M505

X-BAND MAGNETRON

Service Type CV1747

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

ABRIDGED DATA

Fixed frequency pulse magnetron

Frequency range	9360 to 9460	MHz
Typical peak output power	45	kW
Magnet		separate
Output	British X-band waveguide (1.000 x 0.500 inch internal)	
Coupler	A.S.R.E. drawing no. 37820	
Cooling		forced-air

GENERAL

Electrical

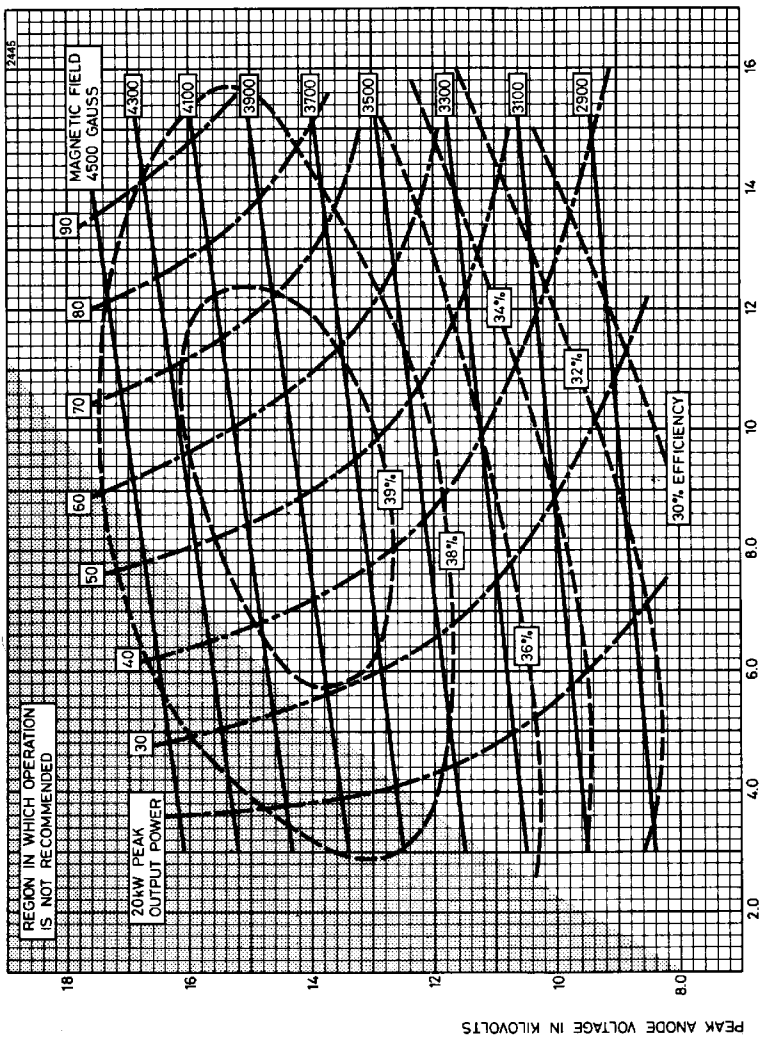
Cathode	indirectly heated	
Heater voltage (see note 1)	3.0	V
Heater current at 3.0V	3.5	A
Cathode heating time (minimum)	90	s

Mechanical

Overall dimensions	8.250 x 3.343 x 3.281 inches max 209.6 x 84.91 x 83.34mm max	
Net weight	1¾ pounds (0.8kg) approx	
Mounting position		any

Cooling . . . . . forced-air

TYPICAL PERFORMANCE CHART



MAXIMUM AND MINIMUM RATINGS (Absolute values)

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

	Min	Max	
Heater voltage (see note 1)	2.7	3.3	V
Anode voltage (peak)	10	16	kV
Anode current (peak)	—	12	A
Input power (peak)	—	150	kW
Input power (mean) (see note 2)	—	150	W
Duty cycle	—	0.001	
Pulse length	—	2.0	μs
Rate of rise of voltage pulse (see note 3)	—	150	kV/μs
Anode temperature (see note 4)	—	140	°C
V.S.W.R. at the output coupler	—	1.5:1	

TYPICAL OPERATION

Operational Conditions

Heater voltage	1.5	V
Magnetic field (see note 5)	3250	gauss
Anode current (peak)	12	A
Pulse length	1.0	μs
Pulse repetition rate	1000	p.p.s.

Typical Performance

Anode voltage (peak)	11.1	kV
Output power (peak)	45	kW
Output power (mean)	45	W

TEST CONDITIONS AND LIMITS

The valve is tested to comply with the following electrical specification

Test Conditions

	Oscillation 1	Oscillation 2	Oscillation 3	
Magnetic field (see note 5)	3250	3250	3250	gauss
Heater voltage (for test)	1.5	1.5	1.5	V
Anode current (mean)	12	12	12	mA
Duty cycle	0.001	0.001	0.001	
Pulse length (see note 6)	1.0	1.0	2.0	μs
V.S.W.R. at the output coupler	1.05:1	1.5:1	1.5:1	
Rate of rise of voltage pulse (see note 3)	150	150	150	kV/μs

Limits

	Min	Max	Min	Max	Min	Max	
Anode voltage (peak)	10.5	12.5	—	—	—	—	kV
Output power (mean)	35	—	—	—	—	—	W
Frequency (see note 7)	9360	9460	—	—	—	—	MHz
R.F. bandwidth at ¼ power (see note 8)	—	—	—	3.0	—	—	MHz
Frequency pulling	—	—	—	15	—	—	MHz
Frequency pushing (see note 9)	—	5.0	—	—	—	—	MHz
Missing pulse count (see note 10)	—	—	—	0.25	—	—	%
Cold impedance	see note 11						
Mode change	see note 12						
Heater current	see note 13						
Temperature coefficient of frequency	see note 14						

LIFE TEST

The quality of all production is monitored by the random selection of valves which are then life-tested under Oscillation 3 conditions. If the valve 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 valve will not be impaired.

End of Life Criteria (under Test Conditions Oscillation 1)

Output power (mean)	28	W min
R.F. bandwidth at ¼ power (Oscillation 2)	3.0	MHz max
Frequency	9360 to 9460	MHz

NOTES

1. With no anode input power.

   On the application of anode power, the heater voltage must be reduced in accordance with the following schedule.

Mean input power (W)	Heater voltage (V)
up to 40	3.0
40 to 110	2.0
110 to 150	1.5

   The valve heater must be protected against arcing by the use of a minimum capacitance of 4000pF shunted across the heater directly at the input terminals; in some cases a capacitance as high as 2μF may be necessary depending on the equipment design. For further details see the preamble to this section.

2. The various parameters are related by the following formula:

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

   where Pi = mean input power in watts
   i_{apk} = peak anode current in amperes
   v_{apk} = peak anode voltage in volts
   and Du = duty cycle.

3. The rate of rise of voltage is the slope of the steepest tangent to the leading edge of the voltage pulse above 80% amplitude. Any capacitance in the viewing system must not exceed 6.0pF.

4. The anode temperature must be kept below the limit specified by means of a suitable flow of air over the anode fins.

5. Tolerance $\pm$50 gauss. The north pole of the magnet must be adjacent to the cathode terminal.

6. Tolerance $\pm$10%.

7. At anode temperature 25°C.

8. The maximum bandwidth in MHz is given by 3.0/(pulse length in μs).

9. The mean anode current is varied between 12 and 14mA.

10. The mismatch is varied through all phases during a 30 second period while the count is taken. Missing pulses are expressed as a percentage of the number of input pulses applied during this 30 second period. Pulses are defined as missing when the r.f. energy level is less than 70% of the normal energy level in the frequency range 9360 to 9460MHz.

11. When a signal of the same frequency as the valve operating frequency is fed into the valve, a standing wave is produced in the feeder system. The v.s.w.r. is tested to be greater than 6:1 and its phase such that a position of standing wave minimum is 4.5 to 10.5mm from the flange toward the anode.
12. Over the range 8 to 15mA, no pulses shall be missing when viewed with a spectrum analyser, nor double traces of voltage or current observed on the oscilloscope.
13. Measured with heater voltage of 3.0V and no anode input power, the heater current limits are 3.0A minimum, 4.0A maximum.
14. Design test only. The maximum frequency change with anode temperature change (after warming) is -0.25MHz/°C.

Outline Dimensions (All dimensions without limits are nominal)

Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	2.984 ± 0.062	75.79 ± 1.57	P	2.875 ± 0.006	73.03 ± 0.15
B	1.500 ± 0.020	38.10 ± 0.51	Q	0.169 ± 0.004	4.293 ± 0.102
C	1.625	41.28	R	0.125 ± 0.002	3.175 ± 0.051
D	0.125	3.175	S	3.250 ± 0.031	82.55 ± 0.79
E	3.062 max	77.77 max	T	2.218 max	56.34 max
F	2.812 max	71.42 max	U	1.107 max	28.12 max
G	2.437 ± 0.020	61.90 ± 0.51	V	0.974 max	24.74 max
H	1.281 max	32.54 max	W	$0.8070^{+0.0050}_{-0.0045}$	$20.498^{+0.127}_{-0.114}$
J	0.875 ± 0.010	22.23 ± 0.25			
K	1.687	42.85	X	0.219	5.56
L	1.437	36.50	Y	0.830 min	21.08 min
M	1.187	30.15	Z	1.500 ± 0.010	38.10 ± 0.25
N	0.193 ± 0.003	4.902 ± 0.076	AA	1.438 max	36.53 max

Millimetre dimensions have been derived from inches.

OUTLINE

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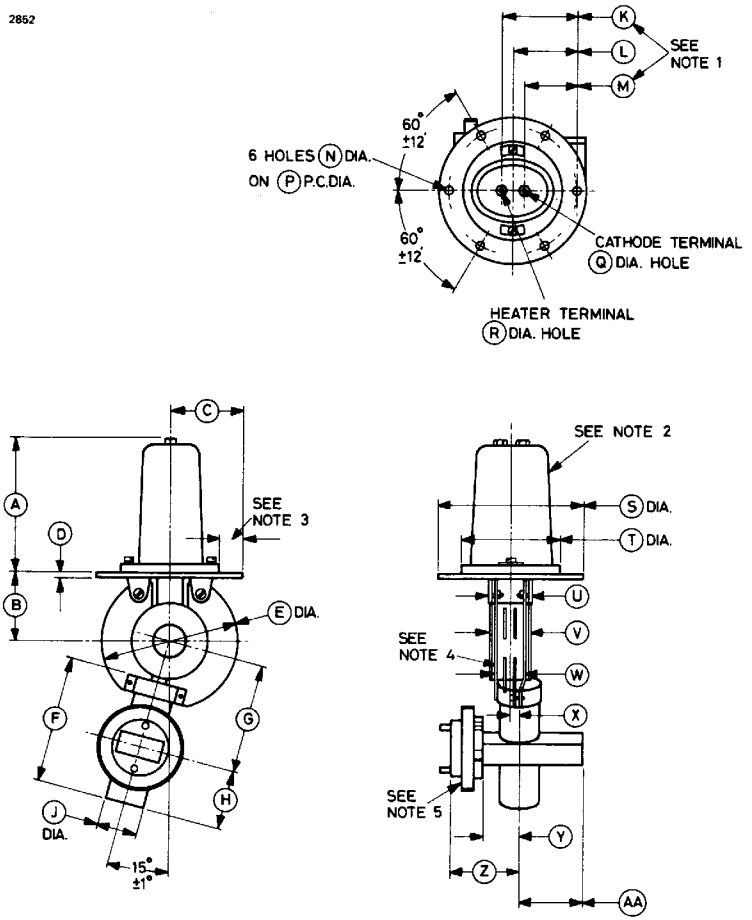

See page 8 for Outline Notes

Outline Notes

1. The centre line will be within 0.023 inch (0.58mm) of the nominal position and the spacing between the pin jacks will be 0.500 ± 0.010 inch (12.70 ± 0.25mm).
2. The common cathode connection is indicated by a letter 'C' on this surface.
3. This surface of the mounting flange will be flat to within 0.010 inch (0.25mm).
4. Position of radiator fin assembly may vary 0.020 inch (0.51mm) from centre line through valve.
5. The face of the flange may deviate 1° from the nominal position relative to the axis of the waveguide.