

SPECIFICATION M.O.A./CV 6099 Issue 1, dated 2nd June, 1964. Also subject to the relevant provisions of the latest issue of the associated J.S. Specification K1001.	<u>SECURITY</u>	
	<u>Specification</u>	<u>Valve</u>
	Unclassified	Unclassified

<u>Type of Valve</u> - Image Converter Tube, Near Infra-Red Sensitive. <u>Cathode</u> - Caesium silver oxide. S1 <u>Screen</u> - Aluminium backed, GG5. P20 <u>Type of Focus</u> - Self Focussing, Electro-Static. <u>Envelope</u> - Glass with metal ring connectors. <u>Prototype</u> - VX 8515	<u>MARKING</u> See K1001/4 Additional Marking:- Serial No. on the outside of the tube.
	<u>DIMENSIONS</u>
	See drawing on page 13

<u>Ratings, Characteristics and Typical Operation</u> (not for Inspection purposes) All limiting values are absolute	<u>MOUNTING POSITION</u> Any. See Note A
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<u>Ratings</u>		NOTE	<u>WEIGHT</u> 1.5 ozs. approx.
Max. Peak Instantaneous Screen Voltage (kV)	13.0		
Max. Continuous Screen Voltage (kV)	12.5	B	
Min. Screen Voltage (kV)	8.0	B	
Max. Photocathode Current (continuous) (μA)	0.1		
Max. Photocathode Illumination (continuous) (lux)	10 IRF	D	
Max. Storage Temperature (°C)	68	E	
<u>Characteristics</u> (At Ambient Temp. of 20°C and a Screen Voltage of 12 kV where applicable)			
Peak Spectral Response (Angstroms)	8000 ± 1000		
Conversion Index (C.I.) (Min.)	10	C	
Magnification at Centre (nom.)	0.75		
Resolution at Centre of Photocathode (Min.)	30 line pairs/mm		
Background Equivalent Illumination (E ₀) (Max.) (lux)	0.025 IRF	F	
Dark Current (Max.) (μA)	0.02		
<u>Typical Operation</u>			
Screen Voltage (kV)	12	B	

NOTES

- A. This tube should be handled by the metal ring connectors in order to avoid producing a conducting surface on the glass.
- Avoid exposure to direct sunlight.
- Connections to the tube should not be soldered to the metal ring connectors.
- Equipment designers are advised that magnetic shielding may be required to minimise the defocussing effects of extraneous fields.

- B. Referred to cathode.
- C. Measured as specified in test t.
- D. This value is the maximum illumination which may be allowed to fall on the infra-red filter which must be interposed between the light source and the photocathode.
- E. This is the maximum temperature which the tube may encounter at any time. To prevent deterioration it must not be stored at a temperature of 50°C or above for longer than 500 hours.
- F. Measured as specified in test u.
- G. Joint Services Catalogue No. 5960-99-037-2574.

Superseded

T E S T S

To be performed in addition to those applicable in K1001. Tests shall be performed in the specified order unless otherwise agreed with the Inspecting Authority. Tests a, b, c and s shall not be performed more than once. Where sampling tests are called for, a lot shall be taken as one calendar month's production.

Test Conditions - Unless otherwise stated

- i An operating voltage of 12.0 kV D.C. negative with respect to the image tube screen shall be applied to the cathode.
- ii There shall be no radiation incident upon the photocathode.
- iii The level of illumination in the vicinity of the test area shall not exceed 0.1 foot candles.
- iv (a) All flux levels are to be measured in terms of the luminous flux obtained from the standard tungsten light source operating at the colour temperature given in the following table:

Colour Temperature	Tests
2850°K	t,u
2700 - 2900°K	r
2000 - 3000°K	d,f,g,h,j,k,l,m,s

- (b) The standard infra-red filter (see Fig.1) shall be interposed between the light source and the image tube photocathode, sufficiently close to the latter, so that only direct radiation through the filter shall reach the photocathode. Suitable baffles to ensure this shall, if necessary, be provided.
- (c) For those tests where the level of filtered radiation incident upon the photocathode is not specified but is left to the discretion of the observer, this shall never exceed 70 lux.
- v The observer shall be suitably dark adapted before commencing the test.
- vi All tests shall be carried out in an ambient temperature of 20°C ± 5°C.

	Test	Test Conditions	AQL	Insp. Level	Symbol	Limits		Units
						Min	Max	
During all electrical testing of the image tube with the exception of the shock test there shall be no flickering or any other indication of malfunctioning.								
	<u>Group A</u>							
a	High and low temperature and temperature shock tests	Test conditions i to vi are not applicable Note 1		100%				
b	Vibration	Test conditions i to vi are not applicable Note 2		100%				
c	Shock test	Test condition vi is not applicable Note 3		100%				
d	Irradiation surge	Note 4		100%				
e	Dark current	Note 5		100%		-	0.02	μA
f	Uniformity of image screen brightness	Note 6		100%				
g	Voltage stability	Note 7		100%				
h	Resolution (1) Centre	Note 8		100%		30	-	line -pairs /mm
	(2) Off axis			100%		12	-	line -pairs /mm
j	Spots, Streaks and Blemishes	Note 9		100%				
	<u>Groups B and C</u>	Omitted						
	<u>Group D</u>	Note 10						
k	Alignment of mechanical and optical axes	Note 11	6.5	IC				
l	Centre magnification	Note 12	6.5	IC	M1	0.728	0.772	
m	Distortion	Note 13	6.5	IC	D	5.5	9.5	%

	Test	Test Conditions	AQL	Insp. Level	Symbol	Limits		Units
						Min	Max	
n	<u>Group E</u>							
	Resistance to external pressure	Test Conditions i to vi are not applicable Note 14		QA				
p	Damp heat (long term)	DEF 5011 Class H6 Note 15		QA				
q	<u>Group F</u>							
	Shelf Life	t = 2 years The tube shall be stored in darkness with no voltage applied Note 16		IV of MIL-STD 414				
	<u>End Point Test at each Test Point Conversion Index</u>	As in test t	6.5	IV of MIL-STD 414	C.I	10	-	
	Operational life	Illumination 18 (+ 10%) lux i.r.f. t = 1000 hours continuous Note 17		Note 18				
	<u>End Point Test 500 hours Conversion Index</u>	As in test t Note 18	-		C.I	8.5	-	
s	<u>Group G</u> <u>100% Retest</u>							
	Accelerated ageing	Note 19		100%				
	Conversion Index	Note 20		100%	C.I	10	-	
u	Background Equivalent Illumination	Note 21		100%	Eo	-	0.025	Lux i.r.f.

NOTES

1. The image tube shall be placed in the test chamber and the internal temperature of the chamber raised gradually, in not less than 30 minutes, to 68°C . After at least 1 hour at this temperature, the temperature of the chamber shall be lowered gradually, in not less than 15 minutes, to 52°C and held there for a further 1 hour. The image tube shall then be removed from the chamber and immediately placed at room temperature for at least 1 hour. Upon completion of this test, the image tube shall be visually examined. There shall be no deformation, cracking or fracture of any part.

Image tubes which have successfully passed this test shall be replaced in the test chamber and the temperature lowered gradually, in not less than 30 minutes, from room temperature to -54°C . The chamber shall remain at this temperature for at least 1 hour and thereafter shall be raised gradually, in not less than 15 minutes, to -32°C where it shall be held for at least 1 hour. The image tube shall then be immediately removed to room temperature and after not less than a further 1 hour the image tube shall be examined again. There shall be no deformation, cracking or fracture of any part.

2. The image tube shall be rigidly mounted with its photocathode downwards in a jig of an approved design and the complete assembly shall be vibrated along the longitudinal axis of the tube with an acceleration of not less than $6g$. The vibration shall be sinusoidal, having a harmonic distortion content not exceeding 5%, at any single nominal frequency between 25 and 30 c/s and be applied for a period of not less than $2\frac{1}{2}$ minutes duration. The image tube shall then be removed from its holder and visually examined. There shall be no loose elements or particles.
3. The image tube shall be rigidly mounted in a holder of an approved design and subjected to shock impacts of peak value $75g$. The waveform of the impact shock shall be substantially rectilinear and the time duration for which the peak shock value is maintained shall be at least 5 milliseconds. The duration of the impact excluding any overshoot which may occur shall be 8 ± 3 milliseconds. Any overshoot which occurs during the decay period of the shock shall be damped and shall not exceed 25% of the peak value. This test shall be performed six times with the shock impact applied along the longitudinal axis of the image tube and six times perpendicular to this same axis. During these tests, the observer shall view the image tube with the unaided eye. There shall be no signs of instability or flashing on more than two of the impacts during each series of six shocks. There shall be no signs of instability or flashing after coming to rest after each impact.
4. This is a conditioning test only. The image tube cathode shall be subjected to the sudden application of radiation produced by filtering 2.0 lumens of luminous flux (7000 lux). This radiation shall be incident over a circular area of 0.75 inch diameter centred on the photocathode for a period of 1 ± 0.5 sec. The total source impedance of the power supply shall be $2\text{ k}\Omega$ ohms $\pm 10\%$.
5. Dark current is defined as that electrical current which flows within the image tube and across the external surfaces of the image tube with no radiation incident on the photocathode.

6. A filtered luminous flux level of 100 microlumens (0.35 lux) shall be incident on the photocathode. The whole of the image screen shall be viewed through a nominal 2.5 power magnifier for evidence of non-uniform screen brightness. There shall be no line of demarcation if any variation of brightness exists, nor shall there be a mottled or water mark appearance.
7. A voltage of 13.0 kV shall be applied to the image tube for a period of not less than 1 minute. During this test the image screen shall be observed through a nominal 10 power magnifier. There shall be no arcing, flashing, flickering or any other indication of malfunctioning.
8. This test shall be performed using a 10 power magnifier.

The test chart shown in Figure 2 of this specification shall be projected on to the photocathode using an optical system such as shall not detract from the resolution capability of the image tube or of the observer. The optical system shall comprise a light source, condenser lens assembly with the test chart in close proximity to it, a high quality projection lens and the standard infra-red filter. The test chart shall be placed so that the outer circle A is concentric with the tube axis.

Using a convenient level of filtered radiation the longitudinal position of the image tube shall be adjusted to present the best simultaneous resolution of the four test patterns in the centre of the test chart. Without further adjustments, the resolution of the image tube shall be such that all the patterns on the test chart are resolved.

9. (a) The image tube screen shall be examined with a 2.5 power magnifier. There shall be no bright spots, streaks or other configuration of greater intensity than the background brightness of the image screen.
- (b) With a convenient level of filtered radiation incident upon the image tube photocathode, the image screen shall be viewed through a 2.5 power magnifier. There shall be no ion spots.
- (c) The image tube, without the operating voltage applied to it shall be held vertically with its photocathode downwards and it shall be tapped in such a way as to cause any loose particles which may be present inside the tube to fall towards the photocathode.

With the operating voltage restored to the image tube the useful image screen shall then be examined with a 10 power magnifier. The photocathode shall be illuminated through a lens at an aperture of f2.8 to give a nominal 0.02 lumen (70 lux) filtered on the cathode. The screen shall be examined for spots. The aperture of the lens shall then be reduced to f11 and the number of grey and dark spots shall be assessed. Differentiation between cathode and screen spots shall be made and the number of cathode spots of size not less than 0.002 inch shall not exceed 10 and none shall exceed 0.006 inch. No spots present shall exceed 0.012 inch and otherwise shall not exceed the size and quantities in all three categories shown below. Spot size is defined as the maximum dimension.

Spot size (inches)	Number of spots within 0.4 inch diameter circle*	Number of spots within area bounded by two circles* of diameter <u>0.4 inch and 0.75 inch</u>
0.009 to 0.012	0	2
0.006 to 0.012	0	12
0.002 to 0.012	10 minus the total number of photocathode spots as defined above	22

*Circles on planar space image at the photocathode concentric with the tube axis.

10. The tests in this group may be performed after the Group G tests if desired.
11. A perspex disc with two lines perpendicular to one another engraved across its diameter shall be located accurately inside the photocathode bearing surface and against the photocathode window (see dimensional outline drawing page 13). A similar disc but having a circle of 0.045 inch radius engraved upon it concentric with the centre of the disc shall be accurately located against the image tube screen. With a conventional level of filtered radiation incident upon the photocathode, the image screen shall be observed using a 10 power magnifier.

The projection of the point of intersection of the photocathode cross-wires on the screen shall be within the prescribed circle at the screen.
12. A test pattern slide containing two parallel lines shall be projected so that their separation on the planar space image at the photocathode is 0.150 ± 0.002 inch. The two parallel lines shall be bisected by a diameter of the photocathode and shall be equi-distant from the tube axis.

Using a convenient level of filtered radiation, the separation of the two lines appearing on the image screen shall be measured with a 10 power magnifier having a calibrated graticule.

The centre magnification M_1 of the image tube is defined as the ratio of the separation of the two lines on the image screen to the separation of the two corresponding lines on the photocathode.
13. A test pattern slide containing two parallel lines shall be projected such that their separation on the planar space image at the photocathode is 0.60 ± 0.002 inch. The two parallel lines shall be bisected by a diameter of the photocathode and shall be equi-distant from the tube axis.

Using a convenient level of filtered radiation, the separation of the two lines appearing on the image screen shall be measured with a 10 power magnifier having a calibrated graticule.

The outer magnification M_2 of the image tube is defined as the ratio of the separation of the two lines on the image screen to the separation of the two corresponding lines on the photocathode.

The percentage distortion of the image tube shall be determined from the following formula:

$$D = \frac{(M_2 - M_1)}{M_1} \times 100$$

where D = percentage distortion

M_1 = centre magnification (obtained in test 1)

M_2 = outer magnification

14. The image tube shall be subjected to the application of an external pressure of 30 lb. per square inch above atmospheric pressure for not less than 1 minute. There shall be no deformation, cracking or fracture of any part.
15. Devices used for this test may be either dummy image tubes or selected from those which have failed any electrical test. Upon completion of this test surface moisture shall be removed by shaking and the image tube shall be visually examined. There shall be no signs of deterioration in the varnish.
16. This test is to be performed as follows:-
 - (a) A random sample is to be drawn from the lot upon release by the manufacturer's inspection organisation at the completion of all other tests (except life test) in accordance with the provisions of MIL-STD-414, Sampling Procedures and Tables for Inspection by Variables for Percent Defective, Section B (Variability Unknown, Standard Deviation Method, Form 2) using Normal Inspection.
 - (b) This sample shall be retained in bonded storage at the manufacturer's premises while the remainder of the lot is delivered.
 - (c) The storage period shall continue until two years after the last day of the month in which the lot was released by the manufacturer's inspection organisation, or until all or part of a lot is embodied into equipment or until the lot is dispersed, whichever occurs earliest.
 - (d) The sample is to be assessed to the end point test during the storage period at intervals of four calendar months from the last day of the month in which the lot was released by the manufacturer's inspection organisation.
 - (e) At each assessment, acceptability to the end point test shall be as specified in clause B6 of MIL-STD-414.
 - (f) The action required in the event of the lot being deemed non-acceptable at any of the four-monthly assessments given in (d) above, shall be as defined in the contract with the manufacturer.
 - (g) At the end of the storage period, the sample tubes held by the manufacturer shall be delivered.

17. The life test sample shall consist of not less than seven tubes per month and shall be selected randomly from tubes which have satisfied the requirements of the Group A tests.

18. This life test shall be conducted for 1000 hours and acceptance shall be on the basis of the 500 hour and 1000 hour requirements. At the end of these periods the sample shall pass the post test end point limits and electrical inoperatives shall be the criterion of failure.

The life test shall be assessed at each end point test time by calculating the average life expectancy of the sample by the methods described below. This is a destructive test.

- (a) If a tube satisfies the end point test requirements up to and including the time of the end point test which is being considered, it shall be credited with a life equal to the duration of the test to that end point test time.
- (b) If the time of failure to satisfy the end point test requirements is known exactly, it shall be credited with a life equal to the number of hours on life completed before failure.
- (c) If the time of failure to satisfy the end point test requirement is not known exactly, the tube shall be credited with a life computed as follows:

Estimate the time at which the conversion index was equal to the end point test limit by linear interpolation on a conversion index/time diagram between the conversion index at the last successful reading and the conversion index at the first unsuccessful reading.

The average life of the sample shall be the average of the hours credited to the individual tubes in the sample. The total number of tubes placed on life test from the lot shall be considered the life test sample, but at the discretion of the Inspection Authority, any tube whose failure is due to test equipment failure or operator error, shall not be considered in the calculation of the average. The average life expectancy of the sample shall not be less than 80% of the time to the end point test.

In the event that a life test sample fails, a lot may be re-assessed by drawing a further random sample of not less than seven tubes from the lot, repeating the life test and then calculating the average life on the combined sample. The lot shall be rejected if the average life expectancy is less than 80%.

19. The image tube shall be conditioned by subjecting the photocathode to a filtered luminous flux of 0.02 lumen (70 lux) for 5 hours. During this period an operating voltage of 12 kV shall be applied to the image tube. The image tube shall then be stored, in the dark, and without further processing, for at least 4 weeks, after which period the measurement of conversion index shall be made in the manner described in Note 20.

20. Conversion index is defined as the ratio of luminous flux emitted by the image tube screen to the infra-red flux incident on the photocathode.

$$\text{i.e. } C.I. = \frac{F_e}{F_i.T}$$

where F_e = luminous flux emitted by the phosphor in lumens

F_i = unfiltered luminous flux incident on the photocathode in lumens

T = filter factor

Conversion index shall be measured with a filtered luminous flux of approximately 0.02 lumens incident upon a circular area of 12.7 mm. diameter centred on the photocathode. The luminous flux emitted by the image tube screen shall be measured with a photovoltaic cell having a response approximating to the C.I.E. average photopic eye. The cell shall be fitted with a truncated perspex cone. The cone shall be 39.7 mm. in diameter at its base, 28.6 mm. in diameter at the top and 42.9 mm. in height, and the base of the cone shall be in intimate contact with the cell window. In use, the top of the cone shall be pressed against the image tube screen and the current generated by the photovoltaic cell shall be measured.

The photovoltaic cell (without perspex cone) is calibrated against a tungsten lamp of accurately known luminous intensity running at $T_c = 2850^\circ\text{K}$. The external impedance of the photovoltaic cell shall be 100 ohms or less. The measurement gives the cell sensitivity in terms of $\mu\text{A}/\text{lum}$.

An image converter tube is used for the calibration of the combination of cell and cone as follows: The tube is run with constant anode voltage at a high screen luminance output level under the conditions stated above, viz. with constant input illumination incident on a 12.7 mm. diameter circular area centred on the photocathode. The luminous intensity of the screen is measured by applying the inverse square law with the calibrated cell (without cone) at a distance $D \geq 10d$ from the screen, where d is the diameter of the illuminated screen area. The total luminous flux emitted by the illuminated portion of the tube screen is then known.

The combination of cell and cone is placed against the screen and a figure - obtained for the sensitivity of the combination of cell and cone in terms of $\mu\text{A}/\text{lm}$.

The conversion index of the image tube shall then be determined from the formula given above.

21. This test shall be performed at an ambient temperature of $20 \pm 1^\circ\text{C}$ in a darkened enclosure from which all extraneous sources of illumination have been removed. The manufacturer may, at his discretion, perform the test at a higher ambient temperature (up to a maximum of 25°C) but the specified limit shall apply whether or not this concession is used.

A filtered illumination level, E_i , having an accurately known value of the order of 1 lux, shall be incident upon a circular area of 12.7 mm. diameter centred on the photocathode. By means of a diaphragm in close proximity to the image tube screen, the emitted radiation from the phosphor over a circular area of 6 mm. diameter around the centre of the screen, shall be received by the cathode of a photomultiplier tube.

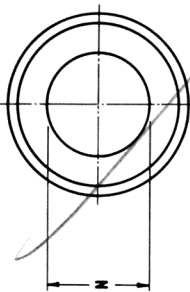
The photomultiplier tube shall be of the end window type, and shall have a spectral response similar to that of the EMI type 9536B. The cathode of the photomultiplier tube shall be at a fixed distance (of the order of 30 mm) from the tube screen. The sensitivity of the photomultiplier tube shall be adjusted by varying the H.T. voltage to its dynode resistance network until a convenient value of photomultiplier tube anode current (I_a) is obtained. This value shall be chosen well within the linear portion of the photomultiplier characteristic. The radiation incident upon the image tube photocathode shall then be excluded and the remaining multiplier anode current (I_B) measured.

The background equivalent illumination (E_o) is then $\frac{I_B}{I_a} \times E_i$

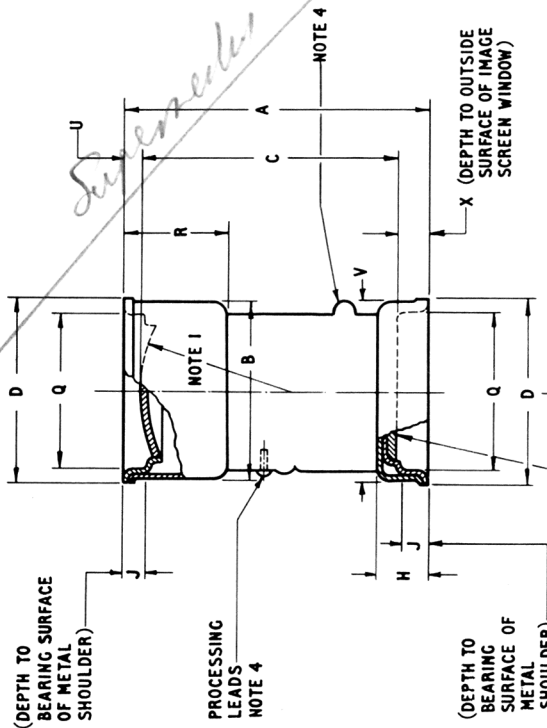
where I_B and I_a are in microamperes and E_o and E_i are in lux i.r.f. For negligible error (less than 10%) in determining the degree of background equivalent illumination, the photomultiplier dark current should be less than one thirtieth of I_B .

Superseded

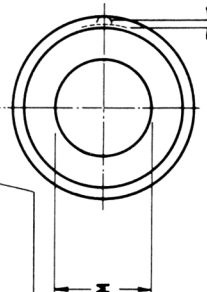
TABULATION OF DIMENSIONS (INCHES)												
A	B	C	D	H	J	M	N	Q	R	U	V	X
MAX 2.335	1.515	2.035	1.375	.410	.200	—	—	1.215	.771	.125	1.315	.200
MIN .2235	—	1.965	1.325	.560	.140	.630	.750	1.205	.711	.065	—	.140



(USEFUL
CATHODE
DIAMETER)



(DEPTH TO
BEARING
SURFACE
OF IMAGE
METAL
SHOULDER)



(USEFUL
IMAGE
SCREEN
DIAMETER)

NOTES

1. FACEPLATE DIMENSIONS *
RADIUS OF CURVATURE 1.230 ± 0.02 (INSIDE)
CENTRE FACEPLATE THICKNESS 0.60 ± 0.004
MAX. VARIATION IN EDGE THICKNESS 0.004

2. IMAGE SCREEN DIMENSIONS *
THICKNESS 0.075 TO 0.085 AT CENTRE
MAX. VARIATION IN EDGE THICKNESS 0.005

* 3. INDEX OF REFRACTION FOR FACEPLATE AND IMAGE SCREEN
GLASS SHALL BE 1.49 ± 0.04

4. NO PART OF THAT PORTION OF THE TUBE BETWEEN THE METAL CONTACT RINGS SHALL PROTRUDE BEYOND THE O/DIA (DIMENSION 'D') OF THE INDIVIDUAL TUBE.

* 5. TUBE AXIS IS ESTABLISHED BY THE CENTRELINE OF THE "O" DIMENSIONS AT END OF TUBE.

6. THE FOLLOWING DIMENSIONS ONLY SHALL BE INSPECTED FOR ACCEPTANCE PURPOSES:-

C, D, J, U, X AND THE EXTERNAL RADIUS OF CURVATURE OF THE CATHODE FACEPLATE (1.230 ± 0.02). THE EXTERNAL RADIUS OF CURVATURE OF THE PHOTOCATHODE SHALL BE MAINTAINED OVER A DIAMETER OF 0.75 MIN. THE EXTERNAL FACE OF THE IMAGE SCREEN SHALL BE MAINTAINED FLAT OVER A DIAMETER OF 0.63 MIN. CONCENTRIC WITH THE TUBE AXIS. "FLAT" MEANS THAT THE SURFACE OF THE AREA DEFINED ABOVE SHALL BE WITHIN A TOLERANCE ZONE OF 0.010 .

* 7. THE PHOTOCATHODE SHALL BE OF CAESIUM SILVER OXIDE.

* 8. THE IMAGE SCREEN SHALL BE ALUMINIUM BACKED WITH A GGS RESPONSE

* 9. ALL EXPOSED METAL SHALL BE NICKEL PLATED.

* 10. ALL METAL PROCESSING TERMINALS PROTRUDING THROUGH THE GLASS ENVELOPE SHALL BE CUT OFF AND GROUND FLUSH WITH THE GLASS BEAD. THE METAL PROCESSING TERMINALS SHALL BE COATED WITH GLYPHTOL OR EQUIVALENT. THE RETURN LEAD USED FOR PROCESSING IS DIAMETRICALLY OPPOSITE EXHAUST TUBING.

* 11. 2 COATS OF AN APPROVED NON-HYGROSCOPIC, TRANSPARENT, VARNISH SHALL BE APPLIED TO THE EXPOSED GLASS SURFACES OF THE TUBE WITH THE EXCEPTION OF THE PHOTOCATHODE AND IMAGE SCREEN FACEPLATES (THE STERLING VARNISH COMPANY'S V130/I MEETS THESE REQUIREMENTS AND IS APPROVED FOR USE ON THIS TUBE.)

* NOT FOR INSPECTION PURPOSES. WHERE DIMENSIONS ARE SHOWN THESE ARE FOR GUIDANCE ON COMPONENT PARTS.

INFRARED IMAGE CONVERTER TUBE.

CHARACTERISTIC OF FILTER CS94 (CORNING NO. 2540, MELT 1613, 2.62 μ /M. THICKNESS)

THE SPECTRAL RESPONSE AND THE FILTER FACTOR
OF THIS FILTER ARE PROVISIONAL AND WILL BE
SUBJECT TO MODIFICATION.

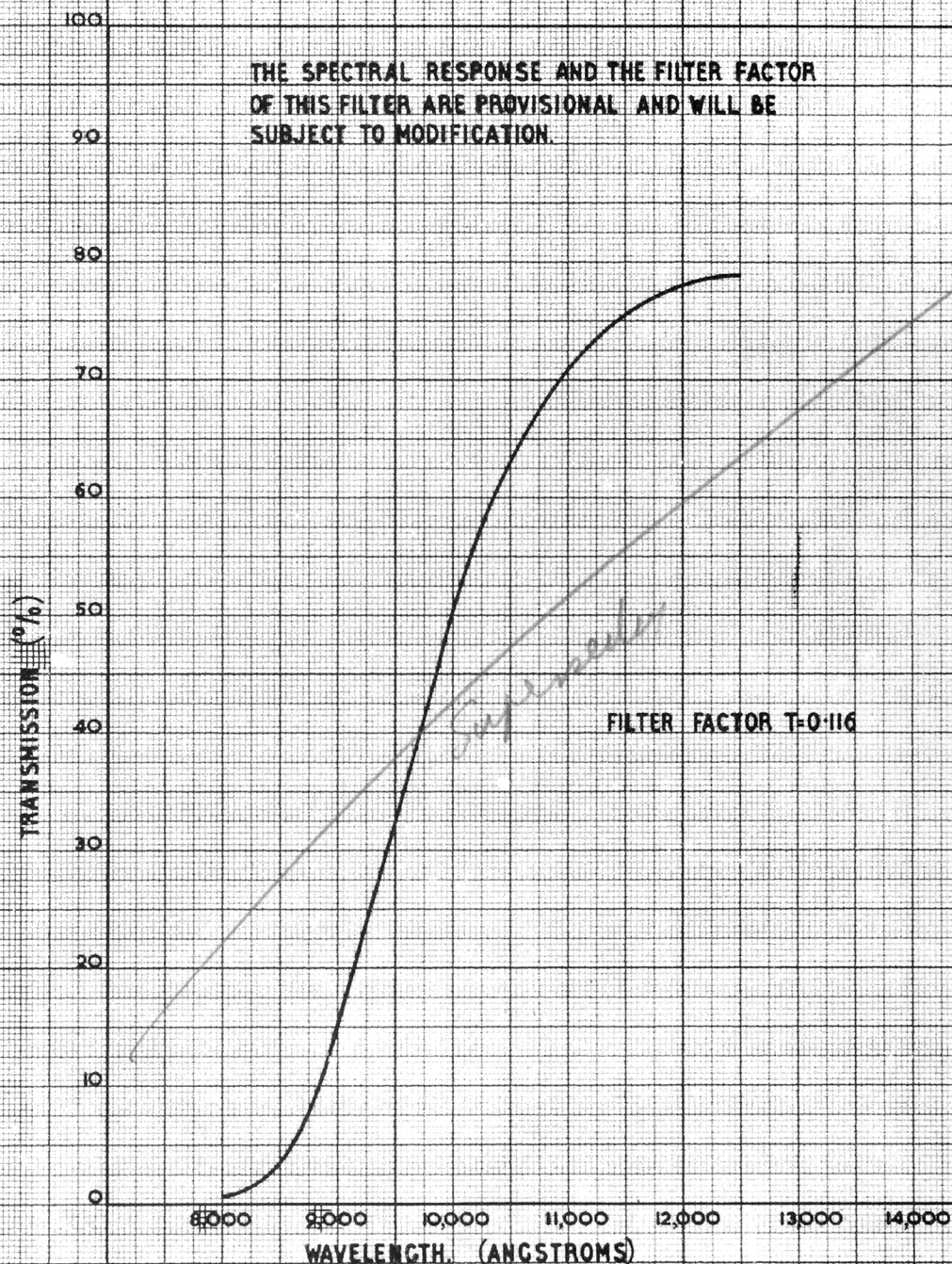


FIG. 1.

NOTES.

- 1 EACH TEST PATTERN SHALL CONSIST OF 8 BLACK LINES WITH A LINE TO SPACE RATIO OF 1:1. THE BLACK LINES SHALL BE ON A BACKGROUND WITH CONTRAST AS HIGH AS POSSIBLE.
- 2 THE LENGTH TO BREADTH RATIO OF EACH LINE SHALL BE 15:1
- 3 THE ORIENTATION OF EACH PATTERN SHALL BE DISPLACED FROM THE ORIENTATION OF AN ADJACENT PATTERN BY 45°
- 4 THE DIMENSIONS SHOWN ON THIS DRAWING SHALL BE THOSE OF THE PLANAR SPACE IMAGE AT THE PHOTO-CATHODE.
- 5 IN CIRCLE B THE OVERALL SIZE OF EACH PATTERN SHALL BE SUCH AS TO SUBTEND 12 LINE PAIRS/MM AT THE PHOTO-CATHODE. (ONE LINE PAIR IS EQUAL TO THE COMBINED WIDTH OF ONE BLACK LINE AND ONE SPACE). EACH BOX SHALL CONTAIN FOUR PATTERNS AND THE FOUR BOXES SHALL BE EQUALLY SPACED ON THE CIRCUMFERENCE OF THE CIRCLE.
- 6 IN CIRCLE C THE OVERALL SIZE OF EACH PATTERN SHALL BE SUCH AS TO SUBTEND 25 LINE PAIRS/MM AT THE PHOTO-CATHODE. THE FOUR TEST PATTERNS SHALL BE EQUALLY SPACED NEAR THE CIRCUMFERENCE OF THE CIRCLE.

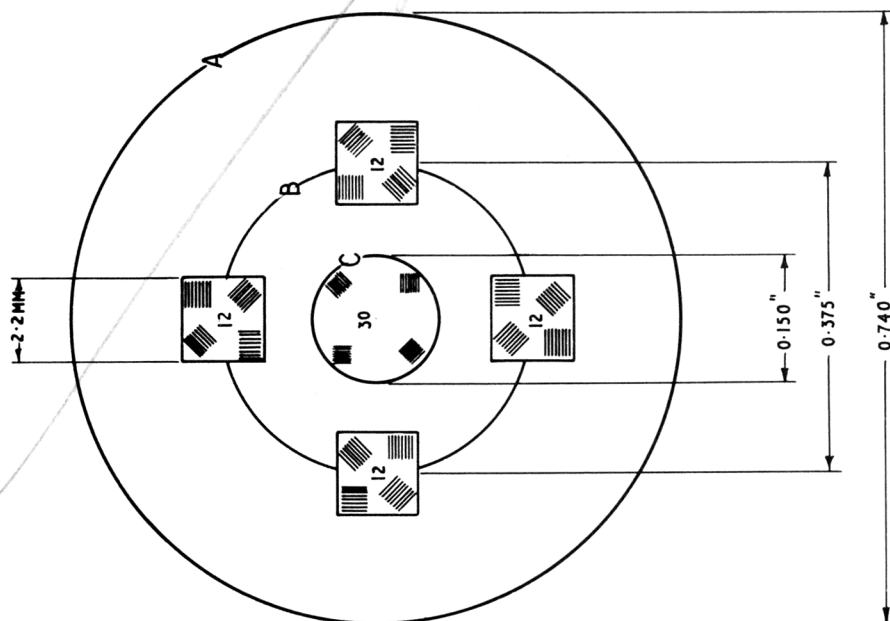


FIG. 2. RESOLUTION CHART. (NOT TO SCALE)