

**MAGNETRON SPECIFICATIONS FOR FEDERAL AVIATION
ADMINISTRATION ARSR-1&2 LONG RANGE RADARS**

SPECIFICATION NUMBER: QC-E-1/480D

DATE: 04/27/04

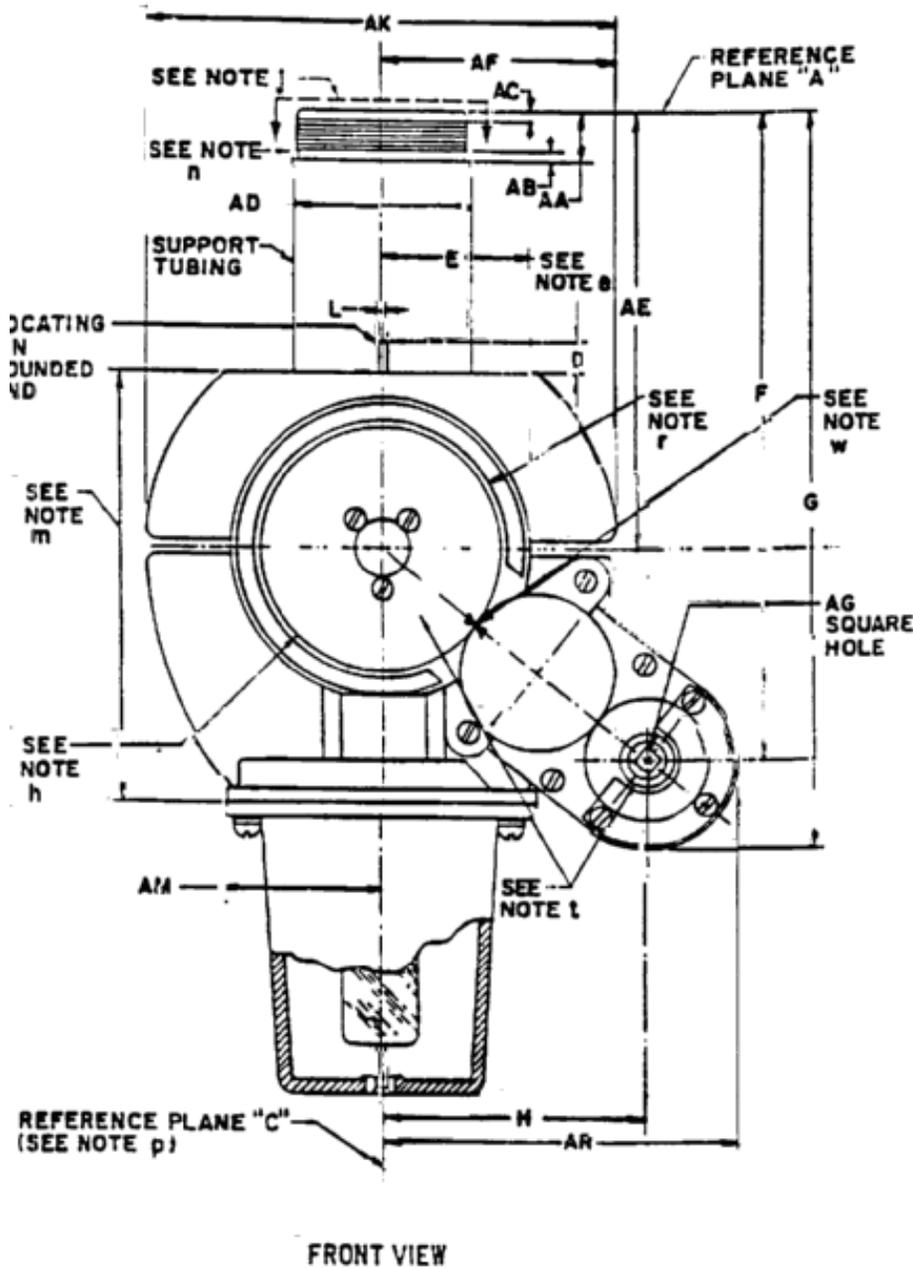
METHOD REQUIREMENT/ TEST NOTES/ TEST CONDITIONS/ SYMBOL/		LIMITS/		UNIT	
		<u>Min</u>	<u>Max</u>		
Quality Conformance Inspection, part 1		11	---		
1301	Heater current	7,12	---	Ef=23.5 V If	2.40 3.00 A
4223	Mechanical tuning	---	1	Upper limit Lower limit	F F 1250 1375 MHz
4003	Pressurizing	---	---	30 psia	---
4306	Pulse voltage	---	1	F1,F2,F3, F4, F5	epy 26.5 31.5 kv
4250	Power output	13	1	F1,F2,F3, F4, F5 F1,F2,F3, F4, F5	PO avg. 454 --- W PO peak 630 --- kw
4308	RF bandwidth	2,3	1	F1,F2,F3, F4, F5	BW --- 2.0/tpc MHz
4315	Starting stability	1,4	2	VSWR=1.5:1 F1,F2,F3,F4, F5	MP --- 2.0 %
Quality Conformance Inspection, part 2					
1031	High-frequency vibration	---	---	No voltages	---
4223	Tuner operating torque	5,6	---		Torque --- 128 in.-oz
4310	Frequency pulling factor	---	1	VSWR-1.5:1 F1,F2,F3,F4, F5	^F --- 5.0 MHz
4311	Frequency pushing factor	8	1	F1,F2,F3,F4, F5	^F --- 0.5 MHz
---	Load stability	4	1	VSWR=1.5:1 F1	MP --- 1.0 %
Quality Conformance Inspection, part 3					
4551	Life test	---	2	Group D	t 500 --- hr
---	Life test end points				

4250	Power output	13	1	F1,F2,F3,F4, F5	PO avg.	325	---	W
				F1,F2,F3,F4, F5	PO peak	451	---	kw
4308	RF bandwidth Periodic-check	2,3	2	F1,F2,F3,F4, F5 Test	BW	---	4.0/tpc	MHz
1047	Low-temperature operation	13	2	tk=300sec(max) F1,F2,F3,F4, F5	PO avg.	325	---	W
				F1,F2,F3, F4, F5	PO peak	451	---	kw
4027	Temperature	9	2	T(anode)-0 to 100 degrees C;F1,F2,F3,F4,F5	AF/AT	---	0.03	MHz/ Deg.C
1042	Shock	---	---			---	---	---

SAFETY REQUIREMENTS: The magnetron shall comply with FAA Safety Order 3900.19B, Chapter 14 Radiation Safety Program specifications.

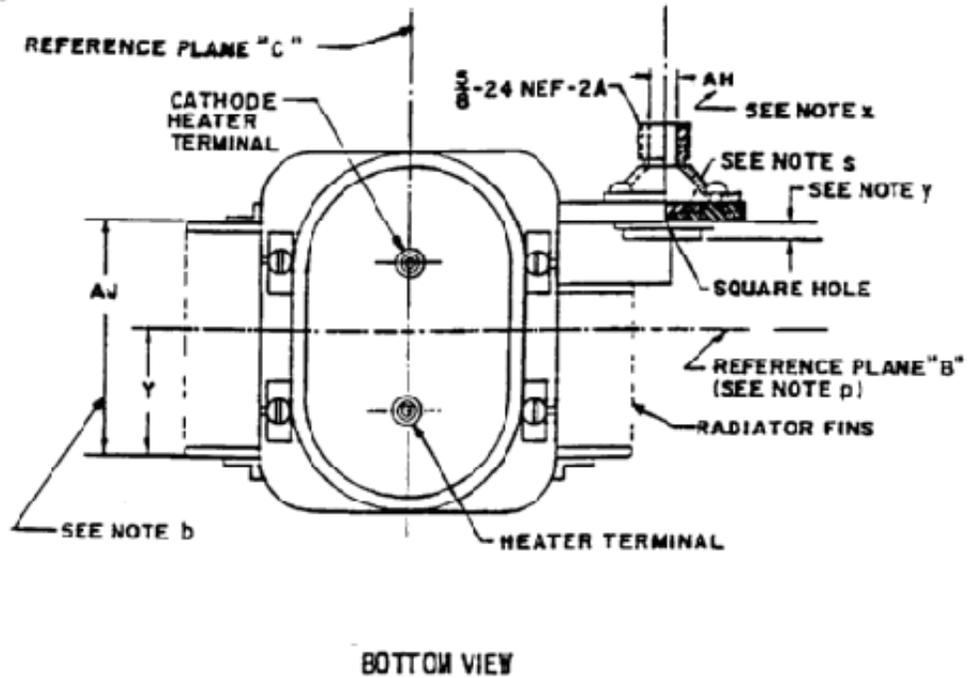
NOTES:

1. The starting stability test shall be performed on 100 percent of the submitted lot.
2. Frequency skipping or unstable operation may be encountered at some phase position when the mismatch occurs at the end of a line 8 meters long, or longer.
3. The RF bandwidth shall be within the limits specified when a VSWR of 1.5: 1 is introduced in the load at a distance of approximately 0.5 meter from the magnetron coupling flange.
4. The missing pulses (MP), due to any causes, are considered to be missing if the RF energy is less than 70 percent of the normal energy level in the frequency range of 1,280 to 1,350 MHz.
5. This test shall be conducted over a temperature range of -60 to + 100 degrees C inclusive. The tube shall not be operating during this test.
6. The tuner drive mechanism shall not be set against either mechanical stop.
7. The heater surge current shall not exceed 4.0 amperes.
8. The peak anode current shall be varied between 36 ± 3.6 amperes (from 32.4 to 39.9 amps) at a minimum rate of 50 cycles per second. The ΔF measurement is the difference between the frequency extremes measured.
9. The temperature is to be measured at the point indicated on Figure 1 (side view).
10. The north-seeking pole shall be adjacent to the cathode terminal.
11. Unless otherwise specified, the AQL for all tests listed under quality conformance inspection, part I, shall be 1.0 percent, inspection level II.
12. A tk of 180 seconds (min) with an Ef of 23. 5 volts is required before test.
13. These average and peak output power measurements are back calculated from the directional coupler of the ARSR 1/2 test bed, and correspond to the power measurements at the output of the magnetron. A pulse width of 2 usecs and a period of 2778 usecs were used to calculate the average power from the peak power values.



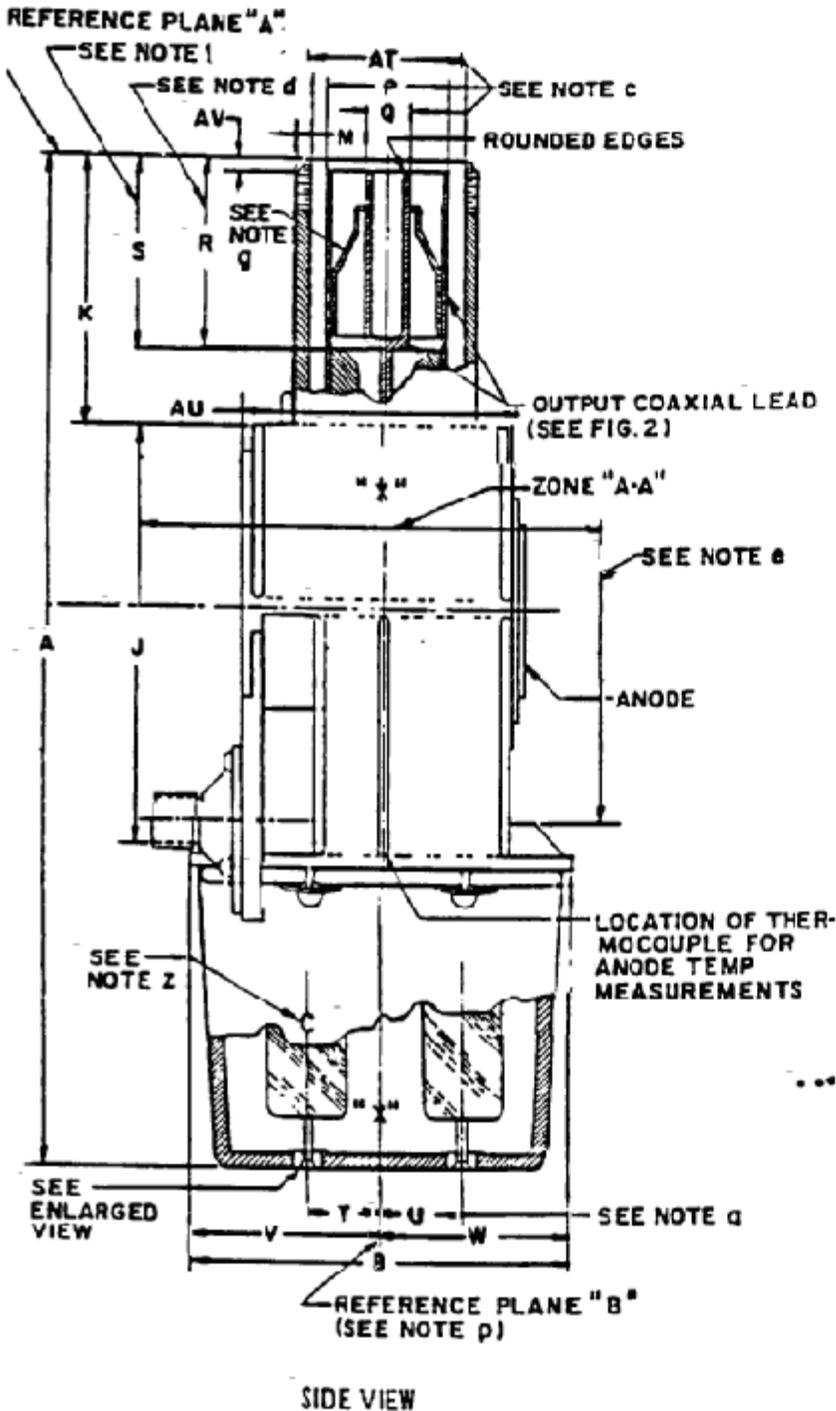
Ltr	Dimensions in inches with metric equivalents (mm) in parentheses	
	Minimum	Maximum
Quality conformance inspection, part 1		
D	.359 (9.12)	.391 (9.93)
L	.122 (3.10)	.128 (3.25)
AA	.531 (13.49)	.625 (15.88)
AD	2.307 (58.60)	2.312 (58.72)
AE	5.406 (137.31)	5.531 (140.49)
Quality conformance inspection, part 2		
F	7.812 (198.42)	8.188 (207.98)
G		9.188 (233.38)
H		3.375 (85.73)
AB	.125 (3.18)	
AC	.062 (1.57)	
AF		3.000 (76.20)
AG	.248 (6.30)	.252 (6.40)
	x	x
	.248 (6.30)	.252 (6.40)
AK		6.000 (152.40)
AM		2.000 (50.80)
AR		4.500 (114.30)
Quality conformance inspection, part 3		
E	2.375 (60.33)	

FIGURE 1. Outline drawing of electron tube 5J26.



Ltr	Dimensions in inches with metric equivalents (mm) in parentheses	
	Minimum	Maximum
Quality conformance inspection, part 2		
Y		1.562 (39.67)
AH	.373 (9.47)	.377 (9.58)
AJ	2.625 (66.58)	3.000 (76.20)

FIGURE 1. Outline drawing of electron tube 5J26 - Continued.



Ltr	Dimensions in inches with metric equivalents (mm) in parentheses	
	Minimum	Maximum
Quality conformance inspection, part 1		
K	3.047 (77.39)	3.062 (77.77)
P	1.567 (39.80)	1.587 (40.31)
Q	.554 (14.07)	.574 (14.58)
AT	1.927 (48.95)	1.935 (49.15)
AU	3.450 (87.63)	3.560 (90.42)
AV	.080 (2.03)	.115 (2.92)
Quality conformance inspection, part 2		
A		12.500 (317.50)
B		4.750 (120.65)
J	4.875 (123.83)	
M		.010 (.25)
R	2.328 (59.13)	
S	2.344 (59.54)	
V		2.297 (58.34)
W		2.453 (62.31)
X	.012 (.30)	
AP	.278 (7.06)	.284 (7.21)
Quality conformance inspection, part 3		
T	.904 (22.96)	
U	1.036 (26.31)	
AN	.025 (.64)	R
AQ	.593 (15.06)	

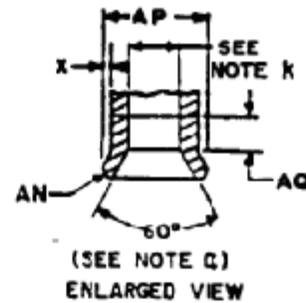
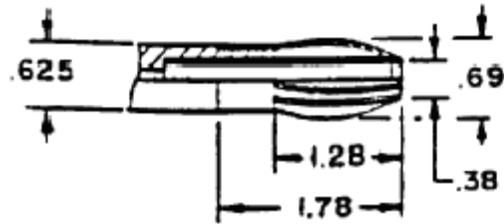


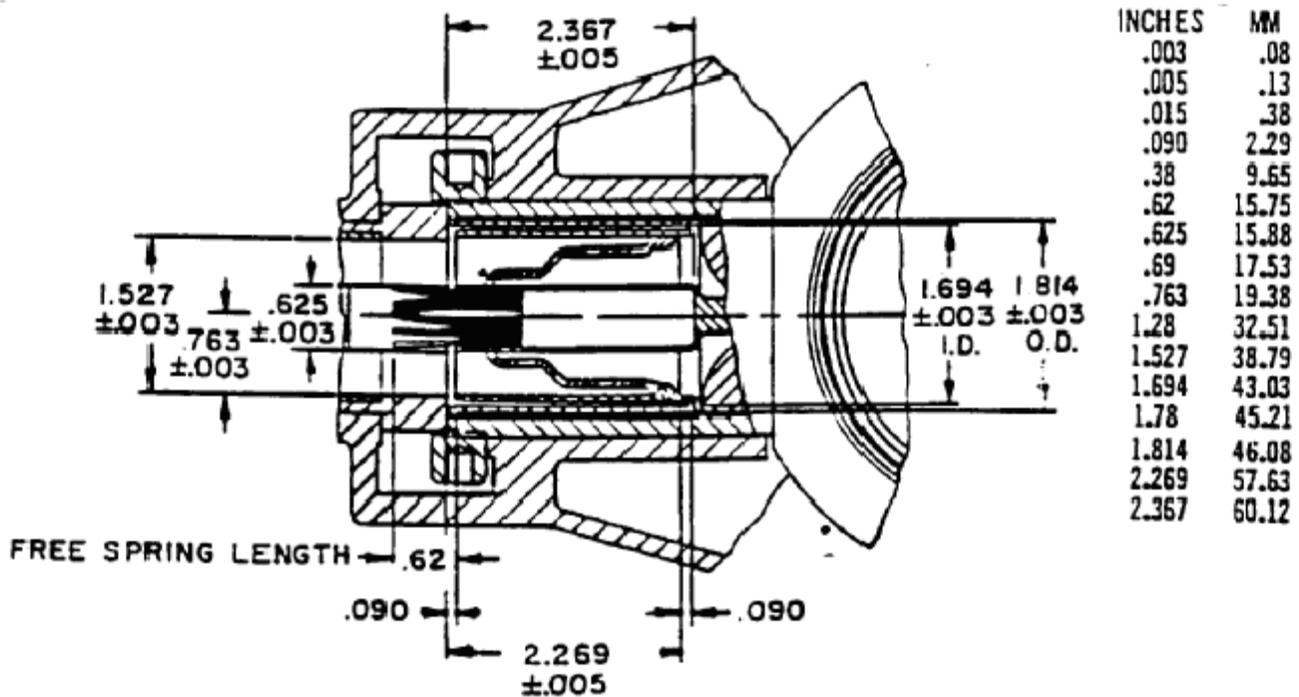
FIGURE 1. Outline drawing of electron tube 5:26 - Continued.

NOTES:

- a. This countersink shall be capable of accepting a cone having a 60 degree included angle and base diameter of .234(5.94mm) and shall reject a similar cone having a base diameter of .254 (6.45 mm).
- b. This dimension applies to the tip of the radiator fins.
- c. The concentricity of these dimensions with respect to each other shall be considered satisfied if they meet the following conditions: Concentric tubes and plug measuring 2.315 (58.80 mm) inside diameter, 1.926 (48.92 mm) outside diameter, 1.600 (40.64 mm) inside diameter and .530 (13.46 mm) diameter shall pass freely into or over these parts to the distances indicated in notes d and f.
- d. Depth to which the 1.926 (48.92 mm) outside diameter, 1.600 (40.64 mm) inside diameter tube shall penetrate (see note c).
- e. Zone 'A -A' shall be capable of being inserted between two parallel planes 3.640 (92.41 mm) apart, which are equidistant from the axis of a 2.315 (58.80 mm) diameter tube into which the support tube is inserted. The locating pin shall fall between parallel planes .150 (3.81 mm) apart equidistant from the 'X - X' axis and normal to the above noted planes 3.640 (58.80 mm) apart.
- f. Depth to which the .530 (13.46 mm) diameter plug shall penetrate (see note c).
- g. Contour of glass may vary from that shown within limiting bounds defined by concentric cylinders and plugs referred to in note c.
- h. Gears shall be under flush with respect to gear housing.
- j. The opening in the support tubing shall be protected by a dust cover when not in use.
- k. Jack holes .169:005x.594 (4.29 ± .13 x 15.08 mm) deep minimum not including tapered section.
- m. All surfaces in this area shall have a heat resistant finish except gears, gear bearing surfaces, gear supports and gear housings.
- n. 2.312-16N.S. 5-full threads minimum.
Maximum major diameter 2.3120 (58.82 mm)
Minimum major diameter 2.2980 (58.37 mm)
Maximum pitch diameter 2.2714 (57.69 mm)
Minimum pitch diameter 2.2629 (57.47 mm)
Maximum minor diameter 2.2353 (56.77 mm)
- p. Reference plane B shall be parallel to either face of the anode. Reference planes B and C shall be at right angles to each other and intersect at the axis of the support tubing.
- q. The jack shall be concentric with respect to the hole in the boot within .062 (1.57 mm). The centers of the holes in the boot shall be within a radius of .062 (1.57 mm) of the specified centers.
- r. These two gears rotate clockwise when increasing frequency.
- s. Complete frequency range covered in approximately 9 1/2 turns of driving gear.
- t. Visible movable parts shall be free from corrosion, paint or other surface imperfections. The tuning mechanism shall operate over the entire mechanical range with a maximum torque of 8 inch pounds applied to the driving gear. This maximum torque rating shall not be exceeded and is not limited to factors such as gear run out and rough bearings.
- u. Lubricant shall appear on visible bearing surfaces of all movable parts.
- v. All screws shall be nonmagnetic, non-corrosive material, or shall have non-corrosive heat resistant finish. Screw heads may be hexagon head, hexagon socket, or straight slotted.
- w. Matched arrows indicate approximate mid band frequencies.
- x. This round hole shall be concentric with the square hole within .003 (.08 mm).
- y. In this zone there shall be a concentric clearance of .360 (9.14 mm) diameter centered on axis of rotation of driver gear.
- z. Cathode-heater lead identification.



THE CONNECTOR SHOULD BE CONSTRUCTED TO REQUIRE A FORCE OF BETWEEN 6 AND 12 POUNDS TO ENGAGE WITH THE TUBE. CONNECTORS CONSTRUCTED OF .015 THICK HALF HARD BERYLLIUM COPPER STRIP (A.S.T.M. B-120 1/2 H), HAVING 12 SEGMENTS SEPARATED BY 1/32 SAWCUTS, HAVE BEEN FOUND TO MEET THIS REQUIREMENT.



NOTE :

THE DIMENSIONED CYLINDRICAL SURFACES SHALL BE CONCENTRIC WITHIN .003

FIGURE 2. Output coupling.

FAA ACCEPTANCE TESTING: The output peak power and side lobe specifications shall be maintained throughout the entire bandwidth (1280 to 1350 MHz). Figure 3 illustrates the layout of the ARSR 1&2 RF path from the output of the magnetron to the input of the Amplitron. The frequency response of the path depicted in Figure 3 is listed in Table 1. Acceptance testing shall consist of and is not limited to measuring the output peak power at the forward port of the directional coupler. This peak power measurement shall be no less than 500 KW when measured at the directional coupler. If a maximum anticipated insertion loss of approximately 1db is considered for all frequencies within the bandwidth, then the calculated output peak power measurement at the output of the magnetron can be back calculated to a minimum value of 630 KW peak power.

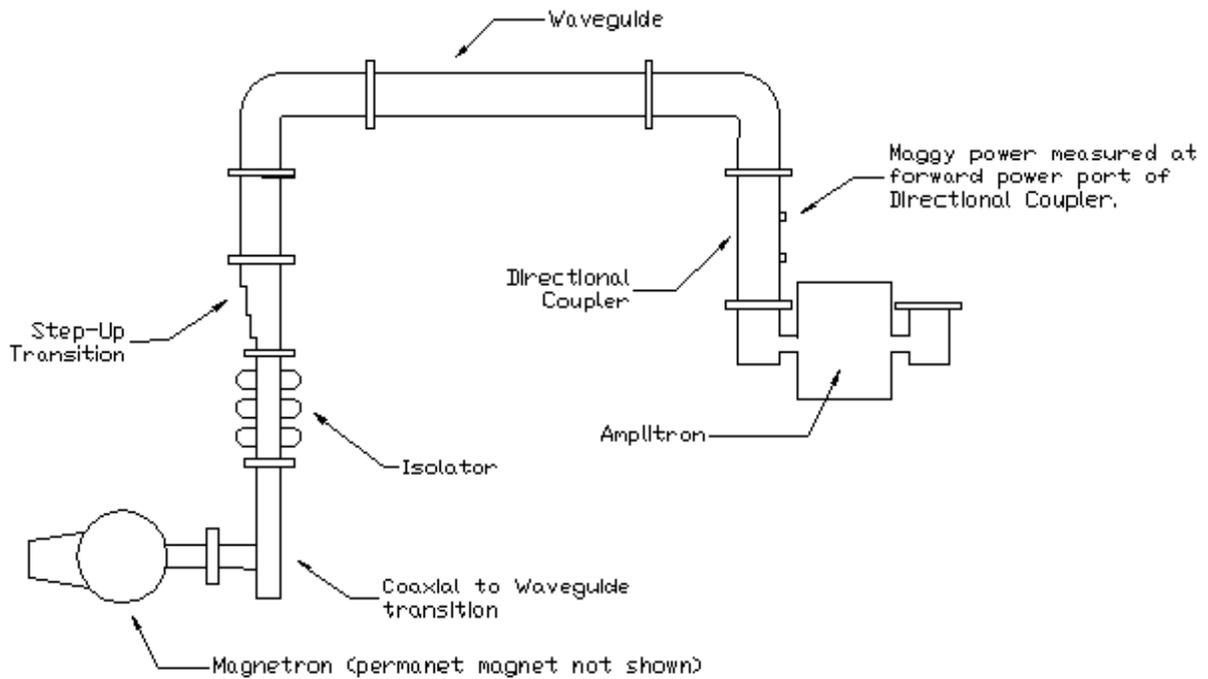


FIGURE 3: ARSR 1&2 System Layout

TABLE 1: A Typical Frequency Response of RF Path
(from output of Magnetron to input of directional coupler)

Magnetron Frequency (MHz)	Measured Loss from Magnetron Output to Forward Power port of Directional Coupler (dB)
1280	0.89
1290	1.02
1300	0.82
1310	0.8
1315	0.7
1320	0.75
1330	0.83
1340	0.79
1350	0.84

Average loss (1280-1350MHz):

0.82 dB