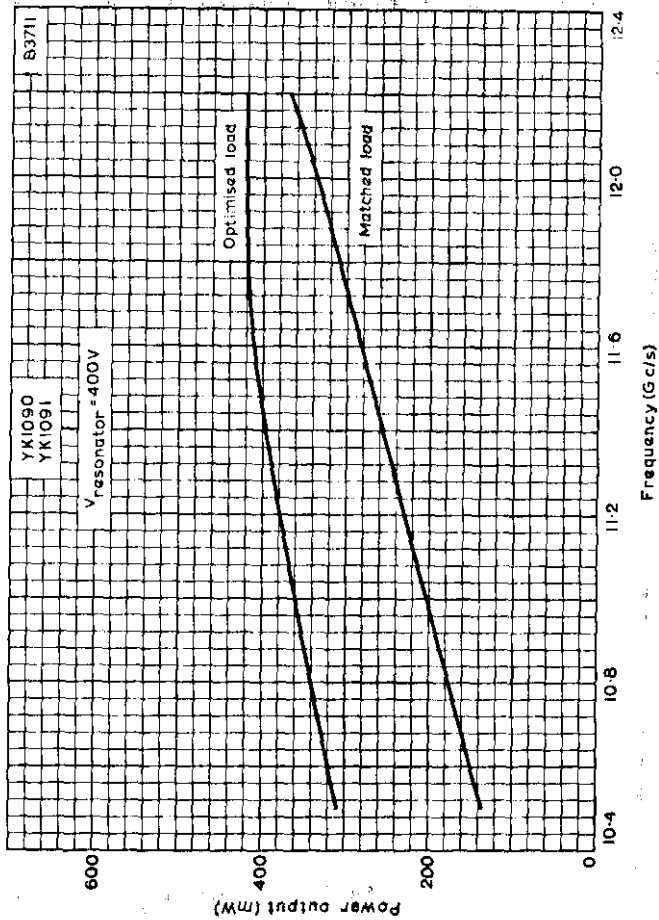
## OUTLINE DRAWING OF YK1091



### DIMENSIONS

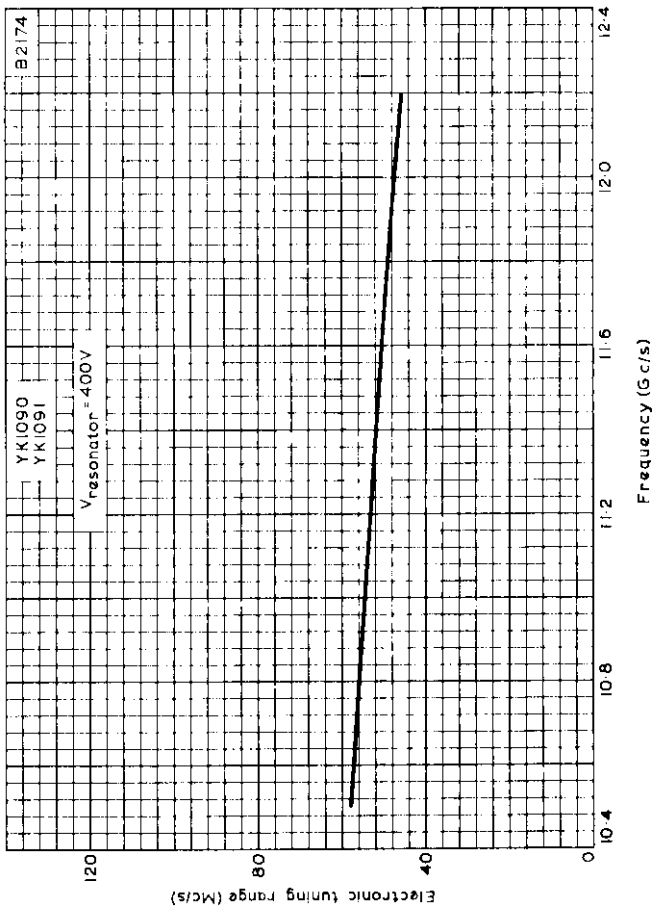
	Inches	Millimetres	
A	1.811	46	max.
B	3.150	80	max.
C	1.378	35	max.
D	1.717 ± 0.094	43.6 ± 2.4	
E	1.651 ± 0.012	42.1 ± 0.3	
F	1.280 ± 0.004	32.5 ± 0.1	
G	1.220 ± 0.004	31 ± 0.1	
H	0.217 ± 0.004	5.5 ± 0.1	

Inch dimensions derived from original millimetre dimensions.

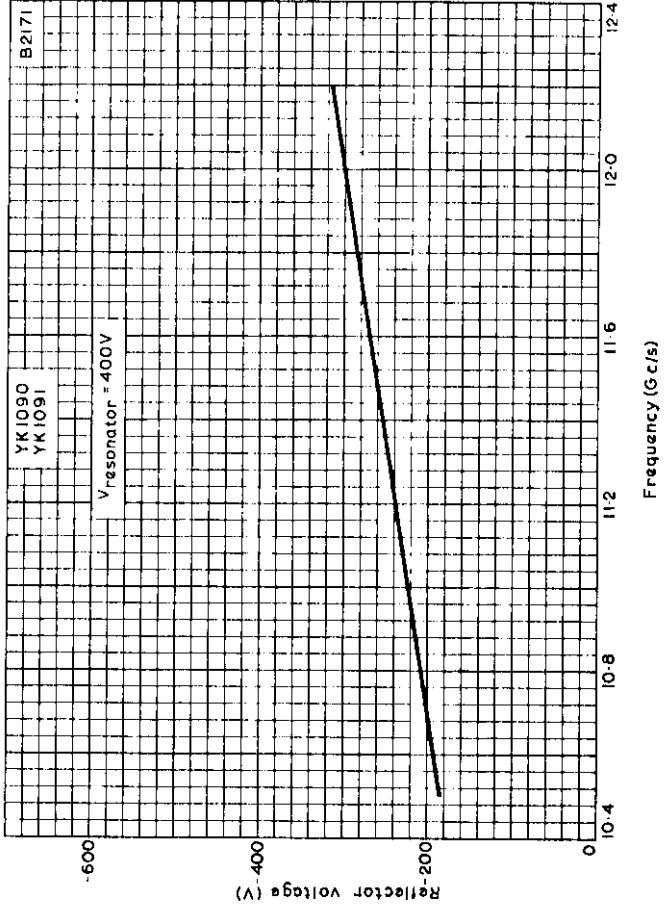


TYPICAL POWER OUTPUT FOR OPTIMISED AND MATCHED LOAD  
PLOTTED AGAINST FREQUENCY.  $V_{\text{resonator}} = 400\text{V}$



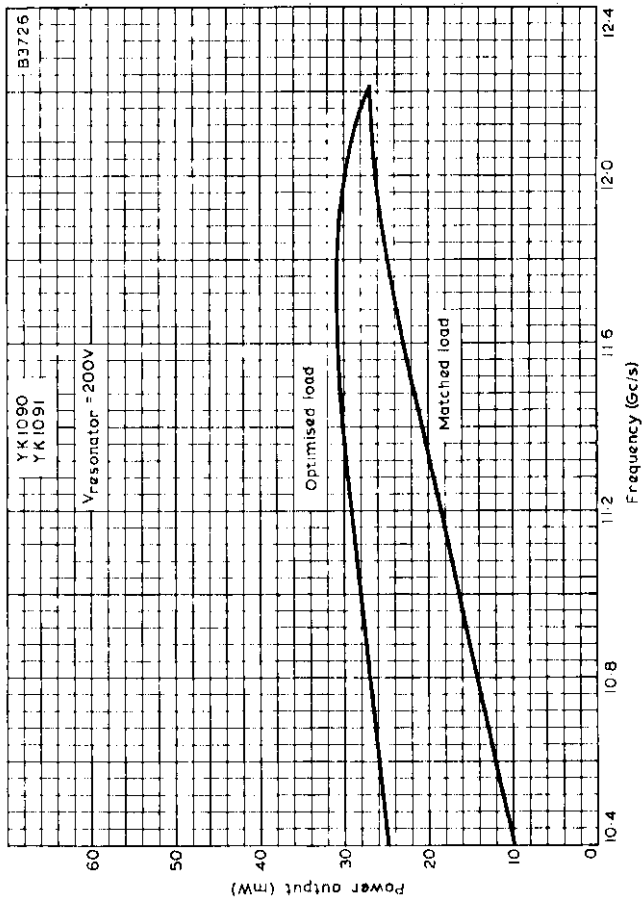


TYPICAL ELECTRONIC TUNING RANGE PLOTTED AGAINST FREQUENCY.  
 $V_{resonator} = 400V.$

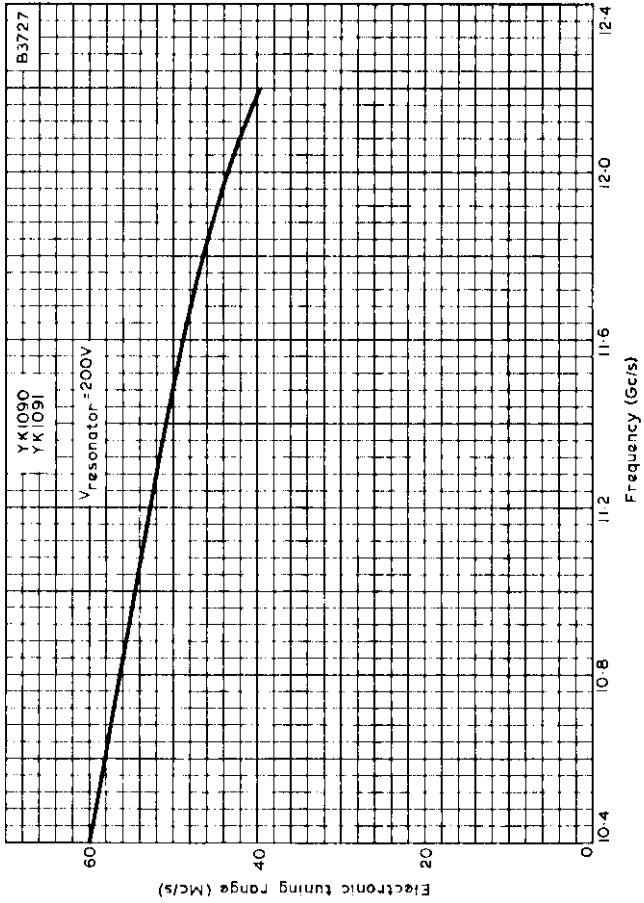


TYPICAL REFLECTOR VOLTAGE PLOTTED AGAINST FREQUENCY.  
V<sub>resonator</sub> = 400V.

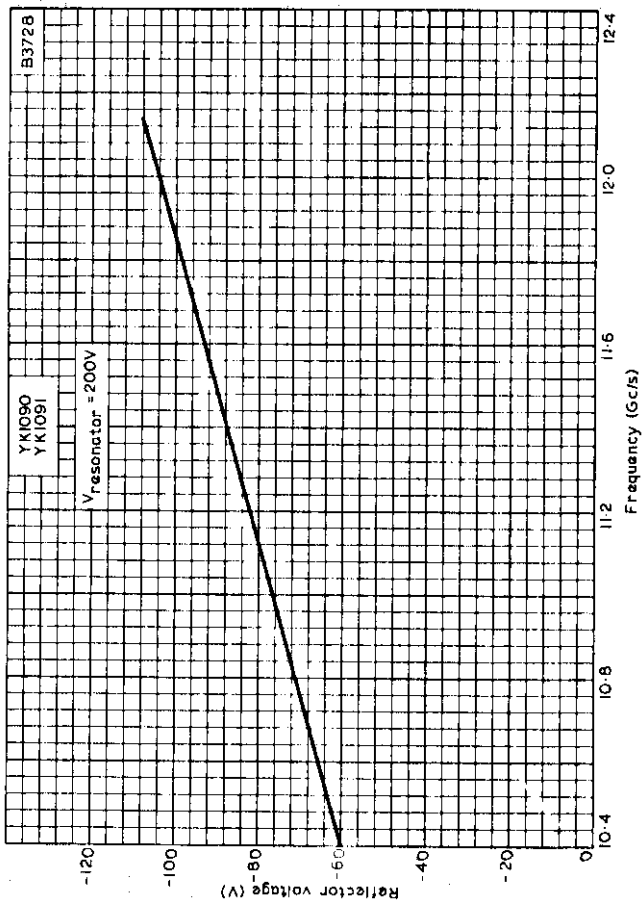




TYPICAL POWER OUTPUT FOR OPTIMISED AND MATCHED LOAD  
 PLOTTED AGAINST FREQUENCY.  $V_{\text{resonator}} = 200\text{V}$



TYPICAL ELECTRONIC TUNING RANGE PLOTTED AGAINST  
FREQUENCY.  $V_{\text{resonator}} = 200V$



TYPICAL REFLECTOR VOLTAGE PLOTTED AGAINST FREQUENCY.  
 $V_{\text{resonator}} = 200\text{V}$

### QUICK REFERENCE DATA

Mechanically tunable reflex klystron intended for transmitter service in microwave relay systems. Forced-air cooled version of the YK1070 Series.

Frequency range	5.925 to 8.1	GHz
Power output	1.2	W
Construction	Metal, waveguide output	

Unless otherwise shown, data is applicable to all types

To be read in conjunction with  
GENERAL OPERATIONAL RECOMMENDATIONS - MICROWAVE DEVICES

### OPERATING CONDITIONS (Typical at 7.0GHz)

Resonator voltage	750	V
Resonator current	70	mA
Reflector voltage	-350	V
Power output	1.2	W
Electronic tuning range	35	MHz
Modulation sensitivity	300	kHz/V

### MECHANICAL TUNING RANGE

		Min.	Max.	
YK1140	(KS7-1000Z)	7.750	8.1	GHz
YK1141	(KS7-1000A)	7.425	7.750	GHz
YK1142	(KS7-1000B)	7.125	7.425	GHz
YK1143	(KS7-1000C)	6.875	7.125	GHz
YK1144	(KS6-1000D)	6.575	6.875	GHz
YK1145	(KS6-1000G)	6.425	6.575	GHz
YK1146	(KS6-1000E)	6.125	6.425	GHz
YK1147	(KS6-1000F)	5.925	6.225	GHz

CHARACTERISTICS (Load v.s.w.r. 1.1:1)

	Min.	Max.	
Reflector voltage	-250	-400	V
Resonator current	55	80	mA
Electronic tuning range between half-power points			
YK1140	21	-	MHz
YK1141	25	-	MHz
YK1142 to YK1147	28	-	MHz
Reflector modulation sensitivity	225	525	kHz/V
Frequency change with temperature			
YK1140	-125	+100	kHz/degC
YK1141 to YK1147	-100	+100	kHz/degC
<i>Power output</i>			
YK1140	0.5	-	W
YK1141 to YK1147	0.7	-	W

TUNING

External cavity, single screw

Tuner turns (average) 3.0

RATINGS (ABSOLUTE MAXIMUM SYSTEM)

	Min.	Max.	
Resonator voltage	-	775	V
Resonator current	-	80	mA
*Reflector voltage	-50	-1000	V

\*Care should be taken in the design of the power supply to ensure that the reflector potential never becomes positive with respect to the cathode, as destruction of the klystron could result.

CATHODE

Oxide coated, unipotential

	Min.	Nom.	Max.	
Heater voltage	5.7	6.3	7.0	V
Heater current (at $V_h = 6.3V$ )	-	800	-	mA
Heater to cathode voltage (pk)	-	-	±45	V

### COOLING

For the YK1140 Series with inputs exceeding 10W, an air flow of 0.85m<sup>3</sup>/min (30ft<sup>3</sup>/min) should be directed on the cooling fins to keep the body temperature below the stated operating maximum. For maximum valve life the operating temperature should be less than the maximum operating temperature.

#### Temperatures

Body temperature max. (see page 4)	150	°C
Operating temperature max.	100	°C

### MOUNTING POSITION

Any

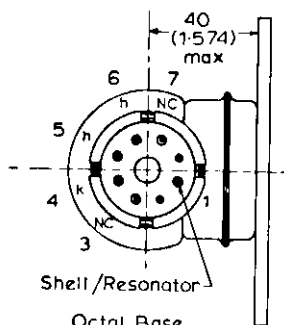
### PHYSICAL DATA

	gm	oz
Weight	230	8.1



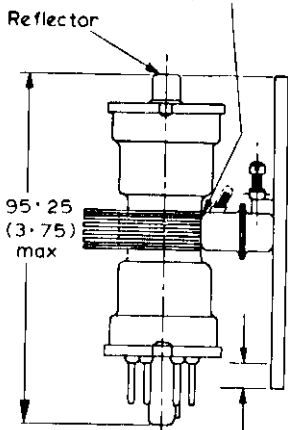
OUTLINE DRAWING OF YK1140 SERIES

Output via waveguide WG14  
to take bolted flange choke  
coupling Joint-services  
type 5985-99-083-0037  
(UG 343/U)

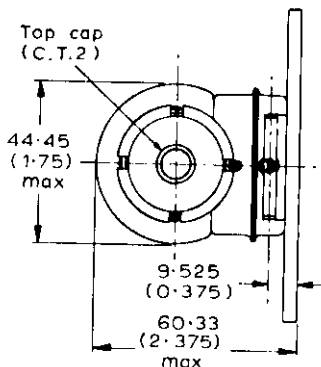
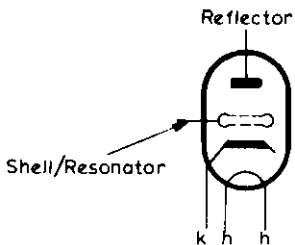
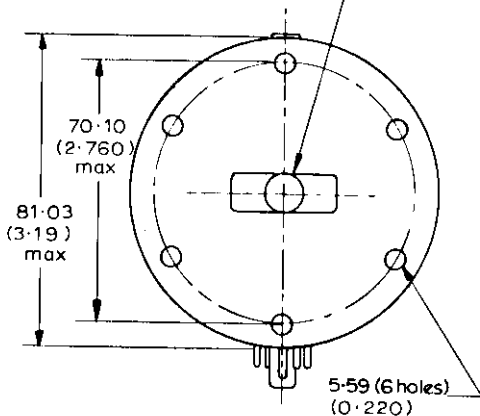


Shell/Resonator

Octal Base  
(Small water)



Base will not  
extend below flange



All dimensions in mm.  
Inch conversions in brackets.

