VALVE ELECTRONIC CV6152

Specification MOA/CV6152
Issue 1 Dated 1st April 1965
To be read in conjunction with K1001, BS448 and BS1409

SECURITY	
Specification	Valve
Unclassified	Unclassified

TYPE OF VALVE - Cathode Ray Tube (2in. dia.)
DEFLECTION - Magnetic
FOCUS - Magnetic
GUN - Triode, with beam limiting aperture
BULB - Glass. External Conductive Coating
SCREEN - BB3 (Aluminium backed)
PROTOTYPE - VX9229

MARKING
See K1001/4

BASE
Modified B9A
See drawing Page 8

RATINGS

(Absolute non-simultaneous and not for Inspectorate)

			NOTES
Heater Voltage	(V)	6.3	
Heater Current	(A)	0.6	
Max. Anode Voltage	(kV)	10	
Max. Cathode Current	(µA)	100	
Max. Heater/Cathode Voltage			
Heater negative	(V)	100	A
Heater positive	(V)	75	A
Min. Resolution (Square Wave) at 60% modulation	(cycles/cm)	150	

Typical Operating Conditions

Anode Voltage	(kV)	5
Cathode Current	(µA)	3

CONNECTIONS

Pin	Electrode	
1	no connection	
2	grid	g
3	no connection	
4	heater	h
5	heater	h
6	grid	g
7	no connection	
8	cathode	k
9	grid	g
Side contact	anode	a

SIDE CONTACT
Special recessed contact
See drawing page 8

CAPACITANCES

Cg - all (max)	(pF)	6	
Ck - all (max)	(pF)	6	

DIMENSIONS
See drawing on page 8

NOTES

A. Voltage may be temporarily increased to 250, either polarity on short term overload condition.

B. NATO Stock No. 5960-99-037-4252

CV6152

TESTS

To be performed in addition to those applicable in K1001

K1001 Ref.	Test Conditions	Test	Insp. Level	Sym-bol	LIMITS Min.	LIMITS Max.	Units
5A.3.1	No Voltages. See drawing on page 8	(a) General Inspection- Dimensions	100%				
5A.3.2.2	No Voltages	(b) Loose Particles	100%				
5A.4.6		(c) Capacitance	5%				
		1. Cathode - all			-	6.0	pF
		2. Grid - all			-	6.0	pF
		3. Anode - External coating			400	-	pF
5A.4.1.2	Vh (V) 6.3; Vg (V) -50; Va (kV) 10	(d) Grid Insulation leakage Current	100%	Ig		2.0	uA
	Alternative Method						
	6.3; Adjust for Cut-off; 10; Resistor 25 megohms	Increase in cut-off voltage	100%			20	V
5A.4.1.3	6.3; 0; 0; Heater at 200V (a) positive and (b) negative with respect to cathode	(e) Heater-Cathode Leakage Current	100%	Ihk		20 20	uA uA
	6.3; 0; 0	(f) Heater Current	100%	Ih	0.55	0.65	A
	For the following tests the beam centralising magnet is to be adjusted to align beam in the centre of the limiting aperture and no further adjustment is to be made.						
5A.4.3	6.3; Adjust for cut-off; 5; Adjust for optimum focus; No deflection	(g) Neg. Grid Voltage Vg1	100%	Vg	15 Record Vg1	25	V

TESTS (Cont'd)

CV6152

K1001 Ref.	Test Conditions			Test	Insp. Level	Symbol	LIMITS		Units
	Vh (V)	Vg (V)	Va (kV)	(h)			Min.	Max.	
5A.5.4	6.3	Adjust	5	Neg. Grid Voltage Vg2	100%		Record Vg2		V
	Deflecting fields applied to give focussed raster Note 1			Grid Drive Vg1 - Vg2 Intensity to increase continuously from zero with increase of grid drive.	100%		3.0	5.5	V
	Grid Voltage adjusted to produce a photometric intensity of 0.011 Orthochromatic candela Type B See Note 6.								
5A.6.4.2	6.3	Any convenient value	5	(j) Displacement of centre of spot from point of intersection of neck axis with screen	100%			4.0	mm
	No deflecting or focusing fields								
5A.5.7.3	6.3	Any convenient value	5	(k) Unfocused spot diameter	100%			9	mm
	No deflecting or focusing fields. Beam diameter visibly defined by beam limiting aperture.								
	6.3	0	5	(l) Total Cathode Current	100%	Ik	50	-	µA
	Deflecting fields applied to give a defocused raster								

K1001 Ref.	Test Conditions			Test	Insp. Level	Sym-bol	Limits		Units
	Vh (V)	Vg (V)	Va (kV)				Min.	Max.	
				(m)					
5A.6.3 and 5A.3.5	6.3	Any convenient value	5	Useful Screen Area. See drawing Page 8	100%				
				Screen Blemishes Note 2	100%				
	Defocused raster to cover whole screen			1. Area above 50 units-Number				0	
				2. Area 13 to 50 units-Separation			10		mm
				3. Area below 13 units-Ignore unless in sufficient number to cause perceptable darkening of the screen when viewed from a distance of 1 ft.					
				Glass Blemishes	100%				
				1. Area above 50 units-Number				0	
				2. Area 13 to 50 units-Separation			10		mm
				3. Area below 13 units-Ignore unless in sufficient number to cause perceptable darkening of the screen when viewed from a distance of 1 foot.					
5A.4.2.1 and 5A.4.2.3	6.3	Adjust for spot just visible - Ik = approx. 0.5 µA	10	(n) Flashover and Stray Emission Note 3	100%				
	Pre-heat cathode for 10 minutes. No deflecting or focusing fields			Tube to be free from sparking and field emission after the first 5 seconds, and for not less than 15 seconds, after tapping has ceased.					
	6.3	Adjust to value measured in (h)	5	(o) Spatial Frequency Response See Appendix A	100%				
	Deflecting fields applied to give a scanned line adjusted for optimum focus in the line direction. Note 4.			Measured as:- $\frac{\text{Mean Amplitude at 150 cs/cm}}{\text{Amplitude of reference}} \times 100$			60		%

TESTS (Cont'd)

K1001 Ref.	Test Conditions			Test	Insp. Level	Sym-bol	Limits		Units
	Vh (V)	Vg (V)	Va (kV)	(p)			Min.	Max.	
	6.3	Adjust to value measured in (h)	5	Screen Noise Number of parallel lines examined within the inspection area acceptable for noise. Note 5.	100%		10		
	Deflecting fields applied to give a scanned line adjusted for optimum focus in the line direction. Note 5								
5A.7.2				External Pressure	QA				
5A.3.9					QA				
5A.3.7				(q). Spot movement * Holding Period - 7 days Repeat Tests (l) and (g) (l)	100%		50	-	µA
				(g)	100%		15	25	V

NOTES

1. Raster size 2.54 cm square.
   Scan conditions : line frequency 8.53 kc/s
   frame frequency 33.3 c/s
   approximately 245 lines

2. The unit of area is one square one-thousandth of one inch.
   Two or more blemishes separated by a distance less than the major dimension of the largest shall be regarded as a blemish with dimensions equal to that of the group.

3. The tube shall be held with the screen horizontal and uppermost. It shall be viewed for 15 seconds in darkened conditions whilst the tube neck is tapped with an approved forked, rubber covered wooden mallet at a minimum rate of 4 taps per second.

* See Amendment 2 for details

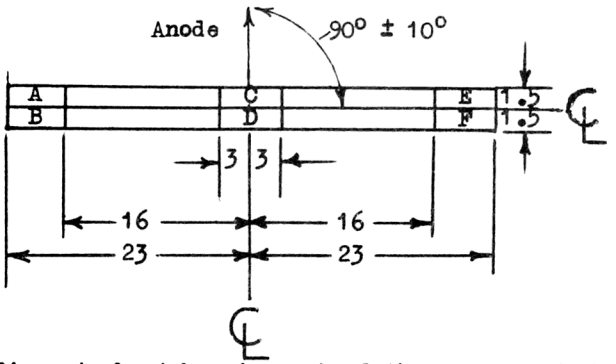
Notes continued over/

NOTES (Cont'd)

4. **Scan conditions** : frequency 10 c/s or less
Length of line 4 mm approximately in a direction parallel to the longer sides of the inspection area. After focussing the spot may be extended, or deflected at a frequency in excess of 100 kc/sec, in a direction at right angles to the direction of scan.

Focus conditions : A focus coil of good quality with astigmatism correction shall be used, positioned with its centre of focus 148 mm from the front ground land of the tube. A Ferranti coil type FC5 is suitable.
The focus must be readjusted at each test position.

Area of screen to be inspected with tube mounted with the anode connection vertical and uppermost.



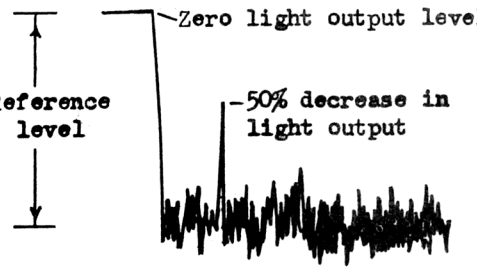
Dimensions in millimetres

Readings to be taken in each of the areas marked A to F above, and the average of the six readings used for the purpose of the test.

5. **Scan conditions** : frequency 1 to 10 c/s
Length of line 46 mm in a direction parallel within 2 degrees to the major axis of the inspection area, which shall be as in Note 4.

Focus conditions: Details of coil and position on tube to be as in Note 4.
Spot adjusted for optimum focus.

Screen noise is measured by viewing the screen with a photomultiplier, so positioned that no significant variation of response as the spot traverses the tube face is introduced by the viewing system. The output of the photomultiplier is amplified and displayed on an oscilloscope. After completion of test an indelible mark shall be made on the face of the cathode ray tube at either end of the central line parallel to the accepted test lines.



TYPICAL TRACE

A line is acceptable when the decrease in light output does not exceed 50% peak at any point along the trace.

NOTES (Cont'd)

Photomultiplier

General purpose type, S.11 photocathode about 1in diameter, with spectral response and characteristics similar to EMI type 9524B.

Oscilloscope - minimum requirements

The C.R.T. should have a long persistance phosphor.

Scan rate : 1 to 10 cycles/second

Scan duration : 0.08 second to 0.8 second.

Vertical deflection range of not less than 5 centimetres with sensitivity of 1 Volt/cm.

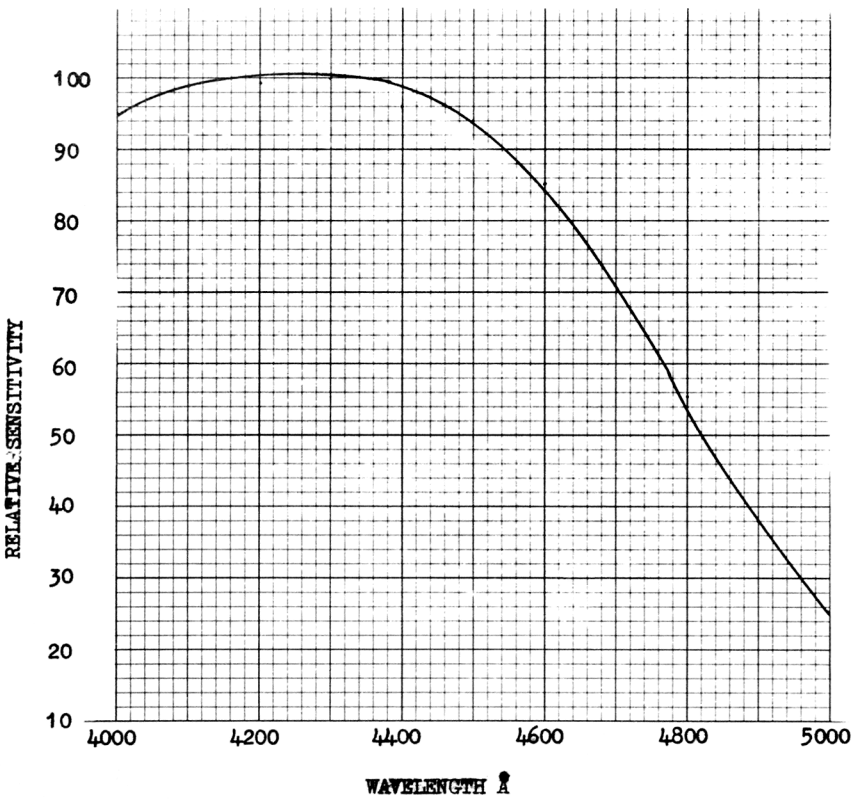
A suitable type is Telequipment S.51

6. The spectral response curve of a detector to measure radiant energy in terms of the unit "Orthochromatic Candela Type B" is given below.

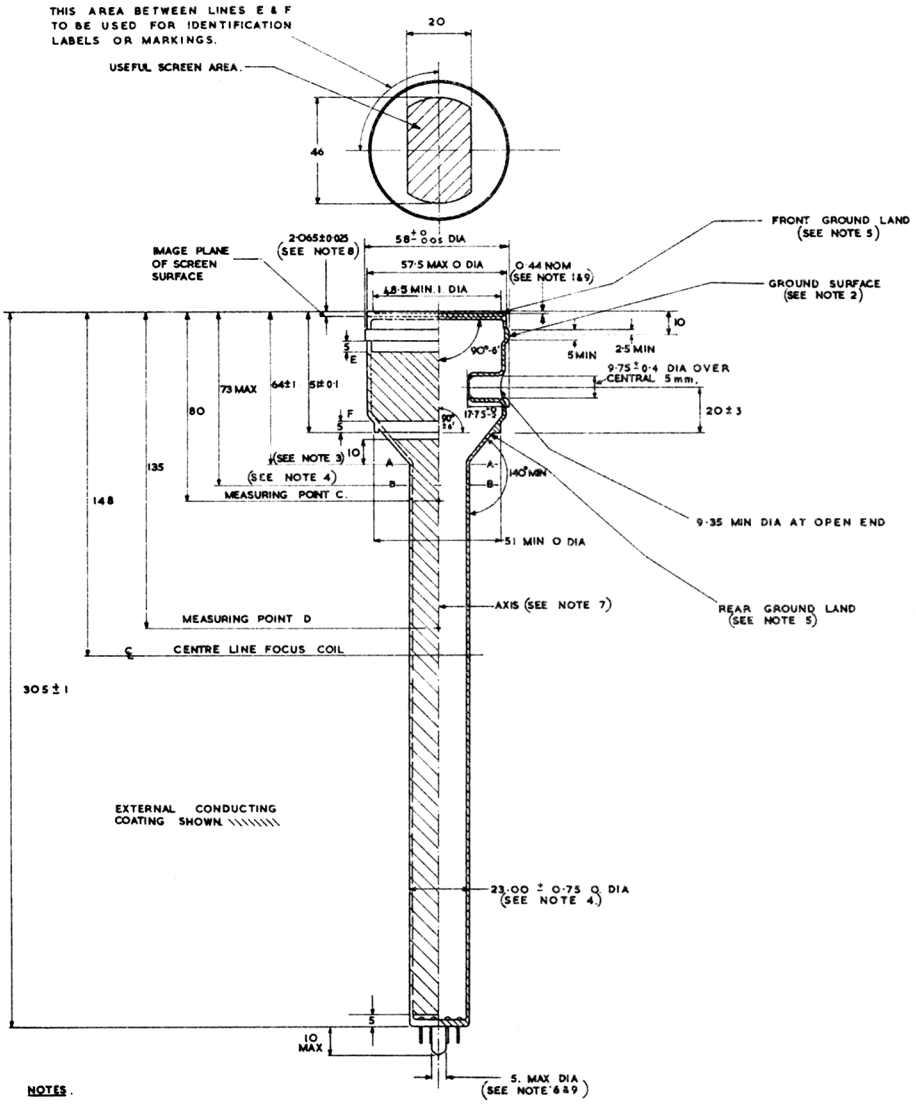
The response corresponds to that of a Selenium Barrier Layer Photocell combined with a special filter. The Qualification Approval Authority will hold a sample of this filter.

The calibration of the detector will compare to that defined in K1001 Section 5A.2.(12).

SPECTRAL DISTRIBUTION OF A PHOTOCELL/COLOUR FILTER COMBINATION FOR MEASURING ORTHOCHROMATIC CANDELLA TYPE B

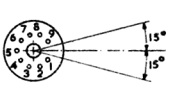


For note 7. See Amendment 2



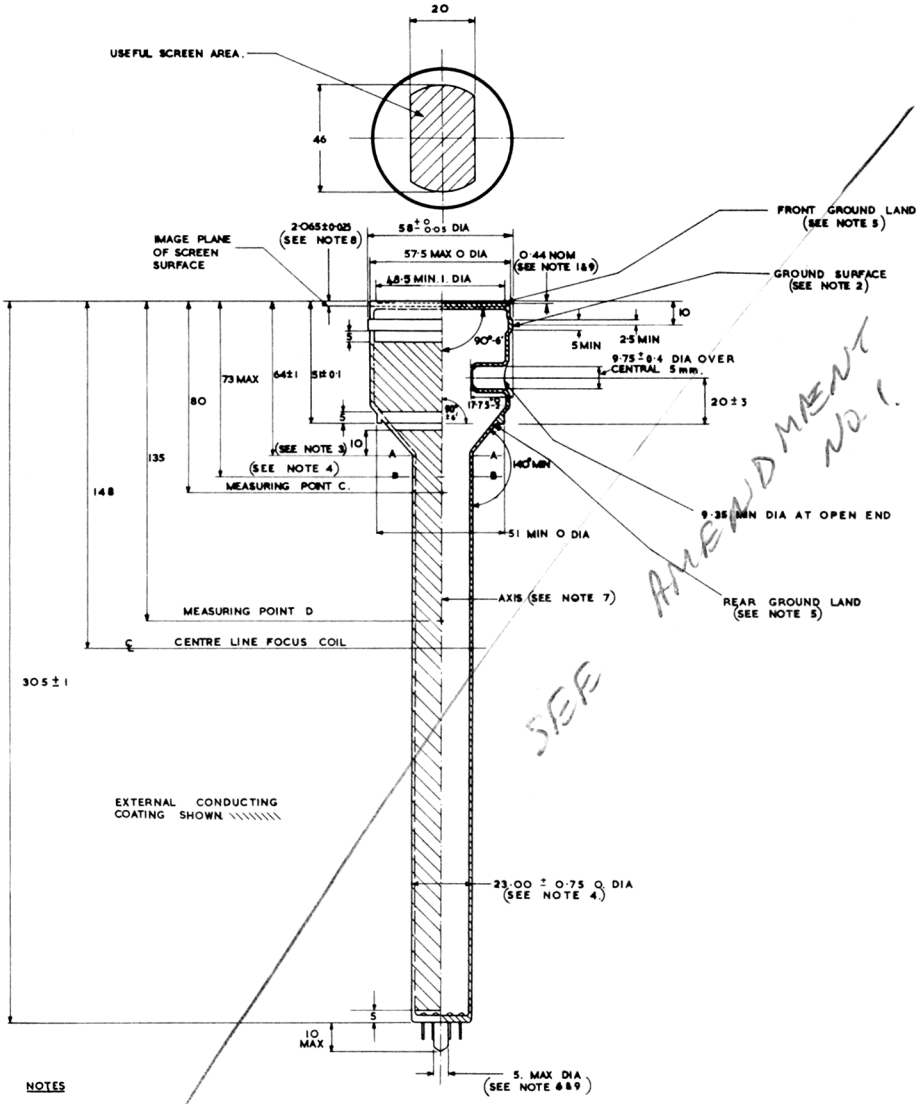
NOTES.

1. WEDGE BETWEEN OUTSIDE SURFACE OF FACE PLATE & PLANE OF FRONT GROUND LAND MUST NOT EXCEED 0·025 mm.
2. ECCENTRICITY BETWEEN GROUND RIM ON BULB AND NECK AXIS MUST NOT EXCEED 0·25 mm.
3. A-A IS 24·5 m m. RING GAUGE REF. LINE.
4. A GAUGE 100 mm. LONG X 23·8 mm. I/DIA SHALL SLIDE FREELY OVER NECK FROM THE PINCH TO REF LINE B-B.
5. MINIMUM WIDTH OF GROUND SURFACE OVER AT LEAST 90 % OF THE CIRCUMFERENCE IS 10mm.
6. BASE TO ENTER A B9A VALVE HOLDER WITH A CENTRAL HOLE 6·5 mm. DIA. TO ADMIT EXHAUST STEM.
7. AXIS OF TUBE IS DEFINED AS THE LINE JOINING CENTRE OF O.D. OF NECK AT POINTS C AND D.
8. THE THICKNESS OF THE FACE PLATE IS DEPENDENT ON THE REFRACTIVE INDEX OF THE GLASS. THE MAXIMUM WEDGE ACROSS ANY DIAMETER OF THE FACE PLATE IS 0·0125 m m. THE DIMENSION OF 2·065 m m. RELATES TO A WAVELENGTH OF 4500 Å
9. THESE DIMENSIONS ARE FOR DESIGN REFERENCE ONLY.



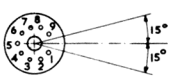
ANODE CONTACT TO LIE WITHIN THESE LIMITS.

DIMENSIONS ARE IN MILLIMETRES.



NOTES

1. WEDGE BETWEEN OUTSIDE SURFACE OF FACE PLATE & PLANE OF FRONT GROUND LAND MUST NOT EXCEED 0·025 mm.
2. ECCENTRICITY BETWEEN GROUND RIM ON BULB AND NECK AXIS MUST NOT EXCEED 0·25 mm.
3. A-A IS 24·5 mm. RING GAUGE REF. LINE.
4. A GAUGE 100 mm. LONG X 23·8 mm. I/DIA SHALL SLIDE FREELY OVER NECK FROM THE PINCH TO REF LINE B-B.
5. MINIMUM WIDTH OF GROUND SURFACE OVER AT LEAST 90 % OF THE CIRCUMFERENCE IS 1·0mm.
6. BASE TO ENTER A B9A VALVE HOLDER WITH A CENTRAL HOLE 6·5 mm. DIA. TO ADMIT EXHAUST STEM.
7. AXIS OF TUBE IS DEFINED AS THE LINE JOINING CENTRE OF O.D. OF NECK AT POINTS C AND D.
8. THE THICKNESS OF THE FACE PLATE IS DEPENDENT ON THE REFRACTIVE INDEX OF THE GLASS. THE MAXIMUM WEDGE ACROSS ANY DIAMETER OF THE FACE PLATE IS 0·0125 mm. THE ▲ DIMENSION OF 2·065 mm. RELATES TO A WAVELENGTH OF 4500 Å
9. THESE DIMENSIONS ARE FOR DESIGN REFERENCE ONLY.



ANODE CONTACT TO LIE WITHIN THESE LIMITS.

DIMENSIONS ARE IN MILLIMETRES.

APPENDIX A

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

Referring to Fig. 1 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 as shown in Fig. 2, the direction of scan being at right angles to the bars of the grating. The transmitted light is collected by a photomultiplier via a field lens which focuses the aperture of the microscope objective on to the photomultiplier cathode. The output from the photomultiplier is fed directly to an oscilloscope as a 'Y' deflection, and the oscilloscope 'X' scan is locked to the scan applied to the C.R.T. under test. To reduce errors due to phosphor noise a high frequency spot wobble is applied in a direction parallel to the grating bars.

Mechanical Requirements

The objective, grating, field lens 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 of fine adjustment of the magnification when calibrating, the distance between the microscope objective and the grating must be adjustable. The field lens is mounted immediately behind the grating, (Fig. 1), and the photomultiplier cathode is preferably positioned at approximately the same distance from the field lens as the microscope objective.

Microscope Objective

Nominal Magnification x5 - suitable lens with N.A. 0.12 is made by Beck, London. Catalogue Number 5229. Colour Code Violet.

Grating

The grating pattern is shown in Fig. 2 and contains one cycle at low frequency, and the remainder at a single high frequency. The grating is made by photographic reduction 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 areas 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. CV6152 the resolution is measured at 150 cycles/cm and the system magnification is X5, thus each bar width on the grating is 0.0066 ins.

Photomultiplier

General purpose type, S11 photocathode about 1 in. diameter, with spectral response and characteristics similar to EMI type 9524B.

Field Lens

A single element type 1.5 in. diameter, focal length 3 in. is satisfactory.

Oscilloscope - Minimum requirements

The C.R.T. should have a long persistance phosphor.

Scan rate : 1 to 10 cycles/second

Scan duration : 0.08 second to 0.8 second

APPENDIX A (Cont'd)

Vertical deflection range of not less than 5 centimetres with sensitivity of 1 volt/cm.

A suitable type is Telequipment S.51.

It has been found convenient to use the oscilloscope time base saw tooth waveform to drive a scan amplifier to deflect the spot on the C.R.T. on test.

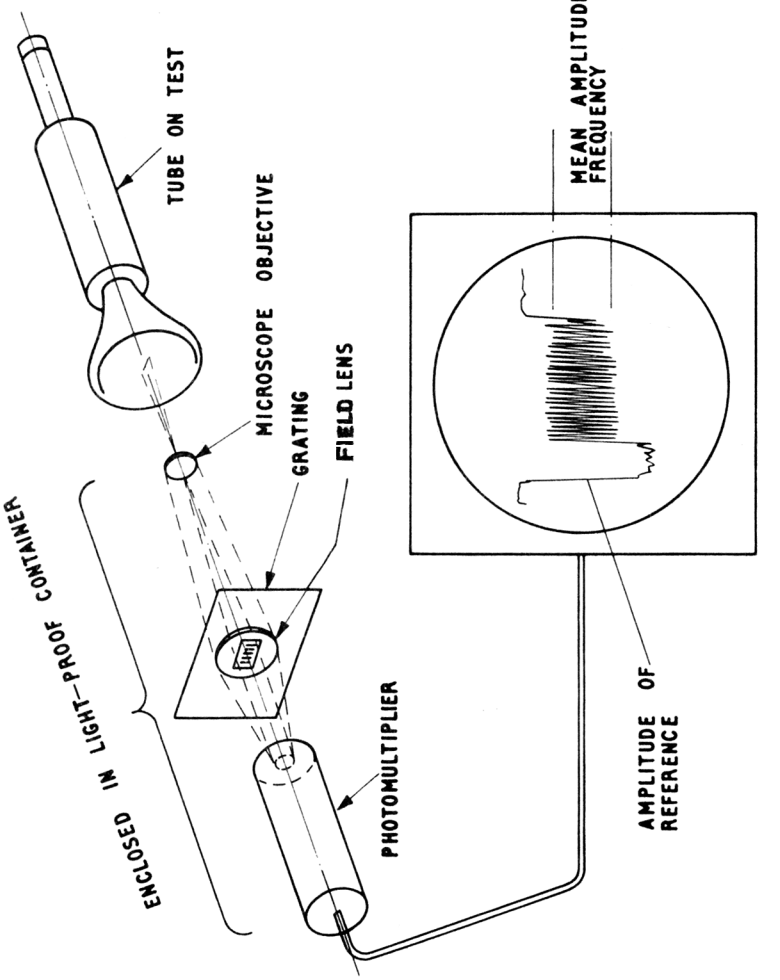
Calibration of system

The photomultiplier is removed and a lamp placed in the plane of the photocathode. The projected aerial image of the grating is viewed through a microscope assembly fitted with a stage micrometer calibrated in 0.001 in. The distance of the microscope objective relative to the grating is adjusted until 30 bars, (15 black and 15 white), occupy 0.040 in. on the stage micrometer. The position of the objective is locked and the photomultiplier replaced.

APPENDIX A

FIG. 1.

MEASUREMENT OF SPACIAL FREQUENCY RESPONSE

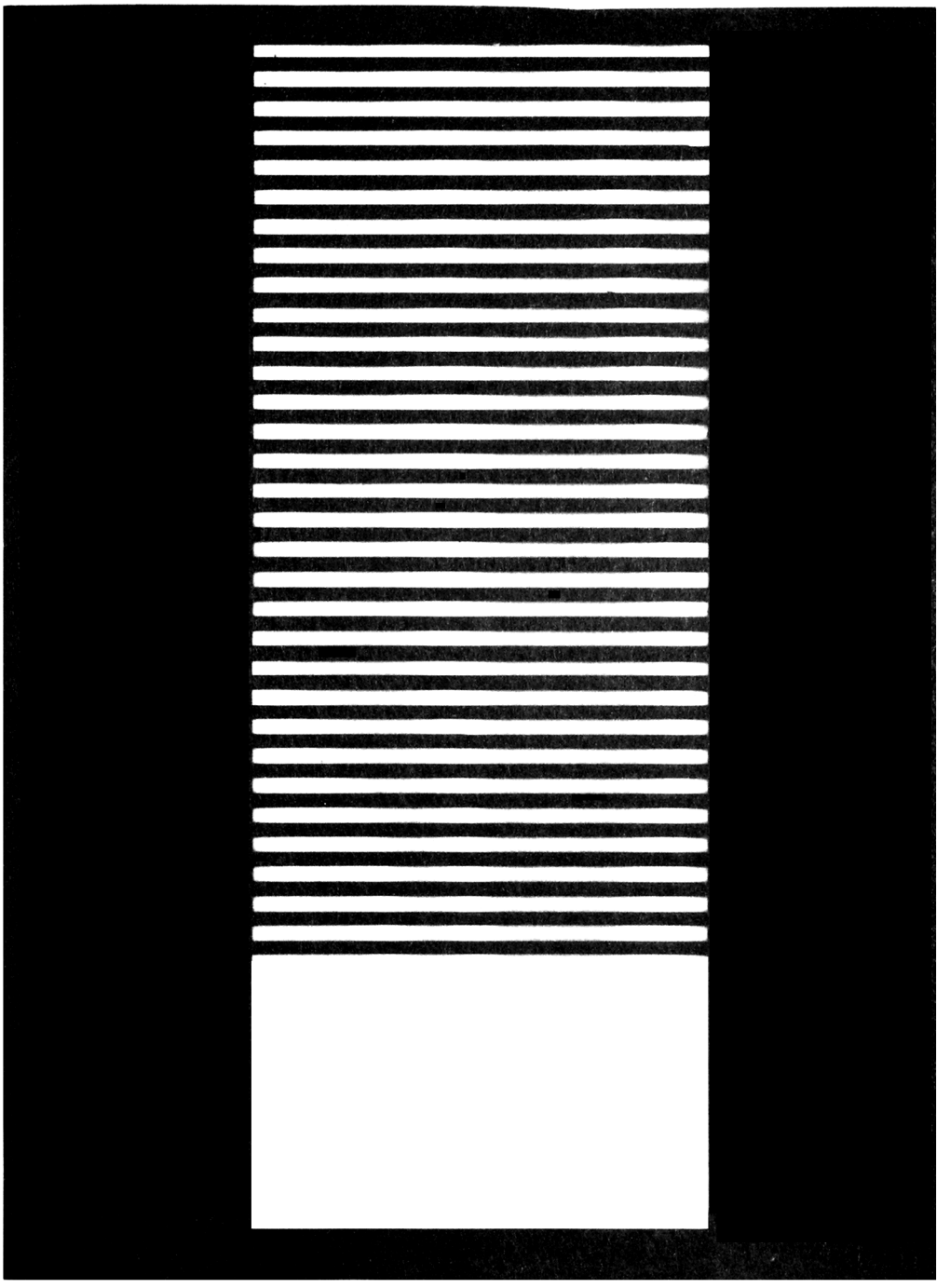


APPENDIX A

FIG 2

TYPICAL GRATING

(Not to scale)



ELECTRONIC VALVE SPECIFICATIONS

SPECIFICATION MOA/CV6152 ISSUE 1 DATED 1st APRIL, 1965.

AMENDMENT No. 1

Page 8 Outline Drawing

Cross out existing Outline Drawing and paste over new Outline Drawing dated 28th July, 1965 attached hereto.

September, 1965.

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

(319491)

ELECTRONIC VALVE SPECIFICATIONS
SPECIFICATION CV6152
ISSUE 1 DATED 1st APRIL, 1965
AMENDMENT No.2

Page 5

Add the following test which shall immediately precede the holding period.

K1001 Ref.	TEST CONDITIONS			TEST	INSP. LEVEL	SYMBOL	LIMITS		UNITS
							MIN	MAX	
	Vh (V) 6.3	Vg (V) Adjust to give cathode current of 0.1 µA See Note 7	Va (kV) 5	(q) Spot Movement	100%		-	0.05	mm
				Duration			20	-	hrs

Page 7 Add Note 7 as follows:-

The focused spot shall be observed with a photomicrometer.

The field of view of the instrument shall be restricted that a spot movement of 0.05mm shall produce a decrease in the detector output of not less than 50%.

The output of the detector shall be fed to a suitable chart recorder having a response time not exceeding 250 m secs for full scale deflection.

The crt shall be lined up in the system. The tube EHT shall then be switched off for a period of not less than 15 minutes and then switched on again. The test commences at the instant EHT is restored and lasts for a period of not less than 20 hours.

It is important that all supplies are suitably stable such that there is no appreciable change in cathode current, focus, or spot position for the duration of the test.

A suitable photomicrometer can be constructed by modifying the instrument described in Appendix A. The grating is removed and is replaced by a limiting aperture of suitable diameter, and the output of the photomultiplier is fed to a chart recorder.

Ministry of Technology/RRE

May, 1968

NM.461725(T)

28/5/68