M5005

X-BAND MAGNETRON

Service Type CV9424

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

ABRIDGED DATA

Fixed frequency pulse magnetron		
Frequency range	9345 to 9405	MHz
Typical peak output power	53	kW
Magnet		integral
Output		no. 16 waveguide (0.900 x 0.400 inch internal)
Coupler		UG-40B/U (5985-99-083-0051)
Cooling		forced-air

GENERAL

Electrical

Cathode		indirectly heated
Heater voltage (see note 1)	12.6	V
Heater current at 12.6V	2.2	A
Heater starting current, peak value, not to be exceeded	10	A max
Cathode pre-heating time (minimum)	1.5	min

Mechanical

Overall dimensions	148.4 x 105.1 x 73.66mm max 5.844 x 4.138 x 2.900 inches max
Net weight	1.77kg (3.9 pounds) approx
Mounting position	any

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

Cooling forced-air

September 1973

Supersedes September 1971 issue

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)	—	14	V
Heater starting current (peak)	—	10	A
Anode voltage (peak)	11.5	13.5	kV
Anode current (peak)	9.0	12	A
Input power (mean) (see note 2)	—	240	W
Pulse duration	—	5.0	μs
Rate of rise of voltage pulse (see note 4)	40	120	kV/μs
Anode temperature	—	150	°C
V.S.W.R. at the output coupler	—	1.5:1	
Pressurizing of waveguide	—	40	lb/in²
	—	2.8	kg/cm²
Altitude (at v.s.w.r. 1.2:1 max)	—	20 000 (360mm Hg min)	ft

TYPICAL OPERATION

Operational Conditions

Heater voltage	7.5	V
Anode current (peak)	12	A
Pulse duration	4.0	μs
Pulse repetition rate	400	p.p.s.

Typical Performance

Anode voltage (peak)	13	kV
Output power (peak)	53	kW
Output power (mean)	85	W

TEST CONDITIONS AND LIMITS

The magnetron is tested to comply with the following electrical specification

Test Conditions

Heater voltage (for test)	9.3	V
Anode current (mean)	12	mA
Duty cycle	0.001	
Pulse duration (see note 3)	5.0	μs
V.S.W.R. at the output coupler	1.05:1	
Rate of rise of voltage pulse (see notes 4 and 5)	75	kV/μs

Limits

	Min	Max	
Anode voltage (peak)	11.5	13.5	kV
Output power (mean)	40	—	W
Frequency (see note 6)	9345	9405	MHz
Frequency pulling (v.s.w.r. 1.5:1)	—	13	MHz
Stability (see note 7)	—	0.5	%
Frequency pushing	—	0.5	MHz/A
Altitude (v.s.w.r. 1.2:1) (see note 8)	20 000	—	ft
	6.1	—	km
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 magnetrons which are then life-tested under test conditions above, but with a v.s.w.r. of 1.5:1 (min) cycled through λg in 30 minutes max. 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 magnetron will not be impaired.

End of Life Criteria (under Test Conditions above)

Output power (mean)	32	W min
Frequency	9345 to 9405	MHz
Stability (see note 7)	2.0	% max

NOTES

1. With no anode input power.

   On stand by the heater voltage must not exceed 12.6 volts. Prior to the application of h.t. the cathode must he heated by applying to the heater 12.6 volts for 1½ minutes. On application of anode power, the heater voltage must be lowered according to the following formula:

   $$V_h = 11.6 - 0.017Pi$$

   where Pi = mean input power in watts.

   The magnetron 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 Magnetron-Preamble.

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. Tolerance ±10%.

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

5. All magnetrons are also tested functionally with the following pulse conditions:

Rate of rise of voltage pulse	60	kV/μs max
Pulse duration	4.0	μs
Duty cycle	0.0016	
Anode current (mean)	19.2	mA

   Load v.s.w.r. 1.5:1 varied through all phases.

6. With anode temperature of 100°C ± 10°C. Operation at any temperature other than that specified will result in a difference between the operating frequency and that specified under Test Limits.

7. With the magnetron operating into a v.s.w.r. of 1.5:1 phased to give maximum instability. 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 5 minutes.

8. The altitude test is carried out under the typical operation conditions, that is

Pulse duration	4.0	μs
Duty cycle	0.0016	
Anode current (peak)	12	A

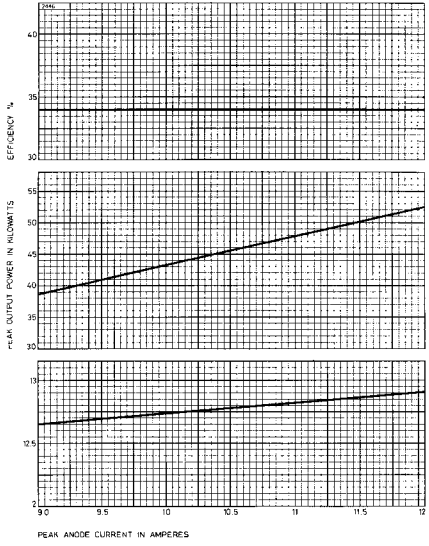
The phase of the mismatch is adjusted to present a voltage maximum at the output flange of the magnetron.

The altitude is computed from pressure readings by means of the I.C.A.O. Standard Atmosphere.

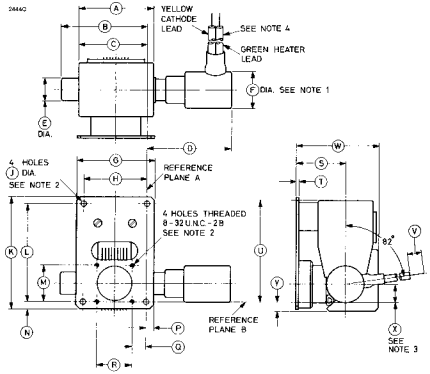
9. Measured with heater voltage of 12.6V and no anode input power, the heater current limits are 2.0A minimum, 2.4A maximum.

10. Design test only. The maximum frequency change with anode temperature change (after warming) is -0.25MHz/°C.

...UE CHART


2446
EFFICIENCY %
40
35
30
PEAK OUTPUT POWER IN KILOWATTS
55
50
45
40
35
30
13
12.5
2
9.0
9.5
10
10.5
11
11.5
12
PEAK ANODE CURRENT IN AMPERES

OUTLINE (All dimensions without limits are nominal)



Ref	Inches	Millimetres	Ref	Inches	Millimetres
A	2.705 max	68.71 max	N	0.250 ± 0.010	6.35 ± 0.25
B	2.944 max	74.78 max	P	0.250 ± 0.010	6.35 ± 0.25
C	2.453 max	62.31 max	Q	0.490	12.45
D	2.900 max	73.66 max	R	1.220	30.99
E	0.787 max	19.99 max	S	1.670 ± 0.125	42.42 ± 3.18
F	1.312 max	33.32 max	T	0.150 max	3.81 max
G	2.705 max	68.71 max	U	3.655 max	92.84 max
H	2.200	55.88	V	0.500 min	12.70 min
J	0.201 ± 0.005	5.11 ± 0.13	W	2.900 max	73.66 max
K	3.905 max	99.19 max	X	0.640	16.26
L	3.400	86.36	Y	0.472 max	11.99 max
M	1.280	32.51			

Millimetre dimensions have been derived from inches.

Outline Notes

1. The cathode sidearm, including silicone rubber encapsulation, will lie within a cylinder of 40mm (1.575 inches) diameter, centred on the axis defined by dimensions S and X.
2. Positional tolerance 0.005 inch (0.13mm) diameter (BS308).
3. Dimension X refers only to the axis of the cathode sidearm.
4. Two leads 30/0.25mm tinned copper wire, silicone rubber covered to 6.35mm (0.250 inch) diameter, of length 242.0mm (9.528 inch) minimum, measured from the centre line of the magnetron.
5. The north seeking pole of the magnet is adjacent to the cathode sidearm.

Lead Connections

Colour	Element
Green	Heater
Yellow	Heater, cathode

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