

ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION MOS/CV.2350

ISSUE 1 DATED 26.6.59

AMENDMENT NO. 1.

Page 1 Lines 5 and 6

Amend to :- "To be read in conjunction with K.1006,
Issue 2, excluding 4.7, 4.8 and 4.9.
See also Note D".

Under RATING (near centre of page)

In column headed "Min", against "Pulse Current"

Delete "4", Substitute "6"

Page 2 Note D

Delete existing text entirely,

Substitute :-

"The A. S. E. S. A. Inspection Instructions for Electron Tubes dated 5th October, 1955, which are required for use with K1006 issue 2, can be obtained from: The Secretary, the Ministry of Aviation, (T.L.5(B)), Castlewood House, 77-91, New Oxford Street, London, W.C.1. Paragraph 5.10.1 and paragraph 60.1.1. of Appendix A shall be excluded for the purpose of this specification."

Ref. 4.16.3.2, 2nd Line, Heater Run

In columns headed "Value Osc.1" and "Value Osc.2"

Delete "1.4", Substitute "1.8"

Page 3 Ref. 4.16.7.3 Stability

At 3rd line, in column headed "Conditions"
Amend "ib = 4-10 Amps" to "ib = 6-10 Amps"

At 8th line, in column headed "Conditions"
Amend "3g" to 2g"

Page 4 Ref. 4.16.3.7 Spectrum I

At 1st line, in column headed "Conditions"
Amend "ib=4-10 A" to "ib = 6-10 Amps"

Information Life Test (2/3rds down page)

In column headed "Conditions"
Delete "Group D", Substitute "Note 17"

Page 8 Add new NOTE 17 as follows :-

"17. One Life Test Socket shall be made available and
2% (min) of the Contract Quantity shall be life tested".

June, 1960.

T.V.C. for R.R.E.

N.17242/D

Specification MOS/CV2350 Issue 1, Dated 26.6.59. To be read in conjunction with K1006 Issue 2, Note D.	<u>Security</u>	
	<u>Specification</u> Unclassified	<u>Valve</u> Unclassified

<u>Type of Valve</u> Pulse Magnetron with integral magnets. Fixed frequency. <u>Prototype</u> VX5027, VX9005 <u>Cathode</u> Unipotential, indirectly heated. <u>Cooling</u> Forced Air <u>Climatic</u> Non Tropical <u>Weight</u> 8 $\frac{3}{4}$ lbs approx. <u>Packing</u> For Temperate zones only	<u>MARKINGS</u> See K1001/4 Additional Markings:- SERIAL No.
	<u>MOUNTING POSITION</u> Any
	<u>MOUNTING SUPPORT</u> Face Plate
	<u>DIMENSIONS AND CONNECTIONS</u> See Pages:- 8 and 9

	<u>RATING</u> Absolute, non-simultaneous values.				
	<u>Units</u>	<u>Symbol</u>	<u>Max.</u>	<u>Min.</u>	<u>Notes</u>
Heater Voltage	Volts	Ef	7.0	5.7	A
Heater Current (Surge)	Amps	If	15	-	A
Warm up time	Seconds	tk	-	180	A
Pulse length	µSec	tp	.25	-	-
Pulse Current	Amps	ib	10	4	-
Peak input power tp = .2µS	KW	pi	140	-	-
Rate of rise of anode voltage	KV/µS	r.r.v.	300	100	B,F
Voltage reflection coefficient of load	ratio	-	0.2	-	F
Anode temperature	°Cent	T	150°	-55°	C
Cathode stalk temperature	°Cent	T	165	-55°	C
Altitude	Feet	-	10,000	-	-

NOTE A. On switching on the H.T. the heater voltage shall be reduced as in the following table:-

Ib (mA)	Ef (volts)
4	2.0
3	3.0
2	4.0

± .2 volts

NOTE B. The rate of rise of the pulse voltage (r.r.v.) is defined as the maximum instantaneous value $\left(\frac{dv}{dt} \max\right)$ measured at pulse voltages which are in excess of 80% of the operating pulse voltage of the magnetron.

NOTE C. Care should be taken that the MAXIMUM permitted temperatures are not exceeded. Forced air cooling may be necessary.

NOTE D. Refers to K1006, Issue 2, and Inspection Instructions for use with K1006, Issue 2, Paragraph 60.1.1. "Correlation Tolerances", of the Inspection Instructions shall be excluded. These documents are available from: The Secretary, The Ministry of Supply, Castlewood House, 77-91, New Oxford Street, London, W.C. 1. MIL/STD-105A which is required in conjunction with the MIL documents can also be obtained from the same source.

NOTE E. The window safety factor is 2.5 (min) under MAX input conditions with loadings upto VSWR = 1.5/1. Operation into loads of VSWR > 1.5/1 will seriously reduce this factor.

NOTE F. Where the r.r.v. exceeds 200KV/ μ S the reflection coefficient should not exceed 0.13

TESTS

To be performed in addition to those in K1006 (Issue 2), used in conjunction with Inspection Instructions for use with K1006 (Issue 2) (See also note D on rating page).

All values are absolute
Conditions for Oscillation Tests

Ref	Feature	Note	Symbol	Value Osc. 1.	Value Osc. 2.	Units
	R.F. Coupler Waveguide Ref 1. Coeff.	1		Z 830018 WG22 .025 Max	Z 830018 WG22 .025 Max	
4.16.3.2.	Heater Start Run Warm up time		Ef EF tk	5.7 (Max) 1.4 (Max) 180 (Max)	5.7 (Max) 1.4 (Max) 180 (Max)	Volts " Secs.
4.16.3.3.	Pulse Characteristics Pulse Width Duty cycle Rate of rise of voltage	2	tp Du	.2 Nom .0004 \pm 10%	.05 Nom .0004 \pm 10%	μ Secs Ratio
	Impedance of Modulator	3	r.r.v.	300	300	kv/ μ S
4.16.3.4.	Peak Anode Current	2	Zo ib	700 \pm 1050 10 \pm 5%	700 -1050 10 \pm 5%	Ohms A

Qualification Approval Tests						
Ref.	Test	Conditions	Symbol	Limits		Units
				Min	Max.	
3.1.	Qualification Approval Required for CV Markings.					
	Altitude	Osc. 1. Pressure 500m.m. (max) of Mercury Abs. Note 4.				
	Corona.	Atmospheric pressure. Note 4 Test Voltage 25KV. $t_p = \frac{1}{4}$ μ Sec. $D_u = .0004$.				
	Input Capacitance Cold.		C(in)	8	14	pfs
4.9.15	Low Temperature operation	Ef = 5.7 tk = 180 (max) Stability (Osc.1) at -55°C Note 6.	M.P.		.25	%
4.9.14	Thermal Factor	Osc.1. Measured at any T_p reference point between 70° and 100°	$\Delta F / \Delta T_p$		1.5	Mc/s/ $^\circ\text{C}$
	Linear Acceleration.	No pulse voltages.		15g		Accel.
	Shock Note 16	No pulse voltages Acceleration 25g Min. Duration 10m.s.				
	Carton drop Note 6, 13	In Carton, to relevant specification	Drop	4'-6"		
	Shelf Life Note 7			90		days
		Post. Linear Accn. Shock, Carton drop, Shelf life test end points (1) 100% Acceptance Tests, same limits EXCEPT (2) and (3) (2) Pulse voltage (3) Wavelength, Osc.1. $T_p = 70^\circ - 100^\circ\text{C}$	Δe_{py}		± 1	KV
			$\Delta \lambda$		$\pm .05$	M.M.
4.16.7.2. 4.16.7.3	Stability Notes 8,9,10	Refl. Coeff = 0.13 min Osc.1. All values between $i_b = 4-10$ Amps $r.r.v = 100-300$ kv/ μ S	M.P.		0.25%	
	Pushing Figure	Osc.1. Over range $i_b =$ 8 - 10 Amps Note 11				2 Mc/s/ Amp Hrs
	Fatigue Note 15	Any frequency in range 10-150c/s at 3g 150-500c/s at $\frac{1}{2}$ g		10		

Ref.	Acceptance Tests		Insp. Level	Symbol	Limits		Units
	Test	Conditions			Min.	Max.	
4.10.8.	Heater Current	Ef = 6.3 tk = 180(min)	100%	If	2.7	3.3	Amps
4.17.7.3	Holding Period		100%	t	168		Hrs.
4.16.7.2	Stability Note 8,9,10	Osc.1 ib = 10A r.r.v. = 300kv/ μ S (min) Refl.Coeff. = 0.13 (min)	100%	M.P.		.25	%
	Information Stability Note 8,9,10	Osc. 2. ib = 10A (min) r.r.v. = 300kv/ μ S(min) Refl.Coeff = 0.13 (min)	100%	M.P.	to be recorded.		
4.16.5	Pulling Figure	Osc.1, Refl.Coeff. 0.13(min)	100%			27	Mc/s
	Pulse Voltage	Osc. 1.	100%	epy	11.5	14.0	KV
	Power Output	Osc. 1.	100%	Po	6		Watts
	Wavelength	Osc. 1. Anode Temperature between 40° - 70°C			8.51	8.69	m.m.
4.16.3.7.	Spectrum I.	Osc. 1 ib 4-10A Refl.Coeff = 0.13 (min) (a) R/F Bandwidth (b) Minor lobes Parameters observed over current range and each phase of reflection. MAX BW and MIN ratio of Minor Lobes to be recorded.			6	2.2 _{tp}	Mc/s Dbs
	Pressurising	45p.s.i. Abs (min)	100%			.005	Lbs/WT /HR
	Dimensions	As per outline	100%				
	Information Life Test intermittent Note 14	Group D Osc. 1. OFF Period 8 minutes.				250	Hrs
	Information Life tests end points	Osc. 1. (a) Power (b) Wavelength		Po 7-	6 8.46	8.74	Watts M.M.
<u>NOTES.</u>							
1. Details of waveguides are given in RCL351 (Waveguide) obtainable from Radio Components Standardisation Committee, 77-91 New Oxford Street, London W.C. 1.							
2. The provisions of K1001 issue 5 section 5F 2.5.1 through to 5.F.2.5.4.1 apply.							
3. The provisions of K1001 issue 5 section 5.F.2.5.5. apply.							
4. (1) There shall be no evidence of corona when operating under the required test conditions at a pressure of 500 m.m. (MAX) of mercury.							

4. (ii) With the cathode cold, and at atmospheric pressure, the magnetron shall withstand the required test voltage with the required pulse characteristics from a source of approximately 1000 ohms impedance for five minutes without suffering damage due to external discharges. If necessary this test may be carried out with magnetrons with dummy magnets.
5. 4.9.15 of K1006 shall be read as -55°C . When the block reached -55°C , the heater, at the specified voltage, shall be applied for $t_k = 180$ sees. (max.) A stability test shall be carried out under the required test conditions.
6. Drop onto four faces and two corners. The sealing envelope nearest the magnetron shall remain undamaged.
7. With or without pack at the discretion of the manufacturer.
8. Stability shall be measured in terms of the number of output pulses missing, expressed as a percent of the number of input pulses applied during the period of observation. The missing pulses (M.P.) due to any cause are considered to be missing if the r.f. energy is less than 70% of the normal energy level within the wavelength range 8.46 - 8.74m.m. Visual evidence will be accepted until a missing pulse counter is available.
9. With the peak power input set to the specified value, the mismatch shall be introduced and the phase adjusted to give maximum anode current. A missing pulse count shall be made over a period of 3 minutes. The phase of the reflection shall then be varied through 360° (one half guide wavelength) and then set to the position showing the maximum missing pulse rate. If the value of phase is less than 45° different from the previous setting and if the previous value of the missing pulse ratio was less than 0.1%, this will be regarded as evidence of satisfactory performance. This part of the test shall be completed within 6 minutes of switching on the H.T. after the specified holding period. If the above two conditions are not satisfied, then the bracketing procedure in 10 shall be used.
10. The following bracketing procedure shall be used. The phase of the mismatch shall be set to the position showing maximum missing pulse ratio, and then the phase altered to two values, one on each side of the previous setting and differing from it by not more than 15° . The missing pulse ratio shall be measured over an interval of not less than one minute in each position. If either of the values of missing pulse ratio found exceeds the value previously obtained, a further measurement shall be made following the same procedure, but in a single position beyond that giving the greater reading. The process shall be repeated until the value of missing pulse ratio is found which is less by at least 0.1% than the highest figure found. This test must terminate within 15 minutes of switching on the H.T. after a holding period.

11. The E.H.T. supply to the modulator shall be modulated so as to cause the magnetron pulse current to vary sufficiently rapidly about a mean value so as to exclude the effects of thermal expansion of the electrodes. As the modulation is increased from zero to the required amount the mean current shall not alter by more than 0.25mA. The maximum variation in frequency shall be measured on a spectrometer which has been suitably adjusted. The results shall be recorded against the serial number of the magnetron.
12. The requirements of 4.16.3.5. may be waived at the discretion of the manufacturer.
13. The magnetron shall be packed to the requirements of R.R.E. The pack shall not transmit vibrations to the valve which will cause fatigue and failure, and when dropped from 4' - 6" shall reduce the acceleration transmitted to the valve to less than 25g.
14. For Type Approval, the Manufacturer, at his expense shall do the following:-
 - (a) Carry out, on each of Two valves, the 100% tests and then send the valves with detailed test reports to the Approving Authority. The Approving Authority at its discretion may carry out on these valves any test or requirement within this specification.
 - (b) Carry out the life test on two valves and send the information to the Approving Authority. This requirement may be waived at the discretion of the Approving Authority, and in lieu the manufacturer will be required to submit evidence of lives to the required limits.
 - (c) Certify that the valves will meet the Qualification Approval requirements. No evidence of compliance will be required.

The Approving Authority may at any time after Type Approval and at its own expense select a small number of valves in any order from submissions during any period. The selection may be delegated. The Inspection Authority may at its own expense at anytime after Type Approval, select a small number of valves in any order from submissions during any period. The Approving Authority, at its discretion, may carry out on these valves any test within the Qualification Approval requirement, any failure will be deemed to constitute evidence of non-compliance. The Manufacturer may at his own expense submit test results on further valves within the selected period, and from such adjacent periods as the Approving Authority will allow. The decision of the Approving Authority on compliance will be based on the combined results of all the valves tested.

15. The magnetron, mounted by attachment of the face plate to a rigid surface by 4 screws, shall be subjected to a resonance search test. For frequencies 10-150c/s the max, acceleration shall be 3g. The test shall be carried out under the required oscillation condition and with vibration applied in three mutually perpendicular directions one of which shall be the axis of the cathode stem, and one of which shall be the axis of the waveguide output.

15. (cont'd)

The frequency shall be swept at a rate not exceeding one octave per minute. Resonance shall be detected by acoustic methods, by the presence of microphony and by other means at the discretion of the Approving Authority. During the search the microphony shall not exceed the limits specified. The p.r.f. may be adjusted if necessary to enable microphony to be detected and measured. The magnetron shall be vibrated for 10 hours or 10^7 cycles in the direction being that which gives greatest excitation of the resonance; when this cannot be established the magnetron shall be fatigued in each of the three directions for 10 hours of 10^7 cycles whichever is less, at the acceleration as for the resonance search test.

16. A shock of 25g (MIN) of duration 60 ± 25 milliseconds shall be applied to the Valve in each of three mutually perpendicular directions one of which shall be the axis of the cathode stem.

Drawing Notes. See Page:- 8

The valve is aligned by means of 2 aligning spigots fitting in holes 'A' and 'B' $.375^{+0.001}_{-0.000}$ " Dia, $3.874" \pm .004$ " between centres.

'X-X' 'Y-Y' and 'Z-Z' are reference axes only; 'X-X' passes through the centres of holes 'A' and 'B' (MAX metal cond'n). Centre of hole 'A' is 1.937 " from axis 'Y-Y' (MAX metal cond'n). The plane 'X-Y' is the plane of the mounting surface (see Dim. 'Q'). The plane through 'Y-Y' and 'Z-Z' is perpendicular to the plane 'X-Y', axes 'Y-Y' and 'Z-Z' are $.770$ " apart as shown.

The output coupler must accept a gauge comprising a cylinder $.724$ " dia., with a slot $.103$ " wide, centred on the axis, mounted on a bar with two spigots spaced 3.874 " apart along the axis. One spigot to be 0.375 " dia and spaced 1.937 " from the centre of the cylinder, the other to conform to two intersecting arcs $.1875$ " rad. whose centres are displaced by $.008$ " along the axis. The heater terminals shall be within $.050$ " of the nominal axis 'Z-Z'.

Other dimensions are:-

G	$.213" \pm .005$ " dia.
# D	$\frac{5}{8}$ " max.
E	$1.687" \pm .003$ "
F	$\frac{1}{2}$ " nom.
# G	5 " max.
H	$1\frac{1}{8}$ " nom.
I	$3.812" \pm .003$ "
# J	$4\frac{3}{16}$ " max.
# K	$2\frac{1}{16}$ " max.
L	$.250" \pm .005$ " dia. $\frac{3}{16}$ " nom. length.
M	$.540" \pm .005$ " dia. $\frac{3}{8}$ " nom. length.
N	$1" \pm \frac{1}{8}$ "
# P	$\frac{3}{8}$ " max. rad. from 'Z-Z'

- Q $.218" \pm .015"$ above plane touching outer surface of clamping plate at positions of 3 - fixing holes. The fourth fixing hole being on or below this plane. The plate may flex by a further $\pm .005"$ under vibration
- R $13/32"$ nom.
- S $.187"$
- T $2\frac{1}{4}"$ max, (including all protrusions)
- U $14/16"$ min. rad.
- a $.182" \pm .005"$
- b $.092" \pm .001"$ dia.
- d $.875" \text{ O/dia} \times 28 \text{ T.P.I.}$ B.S. 1580-1949 Class 2A
- e $.735" \pm .002"$ dia.
 $.001"$
- f $3/16"$ min. thread length
- g $.045" \pm .005"$

dims marks ■ define the max envelope of the valve and are referred to the appropriate reference axis.

