MINISTRY OF TECHNOLOGY - DLRD/RRE

CV 6217

VALVE ELECTRONIC

Specification Min of Tech/CV6217

Issue 1 Dated March 1968

To be read in conjunction with K1001, BS448, and 1409

SECURITY	
Specification	Valve
Unclassified	Unclassified

→ indicates a change

TYPE OF VALVE - Cathode Ray Tube
DEFLECTION - Magnetic
FOCUS - Magnetic
BULB - Glass. Externally coated with conductive coating
FACE PLATE - Non-solarising glass
SCREEN - 009 (Aluminium backed)
PROTOTYPE - VX8541

MARKING

See K1001/4

BASE

B9A/D

RATINGS AND CHARACTERISTICS

(Absolute, non - simultaneous and not for Inspectorate)

			NOTES
Heater Voltage	(V)	6.3	
Heater Current	(A)	0.3	
Max. Anode Voltage	(kV)	35	
Min. Anode Voltage	(kV)	15	
Max. Heater/Cathode Voltage	(V)	300	A
	(V)	90	B
Max. Mean Anode Current	(μA)	300	C
Typical Operating Conditions			
Anode Voltage	(kV)	30	
Max. negative Grid Voltage for cut off	(V)	100	

CONNECTIONS

Pin		Electrode	
1	-	Grid	g
2	-	Heater	h
3	-	Spark Trap	
4	-	Internal Connection	
5	-	Cathode	k
6	-	Internal Connection	
7	-	Spark Trap	
8	-	Heater	h
9	-	Internal Connection	
Flying lead	-	Anode	a

SIDE CONTACT

Flying lead - See drawing on page 9 .

CAPACITANCES

Max. Cg to all other electrodes	(pF)	9
Max. Ck to all other electrodes	(pF)	7
Min. Ca to external coating	(pF)	300

WEIGHT

0.34 Kg. maximum

DIMENSIONS

See drawing on page 9.

NOTES

A. With heater negative with respect to cathode
B. With heater positive with respect to cathode
C. For a period not exceeding 10 μS in 400 μS.
D. NATO Stock No. 5960-99-037-5708

To be performed in addition to those tests specified in K1001

Test conditions unless otherwise stated for an individual test.

1. Vh (V) 6.3 | Vg (V) adjust | Va (kV) 30 | Spark Trap earthed

2. An interlaced 405 line TV raster may be used when required.

3. To reduce risk of voltage breakdown, the time taken for the E.H.T supply to rise from 3 kV to 27kV, (10% to 90%), must be a minimum of 0.15 secs. The voltage rise is to be smooth with no overshoot.

4. Where applicable the tube shall be tested in a focus and deflection coil assembly Ref: RR/D824869 or approved equivalent. Focus coil connected to supply so that front end of coil is North Magnetic seeking.

K1001 Ref. 5A	TEST	TEST CONDITIONS	Insp. Level	Sym-bol	Limits Min	Limits Max	Units
3.1	(a) General Inspection - Dimensions	No voltages. See drawing on Page 8.	100%				
3.2.2	(b) Loose Particles	No voltages	100%				
4.6	(c) Capacitances	Grid - all Cathode - all Anode - external coating	5%		- - 300	9 7 -	pf pf pf
	(d) Heater Current	No voltages except Vh	5%	Ih	275	325	mA
	(e) Gas Test measured as ratio Ia/Ik Note. 1 and 2	Va = -40V Spark Trap = 200V Adjust Vg to give Ik = 400uA	100%		-	2.5×10^{-4}	
4.1.2	(f) Grid Insulation Leakage Current	Vg = -150V	100%	Ig	-	5	µA
4.1.3	(g) Heater Cathode Leakage Current	(i) Heater 90V positive with respect to Cathode	100%	Ihk	-	30	µA
		(ii) Heater 300V negative with respect to Cathode		Ihk	-	20	µA

TESTS (Cont'd)

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K1001 Ref. 5A	TEST	TEST CONDITIONS	Insp. Level	Sym-bol	Limits Min	Limits Max	Units
4.3	(h) Negative Grid Cut-off Voltage	No deflection fields Focused spot	100%	Vg	50 Record	100	V
	(j) Grid Drive Note 3	Focused raster 55mm x 55mm Grid to be pulsed positively from value found in Test (h) to give a mean luminance of 675 Cd/m^2 when viewed through a Wratten 22 filter. Pulse duration to be 20mS Pulse repetition rate 10 per second	100%				
	(i) Minimum negative Vg			Vg	1	–	V
	(ii) Change in Vg from that in Test (h)			Vg	– Record	60	V
	(k) Unfocused Spot Diameter	No deflecting fields. Pulsed spot of amplitude to define the limiting aperture.	100%		–	15	mm
	(l) Deviation of centre of spot from centre of front location band	No deflecting fields. Focused spot. Adjust Vg for lowest convenient light level.	100%		–	3	mm
5.5	(m) ,Persistence measured as a decay time to (i) 30%	Focused raster 55mm x 55mm Grid pulsed positively from cut-off by the value found in Test (j). Pulse duration = 20mS Pulse repetition rate 1 per second. View through Wratten 22 filter.	100%		120	–	mS
	(ii) 10%				250	–	mS
6.3	(n) Useful Screen Area	Focused raster to cover whole screen. Adjust Vg to convenient value.	100%		55	–	mm

K1001 Ref.	TEST	TEST CONDITIONS	Insp. Level	Sym-bol	Limits Min	Limits Max	Units
3.5	(o) Blemishes Note 6 Glass (i) No lines, streaks or open air bubbles permitted (ii) No closed air bubbles on inside of screen face permitted (iii) Permitted closed air bubbles of 80 units area at outside surface of screen face within central area of 25 mm dia. (iv) Permitted closed air bubbles of 300 units area at outside surface of screen face outside area in (iii), provided that minimum separation is 15 mm. Screen Blemishes (i) Area above 80 units Number (ii) 20 to 80 units area - Separation (iii) Area below 20 units Ignore unless in sufficient number to cause perceptable darkening of the screen when viewed from a distance of 30 cm.	As in Test (n)	100%		- - - 10	3 3 0 -	mm
4.2.1 and 4.2.3	(p) Flashover and Stray Emission	Va = 35kV(peak) switched continuously 5 secs on, 1 sec off. Focused raster with Vg adjusted to cut-off. As above but remove deflection fields after 30 secs tapping. Tube to be viewed in darkened conditions with the screen horizontal and uppermost. Using an approved forked, rubber covered wooden hammer, tap the tube neck for 30 secs. at a minimum rate of 4 taps per sec. Tube to be free from sparking and stray emission after the first 5 secs. and for 15secs. after tapping has ceased.	100%				

K1001 Ref.5A	TESTS	TEST CONDITIONS	Insp. Level	Sym-bol	Limits Min	Limits Max.	Units	
	(q) Cathode Emission Cathode Current at Vg = 0 Volts	Defocused raster Preset Va to value for visual cut-off with Vg = 40V. Holding Va at above value reduce Vg to OV.	100%	Ik	500	–	uA	
	(r) Spatial Frequency Response See APPENDIX A Measured as:- Mean amplitude at 50cs/cm x 100 / Amplitude of reference	Deflecting fields applied to give a scanned line adjusted for optimum focus Method (I) and (II) Pulsed line 150mm approx. Pulse duration 100 µSec. p.r.f. ~~50 c/s~~ between 10 and 50 c/s Grid drive Vg as in test (j)	100%		60	–	%	Amdt 3
	(s) Visible Flare on Screen face (i) Visible Flare on Screen face (ii)	Focused pulsed line 55mm approx. Pulse duration 20 mSecs. p.r.f. = 10 c/s. With the anode terminal in the uppermost position the line appears horizontal. Deflect line by twice the nominal screen radius from the tube centre in the direction of the anode terminal. Increase beam current to 150uA peak by adjusting Vg. Measure mean brightness on face through a Wratten 22 filter. Repeat with the line deflected away from the anode terminal. Repeat with the line vertical and deflected horizontally in each direction from the centre.	100%		~~60~~ 60	– –	Cd/m^2 Cd/m^2	Amdt 2

K1001 Ref. 5A	TESTS	TEST CONDITIONS	Insp. Level	Sym-bol	Limits Min	Limits Max.	Units
	(t) Life - See Note 4 for inspection levels period 100 hours	Focused raster 40 mm x 20 mm Pulsed at p.r.f. of 1c/s. Duration 20 mS. Amplitude to give Ik = 300 uA peak. Measure light intensity and record.			100	-	hours
	<u>Life end point</u> Measure % change in light intensity Repeat tests (m) and (q)	 Persistance (i) " (ii)			 - 40 120	 85 - -	 % mS mS
	(u) Holding period:- repeat tests (e) and (q)		100%		7	-	days
7.2	<u>Qualification Approval</u> (aa) Resistance to external pressure		QA				
3.9.1 3.9.2 3.9.3	(bb) Heater Modulation Cathode Illumination Effects of Magnetisation		QA				
Section 8	(cc) Life test - period <u>Life end Point</u> Measure % change in light intensity Repeat test (m) and (q)	Conditions as in test (t) Persistance	QA		200 Record	- 90	hours %
11.2	(dd) <u>Vibration</u> Resonance Search <u>Vibration Fatigue</u> <u>Post Fatigue Tests</u> Repeat Tests (a)(b)(d) (f)(g)(h)(l)(p) & (q)	25 - 500 c/s max acceleration 2.5g Focused spot adjusted until just visible. Vh = 6.8V. No other voltages Note 5.	QA				
Section 10.2	(ee) <u>Climatic</u> Period 28 Days		QA				

NOTES

1. This test shall be made at the commencement of the electrical tests.

2. Grid volts may be positive with respect to cathode to obtain the cathode current.

3. The beam current shall increase continuously over the range from cut-off.

4. The scale of life testing shall be related to production. For orders of less than 51, at least one tube shall be life tested. For orders of greater than 50, the production shall be divided into batches of 50, and at least one tube from each shall be life tested. The batch corresponding to the tube undergoing life test shall not be released until the life test has completed 80% of the required life. At the option of the manufacturer and at his expense any number of additional tubes may be life tested, in which case the average of the lives of these valves shall exceed 80% of the required life before the batch is released. Life test is considered satisfactory when an accumulated total of 100 hours per sample is reached.

5. Tube shall be vibrated in each of 3 mutually perpendicular planes for not less than 30 hours, and not less than 100 hours total. Heater switched 1 minute on and 3 minutes off. Minimum peak acceleration 2.5g; frequency 170 ± 5 c/s.

6. The unit of area is a square one-thousandth of one inch.

OUTLINE DRAWING NOTES

1. The axis of the tube is the line joining the centres of the rear location band and the face plate location ring.

2. The differences between the max. and min. thickness over the useful screen area must be less than 0.046.

3. Centre of plate radius shall be within 0.057 of tube axis.

4. Anode contact shall be within ± 10° of centre line of base through pins 1 and 9.

5. Reference line determined by the 30.28 dia. of gauge shown in Fig. 2 which shall slide fully over the neck.

6. Centre line of E.H.T. lead to be within 3 m.m. of centre of top of corona shield.

7. E.H.T. lead connected to anode cap and sealed in glass cone with silicon rubber. Free length of lead 445 ± 5 m.m. terminated with soldered cap.

   E.H.T. lead: 14/.0076 tinned copper silicone rubber insulation 10 m.m. O/D.

8. An approved moulding compound is :-

   ICI Silioset 101
   Curing Agent C, 1%
   Silicon fluid F100, 10%
   Cure at room temperature for 24 hours.

   Area of glass to which compound will be applied, to be painted with Silioset primer.

9. Area to which graphite coating has been applied, to be varnished. Varnish shall be tested to DEF.32 (A suitable varnish is Stirling V130).

10. Ring gauge shall be used prior to coating.

11. Internal face plate radius to be 104.5 ± 0.75m.m.

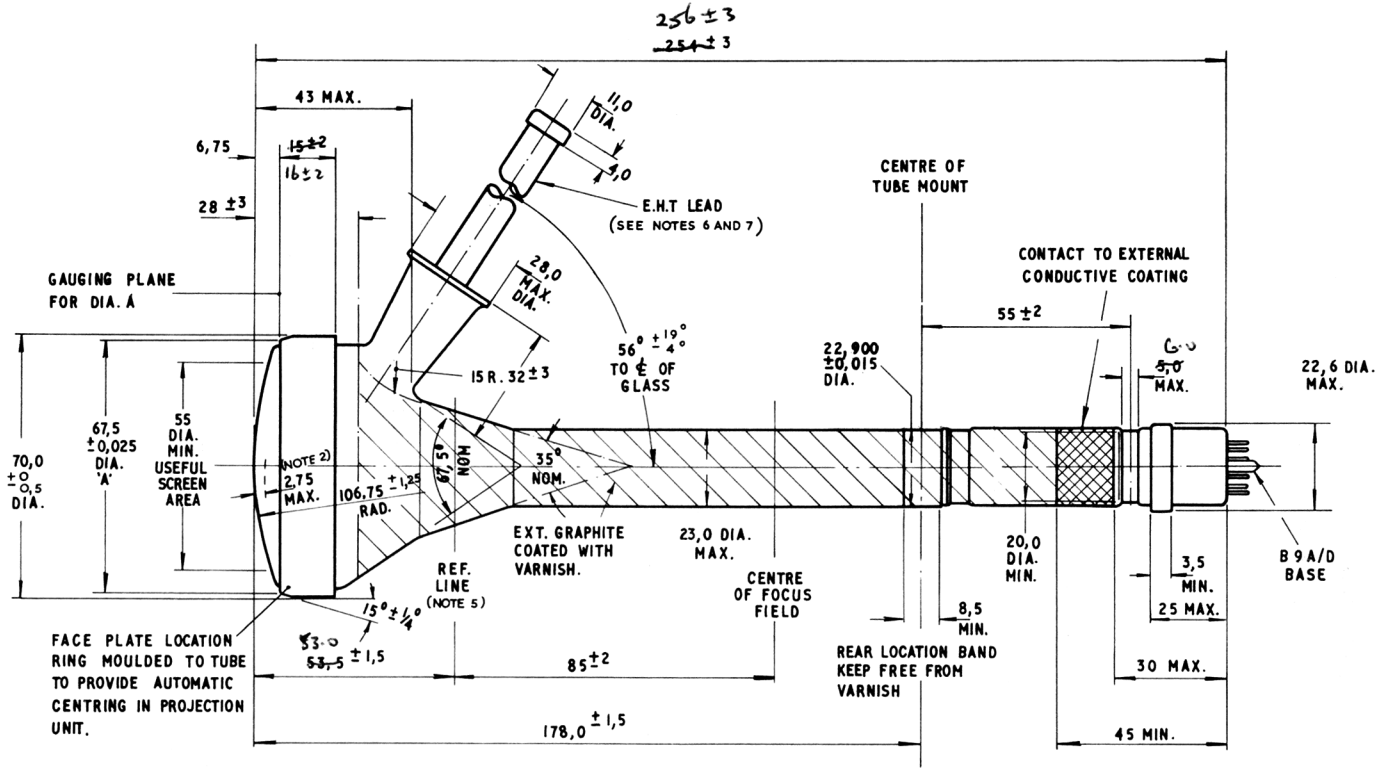
Amdts 3 Amdt 1

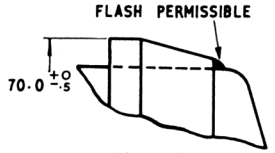
12. The minimum radial thickness of the annular ~~rubber~~ ring when measured at diameter "A" shall not be less than 1·3 mm

13. The eccentricity of the glass faceplate shall be less than 0·02" with respect to the centre of the neck bore.

OUTLINE DRAWING

(TO BE READ CONJUNCTION WITH "NOTES" ON PAGE 8)





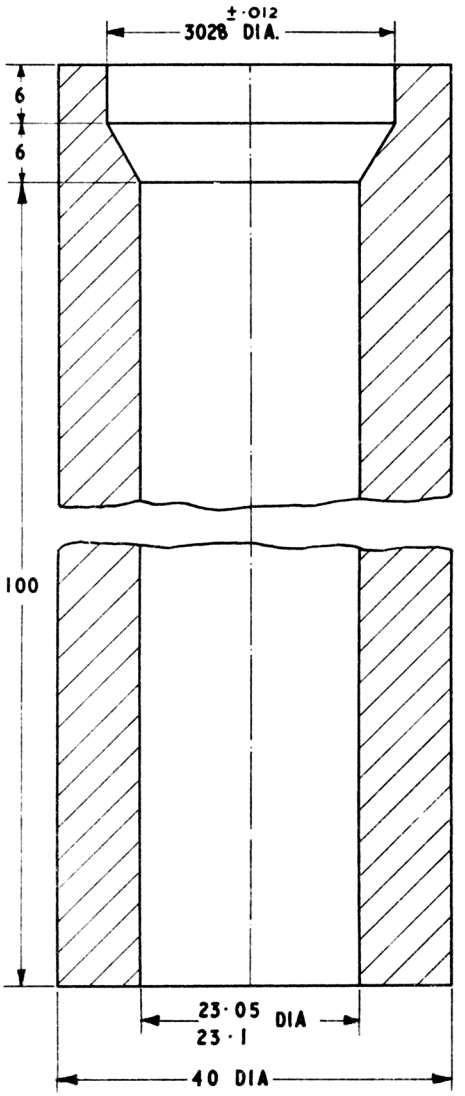
Alterations see Amdt 3.

DIMENSIONS IN MILLIMETRES

CV6217

OUTLINE DRAWING OF RING GAUGE

THIRD ANGLE PROJECTION



BREAK ALL UNNECESSARY SHARP CORNERS

MARK ON:- TR. No. AND VALVE TYPE

APPENDIX A

Test equipment for the measurement of Spatial Frequency Response using square wave modulation

Two acceptable methods of measurement are described, and referring to fig. 1, it will be seen that differing displays are obtained, but that the system is essentially the same for either method. The operation of the system is as follows. A trace displayed on the C.R.T. under test is imaged through a microscope objective on to a grating containing alternate opaque and transparent strips, or bars, the direction of scan being parallel to the bars of the grating. The grating is moved across the image of the trace in a direction perpendicular to the trace and to the bars. The light transmitted through the grating falls on to the cathode of a photomultiplier. The output from the photomultiplier is fed to an oscilloscope as a 'Y' deflection. The oscilloscope 'X' scan is made directly dependent on the grating scan.

Method I

Apply scan to the C.R.T. under test in accordance with specification test conditions. Move the grating across the trace in a period of not less than 15 seconds. The output of the photomultiplier will be a series of pulses, each of which coincides with the trace image sweeping across the grating. The pulses are integrated with a time constant of the order of 200 mS, and are fed to the 'Y' deflection system of the oscilloscope. The 'X' scan of the oscilloscope is made directly dependent on the movement of the graticule across the trace image. The oscilloscope display is shown on fig. 1. It may be necessary to photograph the oscilloscope display due to the slow sweep time.

Method II

Apply scan to the C.R.T. under test in accordance with the specification test conditions. The output of the photomultiplier is fed directly to the 'Y' deflection of the oscilloscope.
Move the grating across the trace between the opaque and transparent reference bars to establish the reference levels, and repeat on the test frequency bars. The display is shown of Fig. 1.

Mechanical Requirements

The objective, grating, and photomultiplier, are housed in a light-tight container, and this should be mounted to allow movement relative to the C.R.T. face. To allow for fine adjustment of the magnification when calibrating, the distance between the microscope objective and the grating must be adjustable. The photomultiplier is preferably positioned at such a distance from the grating as to allow light from the trace image to become diffused.

Grating

The grating pattern is shown on Fig. 1 and contains one cycle at low frequency, and the remainder at a single high frequency. The grating is made by photographic reproduction on to Ilford Formalith film from a master. An accurate master may be made by machining a sheet of black anodised aluminium, and filling the machined area with matt white paint. To maintain the accuracy of the master on the final grating great care is needed in the photographic process. The width of the bars on the grating is a function of the test frequency and the magnification of the objective lens. On C.R.T. CV the resolution is measured at 50 cycles/cm and the system magnification is X1, thus each bar width on the grating is 0.505mm.

Microscope Objective

Nominal magnification X1 - suitable lens is made by Beck, London. Special purpose 75mm. Catalogue 3009.

Photomultiplier

General purpose type, S11 photocathode is acceptable, but S20 is preferred.

Oscilloscope

Capable of accepting 'X' deflection signals down to D.C. 'Y' deflection range of not less than 5 cm. with a typical sensitivity range of 0.1 to 20V/cm For Method II, the CRT should have a long persistence phospher. A suitable oscilloscope type is Telequipment S.51 or Solatron CD1400.

Calibration of system

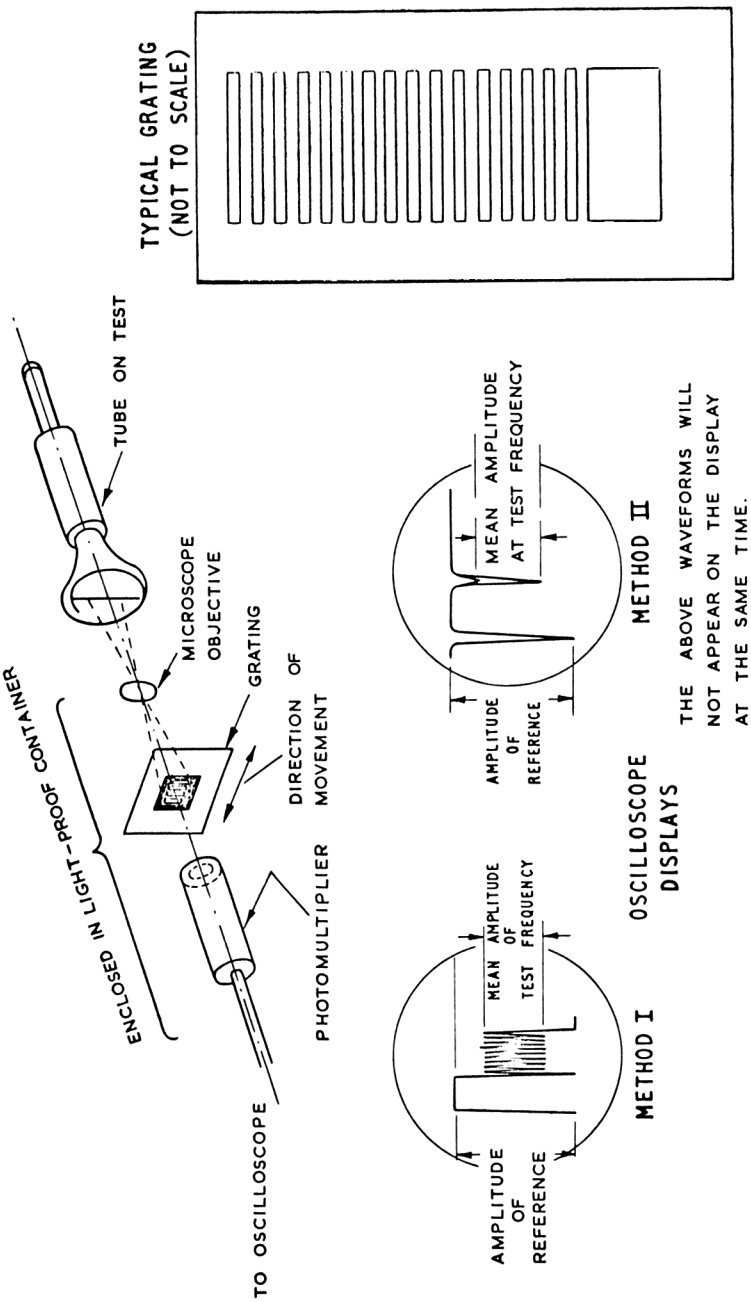
There are a number of methods of calibrating the system and the following is one agreed method.

An optical beam splitter and viewing microscope is placed in the light path between the grating and the photomultiplier permitting an observor to view the grating. When the viewing microscope has been focused on the grating it is locked in position and a stage micrometer is placed in the object plane in place of the tube under test. The position of the objective of the measuring system and the position of the stage micrometer are then adjusted so that the aerial image of the stage micrometer coincides with the grating and both may be viewed simultaneously through the microscope. The effective dimensions of the grating are indicated by the dimensions of the image of the stage micrometer.

APPENDIX A

FIG. I

MEASUREMENT OF SPACIAL FREQUENCY RESPONSE



ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION Mintech/CV6217, Issue 1, Dated March 1968

AMENDMENT No. 1

Page 8, Drawing Notes

Insert two new notes as follows:-

"12. The minimum radial thickness of the annular rubber ring when measured at diameter 'A' shall be less than 1.3 mm."

"13. The eccentricity of the glass faceplate shall be less than 0.02" with respect to the centre of the neck bore."

August 1968

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

ELECTRONIC VALVE SPECIFICATIONS

Specification Mintech./CV6217, Issue 1, Dated March 1968

AMENDMENT No. 2

Page 5 Test Clause (s), (both tests (i) and (ii)).

Transfer the "60" from the column headed 'Limits, Min' to the column headed 'Limits, Max'.

September 1968 T.V.C. for R.R.E.

559886

ELECTRONIC VALVE SPECIFICATIONS

Specification Mintech/CV6217. Issue 1 Dated March 1968

AMENDMENT NO. 3

Page 5 Test Clause (r)

Under TEST CONDITIONS, delete "p,r,f, 50c/s" and insert "p.r.f. between 10 and 50 c/s".

Page 8 Outline Drawing Notes

Amend note 12 to read "The minimum radial thickness of the annular ring, when measured at diameter 'A', shall not be less than 1.3 mm".

Page 9 Outline Drawing

i) Overall length: delete "254 ± 3" and insert "256 ± 3"

ii) Width of face location ring: delete "15 ± 2" and insert "16 ± 2"

iii) Faceplate to reference line dimension: delete "53.5 ± 1.5" and insert "53.0 ± 1.5"

iv) Width of rear rolled section: delete "5.0 max." and insert "6.0 max.".

FEBRUARY 1975

SLR 23 FOR WDL) RRE
STR)