M5196A
M5196B

X-BAND MAGNETRONS

***Service* Type (M5196B) CV10758**

The data should be read in conjunction with the Magnetron Preamble.

ABRIDGED DATA

Fixed frequency pulse magnetrons differing only in cold impedance and heater/cathode connections. M5196A and M5196B are direct replacements for the M599A and M599B respectively, being mechanically and electrically interchangeable but tested to more stringent electrical specifications. Under most conditions they have a longer operating life.

Frequency range	9415 to 9475	MHz
Typical peak output power	4.0	kW
Magnet		integral
Output		no. 16 waveguide (0.900 x 0.400 inch internal)
Coupler		NATO S.N. 5985-99-083-0051
Cooling		natural

GENERAL

Electrical

Cathode		indirectly heated
Heater voltage	6.3	V
Heater current at 6.3 V	0.5	A
Cathode pre-heating time (minimum) (see note 1)	30	s
Input capacitance	9.0	pF max
Distance of voltage standing wave minimum from output flange towards the anode:		
M5196A	3.0 to 9.0	mm
M5196B	0 to 6.0	mm

February 1981

Supersedes February 1980 Issue

Mechanical

Overall dimensions	5.342 x 3.937 x 1.338 inches max 135.7 x 100.0 x 34.0 mm max
Net weight	1.95 pounds (0.9 kg) approx
Mounting position	any

A minimum clearance of 2 inches (50 mm) must be maintained between the magnet and any magnetic materials.

Cooling	natural

MAXIMUM AND MINIMUM RATINGS (Absolute values)

These ratings cannot necessarily be used simultaneously, and no individual rating should be exceeded.

	Min	Max	
Heater voltage	5.7	6.9	V
Anode voltage (peak)	3.2	3.8	kV
Anode current (peak)	2.5	3.5	A
Input power (mean) (see note 2)	–	13	W
Duty cycle	–	0.001	
Pulse duration	0.02	1.0	μs
Rate of rise of voltage pulse (see note 3)	–	70	kV/μs
Anode temperature	–	120	°C
V.S.W.R. at the output coupler	–	1.5:1	

TYPICAL OPERATION

Operational Conditions

Heater voltage (for operation)	6.3	V
Anode current (peak)	3.0	A
Pulse duration	0.1	μs
Pulse repetition rate	2000	p.p.s.
Rate of rise of voltage pulse	60	kV/μs

Typical Performance

Anode voltage (peak)	3.6	kV
Output power (peak)	4.0	kW
Output power (mean)	0.8	W

TEST CONDITIONS AND LIMITS

The magnetron is tested to comply with the following electrical specification.

Test Conditions

Heater voltage (for test)	6.3	V
Anode current (mean)	3.0	mA
Duty cycle	0.001	
Pulse duration (see note 4)	1.0	μs
V.S.W.R. at the output coupler	<1.15:1	
Rate of rise of voltage pulse (see note 3)	70	kV/μs

Limits

	Min	Max	
Anode voltage (peak)	3.2	3.8	kV
Output power (peak)	3.6	–	kW ☆
Frequency (see note 5)	9415	9475	MHz
R.F. bandwidth at ¼ power (see note 6)	–	2.5	MHz
Frequency pulling (v.s.w.r. not less than 1.5:1)	–	18	MHz
Frequency pushing	–	2.5	MHz/A
Stability (see notes 6 and 7)	–	0.25	%
Cold impedance			see note 8
Heater current			see note 9
Temperature coefficient of frequency			see note 10

LIFE TEST

The quality of all production is monitored by the random selection of tubes which are then life-tested under Typical Operating Conditions. If the magnetron is to be operated under conditions other than those specified herein, English Electric Valve Company Ltd. should be consulted to verify that the life of the tube will not be impaired.

End of Life Criteria (under Test Conditions above)

	Min	Max	
Anode voltage (peak)	3.2	3.8	kV
Output power (peak)	2.5	–	kW
Frequency	9415	9475	MHz
R.F. bandwidth at ¼ power (see note 6)	–	3.5	MHz

☆ Indicates a change.

NOTES

1. For ambient temperatures above 0 °C For ambient temperatures between 0 and −55 °C the cathode pre-heating time is 45 seconds minimum.
2. The various parameters are related by the following formula:

$$P_i = i_{apk} \times v_{apk} \times Du$$

where P_i = mean input power in watts

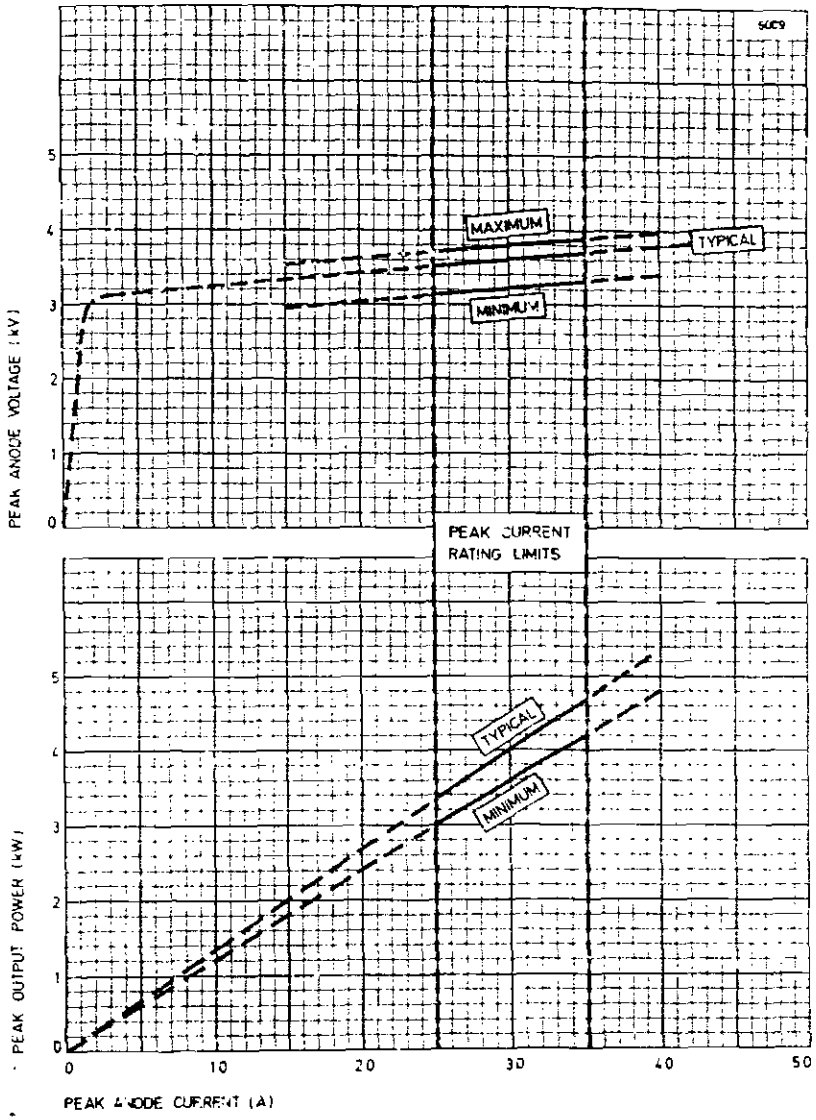
i_{apk} = peak anode current in amperes

v_{apk} = peak anode voltage in volts

and Du = duty cycle

3. Defined as the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance in the viewing system must not exceed 6.0 pF.
4. Tolerance ± 10%.
5. Other frequency ranges can be supplied on request.
6. With the magnetron operating into a v.s.w.r. of 1.5:1 varied through all phases over the mean anode current range of 2.5 to 3.5 mA
7. Pulses are defined as missing when the r.f. energy level is less than 70% of the normal energy level in a 0.5% frequency range. Missing pulses are expressed as a percentage of the number of input pulses applied during the period of observation after a period of 10 minutes operation.
8. The impedance of the magnetron measured at the operating frequency when not oscillating will be such as to give a v.s.w.r. of at least 6:1. The voltage minimum will be 3.0 to 9.0 mm from the output flange of the M5196A and 0 to 6.0 mm from the output flange of the M5196B, towards the anode.
9. The heater current, measured with heater voltage of 6.3 V and no anode input power, will be within the range 0.5 A and 0.6 A.
10. Design test only. The maximum frequency change with anode temperature change (after warming) is −0.25 MHz/°C.

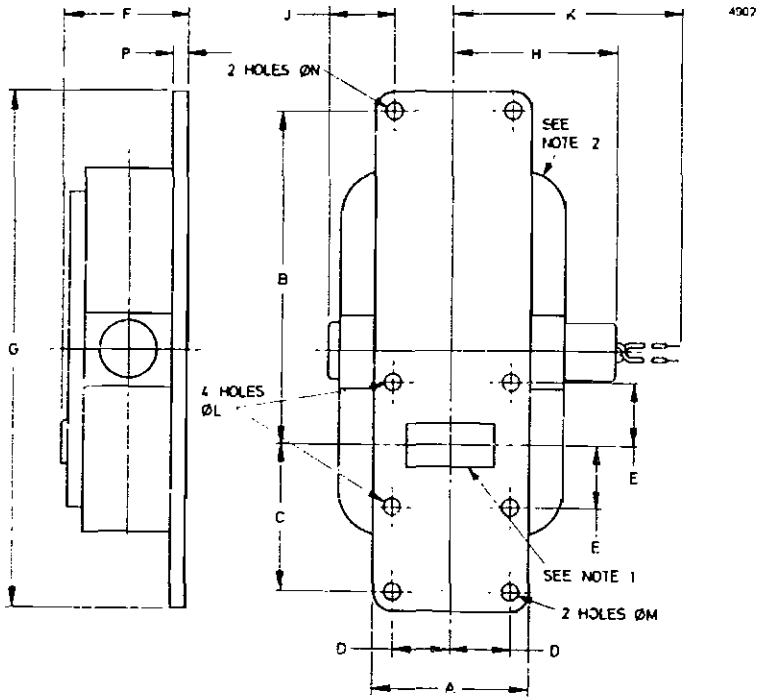
☆ TYPICAL PERFORMANCE CHART



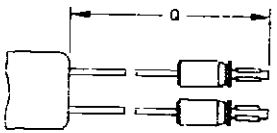
☆ Indicates a change

OUTLINE

M5196B is identical in outline with M5196A but the heater and cathode terminals are fitted with plugs and are dimensioned as shown (see detail drawing below).



Detail of M5196B Heater and Cathode Terminals



Outline Dimensions

Ref	Inches	Millimetres
A	1.625 ± 0.015	41.28 ± 0.38
B	3.463 ± 0.004	87.960 ± 0.102
C	1.521 ± 0.004	38.633 ± 0.102
D	0.610 ± 0.002	15.494 ± 0.051
E	0.640 ± 0.004	16.256 ± 0.102
F	1.338 max	33.99 max
G	5.335 ± 0.007	135.51 ± 0.18
H	2.165 max	54.99 max
J	0.720 max	18.29 max
K	9.625 min	244.5 min
	(M5196A)	(M5196A)
L	0.170 ± 0.003	4.318 ± 0.076
M	0.175 ± 0.003	4.445 ± 0.076
N	0.175 ± 0.003	4.445 ± 0.076
P	0.157 min	3.99 min
Q	8.500 ± 0.500	215.9 ± 12.7
	(M5196B)	(M5196B)

Millimetre dimensions have been derived from inches

Lead Connections

Colour	M5196B Plug*	Element
Red	378/4/Red	Heater
Blue	378A/3/Black	Heater, Cathode

* By Belling Lee

English Electric Valve Company Limited
Chelmsford, Essex, England
Printed in England