


SPECIFICATION
 PULSE TYPE COAXIAL MAGNETRON, TUNABLE

Same outline as ROT (43)

DATE PRINTED	2-6-76	SPECIFICATION	RELMAG, INC. 1240 HIGHWAY 1, WATSONVILLE, CALIFORNIA 95076
SEE ASSEMBLY	RM-145		
DATE PRINTED	2-6-76	SPECIFICATION	RELMAG, INC. 1240 HIGHWAY 1, WATSONVILLE, CALIFORNIA 95076
SEE ASSEMBLY	RM-145	DR: _____ CH: _____ APP: _____	SCALE: _____ 

1.0 DESCRIPTION

Coaxial magnetron, pulse type, tunable from 16,200 MHz to 16,300 MHz, 2.2 Kw rated peak power output, permanent magnet, air cooled.

- 1.1 Dimensions - See RM-145-1
- Mounting Position - Any
- Cooling - Conduction
- Mounting Support - Output Flange
- Input Connector - See RM-145-1
- Weight - 24 oz. max.

2.0 ABSOLUTE MAXIMUM RATINGS - See Note A

Parameter	Ef	If	Ib	Ib	tk	VSWR	tsrv	t anode	tp	Alt
Units	V	A	A	mADC	sec	Ratio	us	°C	us	Ft
Maximum	7.0	2.5	3.25	9.75	--	1.5:1		150	2.0	25000
Minimum					60		0.080	-65	0.20	
Note	B	Surge								C

ELECTRICAL DESIGN RATINGS

Parameter	Ef	ib	Pi
Units	V	A	W
Nominal Value	6.3	2.75	9.9
Notes	B	D	

TEST CONDITIONS

Parameter	Ef	tpc	Du	rrv	ib	epy	tsrv
Unit	V	usec	--	KV/usec	mADC	KV	sec
Tolerance	--	±10%	--	±6	--	±.1	±5%
Test Condition 1 (TCL)	6.3	0.25	.003	29	8.25	3.6	0.08

REQUIREMENTS

	Reference MIL-E-1
Qualification - Required	3.2
Holding Period - 168 Hours	B50.2
Marking	par 3.7
Preparation for Delivery	par 5.1
Performance	par 3.1.1
Container Drop (Pkg. Gr. 9 Size A.)	par 4.5 and E-1136

NOTES:

- A. Ratings cannot be used simultaneously and no individual ratings should be exceeded.
- B. Prior to application of high voltage, the cathode shall be heated to the required operation temperature. This may be done by applying 6.3 volts for 60 seconds. On standby the heater voltage should be adjusted to 6.30 volts $\pm 5\%$.
- C. The time of steepest rise of voltage (tsrv) shall be expressed as the time between 20 and 85 percent points on a line defining the steepest tangent to the leading edge of the voltage pulse about 50% amplitude. Any capacitance in the viewing circuit shall not exceed 6.0 μfd .
- D. When this tube is used as a constant frequency generator, careful regulation of the filament voltage and peak anode current is required.

3.0 APPLICABLE DOCUMENTS

- 3.1 The following documents of the issue in effect at the date of solicitation, form a part of this drawing unless specified otherwise:

SPECIFICATIONS

MILITARY

MIL-E-1	Electron Tubes, General Specifications for.
MIL-E-75	Electron Tubes, Packaging and Packing, General Specifications for.
MIL-STD-130	Marking of Electronic Items
MIL-STD-105	Sampling Procedures and Tables for Inspection.

MIL-E-1 METHOD OR PAR.	REQUIREMENT OR TEST	CONDITIONS	SYMB	LIMITS		UNITS
				Min	Max	
	<u>Quality Conformance Inspection-Part 1</u>					
D-30 (a) 40 & 60	Visual & Mechanical					
E-4303	Heater-cathode warm-up time	TCl (Note 5)	tk	--	60	sec
E-1301	Heater current	TCl	if	0.50	1.0	A
	Tunable Frequency	TCl		16.2	16.3	GHz
E-4306	Pulse Voltage	TCl (Note 6) F1, F3	epy	2.5?	3.7	Kv
E-4250	Power Output	TCl (Note 6)		6.6	--	W
E-4308	RF Bandwidth	TCl (Notes 6,7) F1, F3 VSWR=1.5:1	BW	--	2.4/tp	MHz
	Minor Lobes	TCl (Note 6) F1, F3	Ratio	8		db
E-4310	Pulling Factor	TCl (Note 6) F1, F3 VSWR=1.5:1	Δf	--	10	MHz
E-4315	Pulse Stability	TCl (Notes 6,8) F1, F3	MP	--	0.5	%

MIL-E-1 METHOD OR PAR.	REQUIREMENT OR TEST	CONDITIONS	SYMB	LIMITS		UNITS
				Min	Max	

Quality Conformance
Inspection - Part III

Par 4.6.1	Life Test	Group D TC1 (Note 9)	Cycles	1080	--	
Par 4.6.2	Life Test End Points	TC1 (Note 10)				
	Pulse Voltage	F=F1, F3	epy	3.5	3.7	KV
	Power Output	F=F1, F3	Po	6.0	--	W
	RF Bandwidth	F=F1, F3	BW	--	2.4/tp	MHz
	Minor Lobes	F=F1, F3	Ratio	6	--	db
	Pulse Stability	F=F1, F3	MP	--	0.5	%
	Tunable Frequency		F	16200	16300	MHz
	Pulling Factor	F=F1, F3	Δf	--	12	MHz
Par 4.1.1.2	Periodic Checks					
	Heater Current	TC1	If	0.50	1.0	A
	Temperature Coeff.	TC1 (Notes 6, 11) F1, F3	$\Delta f / \Delta T$	-35	-110	KHz/c
E-1026	Low Temperature Op'n	TC1 (Notes 6, 8) Pretest Cooling 60 min st -32°C F1, F3	Pulse Stability MP	--	0.5	%
E-1026	High Temp. Op'n	TC1 (Notes 7, 8) Pretest heating 60 min at 85°C F1, F3				
	Power		Po	6.6	--	W
	RF Bandwidth		BW	--	2.4/tp	MHz
	Pulse Stability		MP	--	0.5	%

MIL-E-1 METHOD OR PAR	REQUIREMENT OR TEST	CONDITIONS	SYMB	LIMITS		UNITS
				Min	Max	
E-4311	Pushing	TCl (Notes 6, 13) F1, F3 $I_b = 7.75$ to 8.75 mADC	F		2	MHz
	Stray Magnetic Field	Note 14 No voltages	C		30	Gauss
<u>Qualification Requirements Part II</u>						
E-1041	Shock	No voltages Notes 1,3 30g at 11 msec				
E-1031	Vibration	No voltages (Notes 2,3)				
E-1331	Input Capacitance	Between cathode term & mtg plate	C	10	20	pf
E-1027	Temperature Cycling	No voltage t= 60 min.				
E-1002	Barometric Pressure Reduced	TCl (Note 4) No voltages Altitude 25000 ft. at -32°C for 60 minutes. Operate at 10000 ft at -32°C				

NOTES

1. The magnetron shall be mounted on a test plate and dropped three times in each direction of three mutually perpendicular planes for a total of eighteen times. The shock pulse shall be 30g and have a duration of approximately 11 milliseconds as measured at the quarter amplitude points or the acceleration shock wave.
2. The magnetron shall be subjected to vibration of 10 to 55 to 10 Hz at 0.08 inches total excursion for a total test time of 60 minutes in each of three mutually perpendicular planes.
3. After subjection to shock test, and also after vibration test, each tube shall meet all the requirements of the specification under Quality Conformance, Part 1.

NOTES (Cont'd)

4. Under the conditions of Test Condition 1 there shall be no visible corona around the cathode seal.
5. The heater voltage shall not be reduced during operation after the application of pulse voltage.
6. Tests may be performed at any frequency from 16,200 to 16,300 MHz; however, tests shall be performed at frequencies where $F_1 = 16,200 \pm 15$ MHz, and $F_3 = 16,300 \pm 15$ MHz.
7. The R.F. Bandwidth shall be within the limits specified when a VSWR = 1.5:1 minimum is introduced in the load at a distance no greater than 1/4 meter from the magnetron output flange, the phase being adjusted for maximum bandwidth.
8. Stability shall be measured in terms of the average number of output pulses missing, expressed as a percent of the number of input pulses applied during the period of observation. The output pulses are considered to be "missing" if, due to any causes, the average R-F energy content per pulse is less than 70% of the normal energy level. A VSWR = 1.5:1 minimum shall be adjusted to that phase producing maximum instability and the missing pulses counted during any consecutive five minute interval of a ten minute test period.
9. The frequency shall be varied between F_1 and F_3 at 24 hour intervals during the life test of the tube. At each frequency, the power input to the tube shall be cycled according to the following schedule:

<u>Ef</u> <u>Volts</u>	<u>I_b</u> <u>mADC</u>	<u>Time</u> <u>Minutes</u>
0	0	4
4.75	0	1
4.75	1.6	55

10. Tests to be performed at the conclusion of the 1080 cycles life test shall be executed as prescribed by Quality Conformance, Part I.
11. The absolute value of the temperature coefficient shall not exceed the specified value when measured in increments of 30 degrees or less over an anode temperature range from 0°C to 110°C.

NOTES (Cont'd)

13. The pushing factor shall not exceed the specified limit when the peak magnetron current I_b , is varied from 7.75 mADC to 8.75 mADC as determined by the measurement of $I_b/duty$.
14. This test to be performed while rotating the magnetron in each of three mutually perpendicular planes. The stray magnetic field strength shall not exceed the specified value when measured at a distance of $4.0 \pm 1/4$ " away from the intersection of each of the three planes.

Input power (peak)
Input power (mean) (see note 3)
Duty cycle
Pulse duration
Rate of rise of voltage pulse (see note 4)
Anode temperature (see note 5)
V.S.W.R. at the output coupler

X TYPICAL OPERATION

Operational Conditions

Heater voltage
Anode current (peak)
Pulse duration
Pulse repetition rate
Rate of rise of voltage pulse

1
6.3
2.75
0.25
12000
2.9

2

✓
a
use
PPS
KV/us

Typical Performances

Anode voltage (peak)
Output power (peak)
Output power (mean)

3.6
2.2
6.6

KV
KW
W

TEST CONDITIONS AND LIMITS

The magnetron is tested to comply with the following electrical specification

Test Conditions

Heater voltage (for test)
Anode current (mean)
Duty Cycle
Pulse duration (see note 6)
V.S.W.R. at the output coupler
Rate of rise of voltage pulse (see note 4)

Limits

Anode voltage (peak)
Output power (mean)
Frequency (see note 7)
R.F. bandwidth at 1/4 power
Frequency pulling (v.s.w.r. not less than 1.5:1)
Stability (see note 8)
Cold impedance
Heater current
Temperature coefficient of frequency