New JRC
MICROWAVE DEVICES

Technical
Information

5586

TUNABLE S-BAND Magnetron

GENERAL DESCRIPTION

5586 is a mechanically tuned S-band pulse magnetron

Frequency range	2700 to 2900 MHz
Output power	500kW
Magnet	SEPARATE
Cathode	indirectly heated
Cooling	FORCED-AIR
Output	COAXIAL LINE

ELECTRICAL CHARACTERISTICS

Maximum and Minimum Ratings (Absolute)

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

	Min	Max	Unit	Symbol
Heater voltage	—	17.6	V	Ef
Cathode preheating time	120	—	s	tk
VSWR at load	—	1.5:1	—	—
Rate of rise of voltage pulse	—	200	kV/μs	r.r.v.
Temperature	—	100	℃	T
Anode voltage	—	32	kV	eb
Anode current	—	50	A	ib
Input power	—	2000	kW	Pi
Pulse duration	—	2.0	μs	tp
Duty cycle	—	0.001		
Pressurizing of output circuit	—	45	lb/in^2	
		3.2	kg/cm^2	

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MECHANICAL CHARACTERISTICS

Dimensions	per outline drawing
Net weight	2.5kg
Cooling	see note 5
Magnet	see note page 8
Mounting support	by mounting plate
Mounting position	any direction

TYPICAL OPERATION

Operational Conditions	Condition 1	Condition 2	
Heater voltage	8	10.5	V
Magnetic field (see note 1)	270	270	mT
	2700	2700	gauss
Anode current (peak)	50	40	A
Pulse duration	1.0	2.0	μs
Duty cycle	0.00075	0.00075	

Typical Performance			
Anode voltage (peak)	27.5	—	kV
Output power (peak)	500	—	kw
Output power (mean)	375	—	W

TEST CONDITIONS AND LIMITS

The magnetron is tested to comply with the following electrical specification
Test Conditions

	Oscillation 1	Oscillation 2	
Magnetic field (see note 1)	270±5	270±5	mT
	2700±50	2700±50	gauss
Heater voltage (for test)	8	10.5	V
Anode current (mean)	37.5	30	mA
Duty cycle	0.00075	0.00075	
Pulse duration (see note 9)	1.0	2.0	μs
V.S.W.R. at the output coupler	1.15:1	1.15:1	
Rate of rise of voltage pulse (see note 7)	200	200	kV/μs

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Limits	Min	Max	Min	Max	
Anode voltage (peak) (see note 10):	25.5	30.5	—	—	kV
Output power (mean) (see note 10):	375	—	300	—	W
Frequency (see note 11):	2700	2900	2700	2900	MHz
R.F.bandwidth at 1/4 power (see note 12)	—	2.5	—	—	MHz
Frequency pulling (v.s.w.r. not less than 1.5:1)	—	15	—	—	MHz
Stability (see notes 10 and 13)	—	1	—		%
Heater current					see note 14
Temperature coefficient of frequency					see note 15

LIFE TEST

The quality of all production is monitored by the random selection of tubes which are then life-tested under Oscillation 1 conditions.

End of Life Criteria (under Test Condition Oscillation 1)

Output power (mean)	320	W min
RF.bandwidth at 1/4 power	2.5	MHz max

NOTES

1. The magnetron is designed for use with a separate magnet which must conform with the specification given on page 6. The axis of the magnetic field must be coincident with the axis of the anode, and the north pole of the magnet must be adjacent to the cathode terminal.
2. With no anode input power.
   During high voltage operation it is essential to operate the heater according to the following schedule:

Mean Input Power (W)	Heater Voltage (V)
1000-1200	8.0
800-1000	10.5
600-800	13
400-600	15
less than 400	16

The above schedule is valid only for pulse repetition rates of 300p.p.s. or greater. The magnetron heater shall be protected against arcing by use of a minimum capacitance of 4000pF shunted across the heater directly at the terminals: in some cases a capacitance as high as 2 μF may be necessary depending on the equipment design. For further details see the Magnetron Preamble.

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3. It has been verified that the magnetron will operate at ambient temperatures as low as –55℃. At this temperature the minimum cathode heating time is 3 minutes.
4. Tuning is achieved by rotating a splined shaft which can be fitted to the magnetron in two positions as shown on the outline drawing.
5. The anode temperature must be kept below the limit specified by means of a suitable flow of air over the cooling fins.
6. 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

7. 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 used in the viewing system must not exceed 6.0 pF.
8. The mounting plate and the guard pipe are fitted to the magnetron in a manner to permit pressurizing of the input and the output circuit of the magnetron. At the maximum pressure of 45 lb/in^2(3.2kg/cm^2) absolute, the leakage will not exceed 0.5 litre (N.T.P.) per minute.
9. Tolerance ±10%
10. These tests are carried out at 2700, 2800 and 2900MHz for the 5586.
11. The magnetron will tune over the indicated frequency range.
12. The specification limit for bandwidth applies over the whole tuning range.
13. 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 the rated frequency range of the magnetron. Missing pulses are expressed as a percentage of the number of input pulses applied during the last 3 minutes of a test interval not to exceed 6 minutes.
14. Measured with heater voltage of 16V and no anode input power, the heater current limits are 2.8A minimum, 3.4A maximum.
15. Design test only. The maximum frequency change with anode temperature change (after warming) is –0.07MHz/℃.

X-RAY WARNING

High voltage magnetrons emit a significant intensity of X-rays not only from the cathode sidearm but also from the output waveguide. These rays can constitute a health hazard unless adequate shielding for X-ray radiation is provided. This is a characteristic of all magnetrons and the X-rays emitted correspond to a voltage much higher than of the anode.

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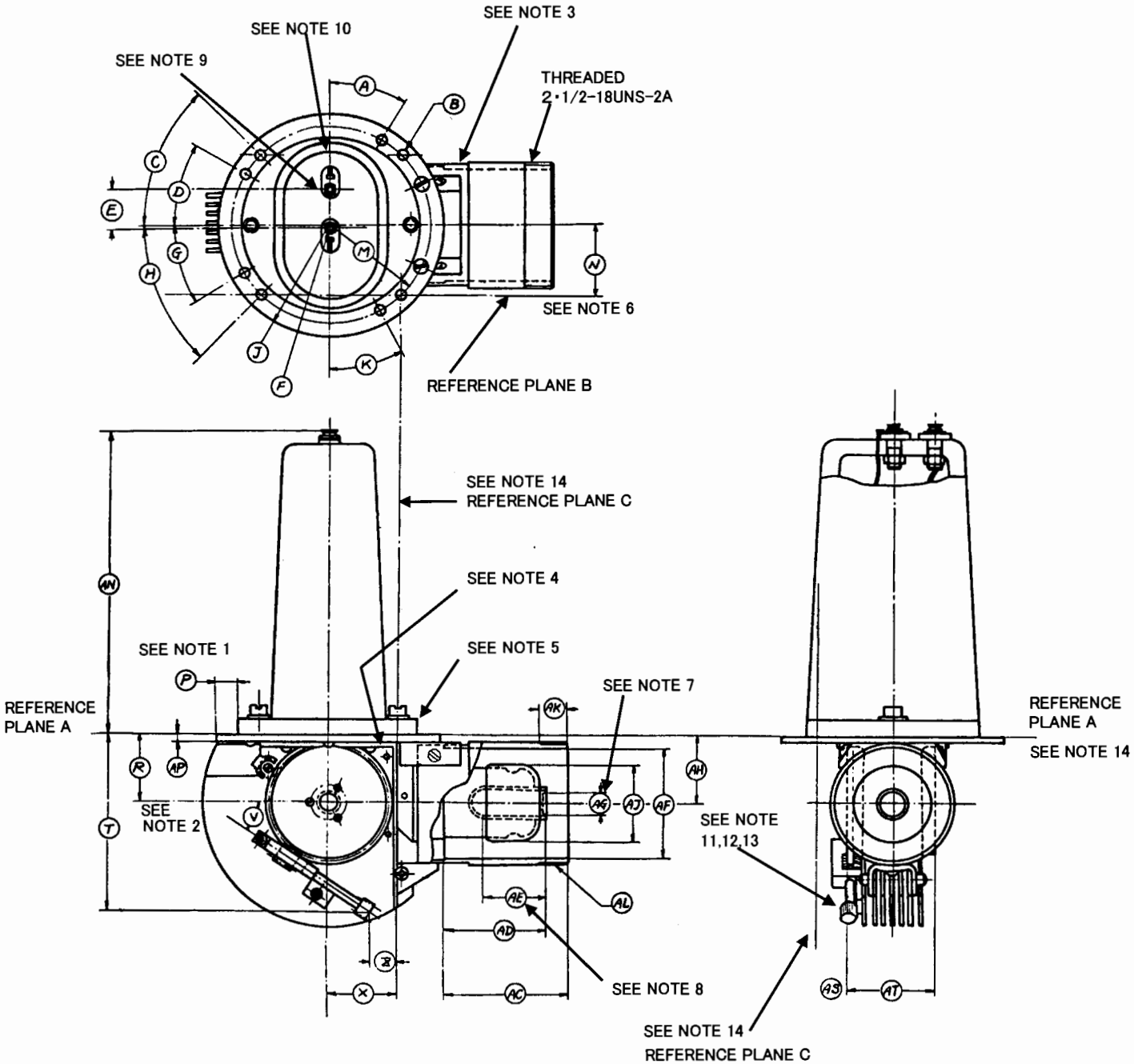
OUT LINE



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Outline Dimensions (All dimensions without limits are nominal)

Ref	Inches	Milimetres
A	30° ±12'	30° ±12'
B	0.210±0.005	5.33±0.13
C	45° ±12'	45° ±12'
D	30° ±12'	30° ±12'
E	0.796±0.015	20.24±0.38
F	DIA0.169±0.005	DIA4.295±0.13
G	30° ±12'	30° ±12'
H	45° ±12'	45° ±12'
J	RAD2.281±0.015	RAD57.94±0.38
K	30° ±12'	30° ±12'
M	RAD2.032±0.003	RAD51.615±0.075
N	1.437±0.020	36.5±0.51
P	0.500min	12.70min
R	1.440	36.58
T	3.500	88.90
V	32.5° ±2.5°	32.5° ±2.5°
X	1.437	36.50
Z	0.756	19.20

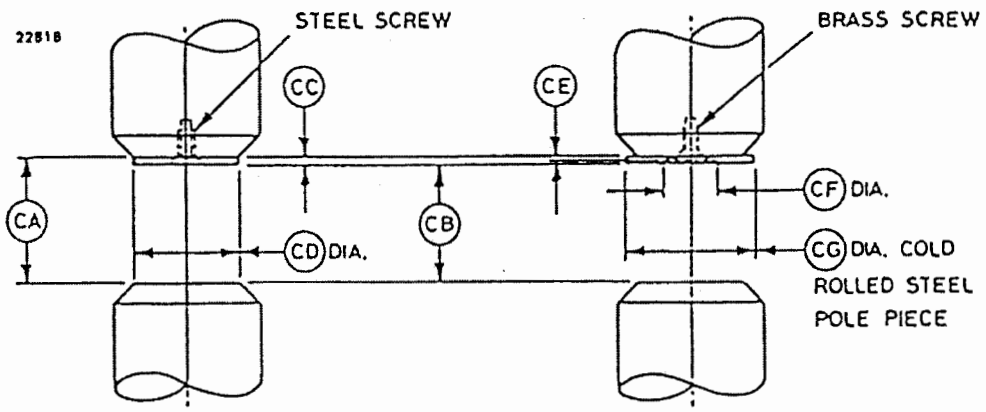
Ref	Inches	Milimetres
AC	2.297±0.010	58.34±0.25
AD	2.085±0.025	52.96±0.64
AE	1.125min	28.58min
AF	2.321±0.007	58.95±0.18
AG	0.555±0.005	14.10±0.13
AH	1.440±0.020	36.58±0.51
AJ	1.620max	41.15max
AK	0.593min	15.06min
AN	6.313±0.094	160.4±2.4
AP	0.187	4.75
AS	0.575±0.050	14.61±1.27
AT	1.740max	44.20max

Millimetre dimensions have been deriverd from inches.

ELECTRO-MAGNET POLEPIECES

Magnet with Single
Conventional Pole Piece

Magnet with
Distortion Pole Piece



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Ref	Inches	Millimetres	Ref	Inches	Millimetres
CA	1.925±0.005	48.90±0.13	CE	0.031±0.015	0.79±0.38
CB	1.800±0.005	45.72±0.13	CF	0.786±0.005	19.96±0.13
CC	0.125±0.015	3.18±0.38	CG	2.000±0.015	50.80±0.38
CD	1.625±0.015	41.28±0.38			

Millimetre dimensions have been deriverd from inches.

Outline Notes

1. With the magnetron resting on a plane surface the flatness of this annular area will be such that a feeler gauge 0.015 inch (0.38mm) thick and 0.125 inch (3.18mm) wide will not enter more than 0.250 inch (6.35mm) at any point.
2. The periphery of the anode will lie within a 2.160 inches (54.86mm) diameter circle located as specified for the non-tunable side of the anode.
3. The magnetron will be painted with black,heat resisting non-corrosive paint,except for the following paint free areas: top surface of mounting plate,parts above mounting plate, screw threads on guard pipe,all surfaces inside guard pipe,tuning gear,stop and worm shaft assembly.
4. All joints on the mounting plate and guard pipe wil be soldered to provide hermetice seals.
5. The magnetron may be supported by the mounting plate or guard pipe.
6. Applies to the location of the center line of the guard pipe only.
7. Applies to the inner conductor insert only. The center line of the inner conductor insert will be concentric with the contreline of the guard pipe to within 0.025 inch (0.64mm).
8. Applies to the straight portion of the inner conductor wall.
9. Hexagon locking head banana pin jack, hole 0.169±0.005 inch (4.29±0.13mm) diameter × 0.593 inch (15.06mm) long as per Mil-E-1,latest issue.
10. The common cathode connection is marked with letter K.
11. The tuning mechanism will provide the full range of tuning with a maximum of 5 complete revolutions of the large tuning gear for the 5586.
12. The spline for adjusting the tuning mechanism is as follows: 12 teeth, 48 d.p.,involute from.
13. The clearance between the tuning spline and the guard pipe will be sufficient to allow the use of S.S. White No. 2666X end fitting ($1\,^3/_{3\,2}$inch diameter)
14. Reference plane A is defined as a plane passing along the face of the mounting plate.
    Reference plane B is defined as a plane perpendicular to plane A and passing through the centre of the holes shown.
    Reference plane C is defined as a plane mutually perpendicular to plane A and B and passing through the centre of the hole as shown.

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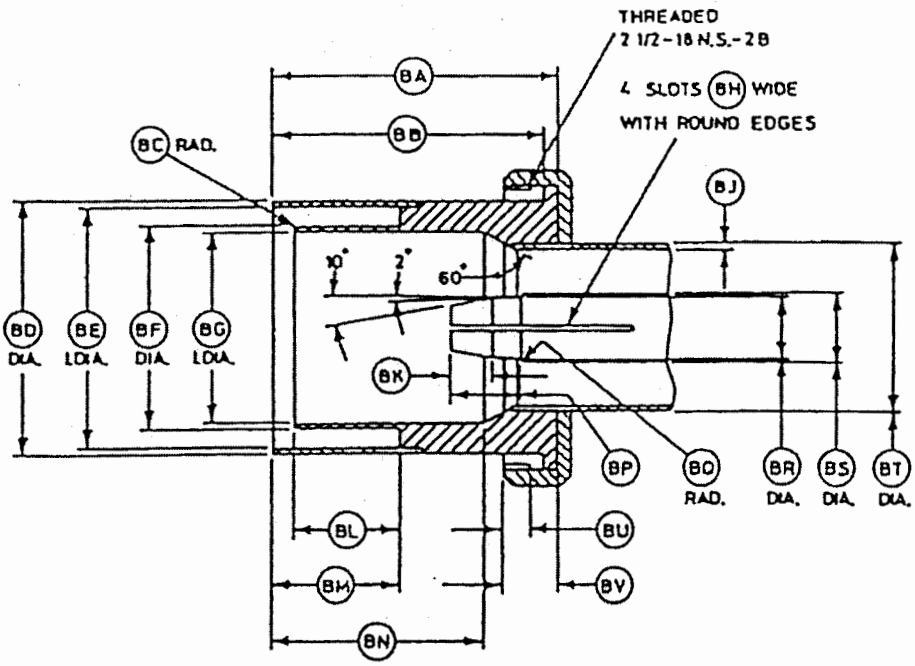
COUPLER (All dimensions without limits are nominal)
This coupler matches the output of the magnetron to a standard 1 5/8-inch coaxial line having an outer conductor of 1.527 inch (38.79mm) internal diameter and an inner conductor of 0.625 inch (15.88mm) diameyer.



Ref	Inches	Millimetres	Ref	Inches	Millimetres
BA	2.531±0.015	64.29±0.38	BL	0.937±0.003	23.800±0.076
BB	2.402±0.005	61.01±0.13	BM	1.125±0.003	28.575±0.076
BC	0.031±0.015	0.79±0.38	BN	1.875±0.005	47.63±0.13
BD	2.310±0.002	58.674±0.051	BP	0.625±0.015	15.88±0.38
BE	2.185±0.002	55.499±0.051	BQ	0.016±0.015	0.41±0.38
BF	1.875±0.002	47.625±0.051	BR	0.576±0.002	14.630±0.051
BG	1.720±0.002	43.688±0.051	BS	0.625	15.88
BH	0.030	0.76	BT	1.625	41.28
BJ	0.049	1.24	BU	0.250±0.015	6.35±0.38
BK	0.375±0.015	9.53±0.38	BV	0.500±0.015	12.70±0.38

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