

# Beijing Matsushita Color CRT Co., Ltd.

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<b>TUBE SPECIFICATION</b> <b>COLOR PICTURE TUBE</b>
<b>A51JXS098X</b> <b>A51JXS95X</b>

\* Tube Size:

Flat and Square Screen

51cm Screen Diagonal, **1,239**sq.cm Screen Area

Rectangular 4×3 Aspect Ratio

Deflection-Angle Diagonal-90°

Overall Length-**446.3** mm

Neck Diameter- 29.1mm

\* Horizontal in-Line, OLF<sup>△</sup>-ART<sup>△</sup>Gun and Quick-Heating cathodes

\* Shadow-Mask Assembly---Slotted Type, Temperature Compensated

\* High Contrast ---Vertical Line with Black Matrix

---Pigmented Red/Blue Phosphors

\* Self-Converging and Self-pincushion Correction System

\* Internal Magnetic Shield

\* Implosion Protection --- Tension-Band Type (with mounting lugs)

\* **525/625** TV-Line System Use

\* Northern, Southern Hemisphere and Equatorial Area Use

\* Soft flash

△ Overlapping Field Lens

△△ Aberration Reducing Triode

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ELECTRICAL DATA

Electron guns with unitized grids	Center beam: green Outside beams: red & blue
Heater current at 6.0V	0.613A
Focusing method	Electrostatic
Focus lens	Bipotential
Convergence correction method	Magnetic
Deflection method	Magnetic
Deflection angles (approx.):	
Diagonal	90°
Horizontal	75°
Vertical	59°
Direct interelectrode capacitances (approx.):	
Grid No.1 to all other electrodes	13.6 pF
All cathodes to all other electrodes	14.8 pF
Focusing electrode (Grid No.3) to all other electrodes	5.4 pF
External conductive coating (including metal tension-band) to anode	2,200 max. pF 1,600 max pF

OPTICAL DATA:

Screen (on inner surface of faceplate):	
Type	Metal-backed, Vertical line Tricolor phosphors
Matrix	Black opaque material Negative guard band type
Phosphor (three separate phosphors, collectively)(note1)	Type X Red: Rare earth, pigmented Green: Sulfide Blue: Sulfide, pigmented
Persistence	Medium short
Horizontal spacing between centers of adjacent Phosphor trios (approx.)      Hor./Ver.	0.63/0.64mm
Array	Vertical line
Faceplate:	
Light transmission at center (approx.)	53.5%
Surface	polished

MECHANICAL DATA

Tube dimensions:	
Overall length	446.3 ± 6.5mm
Greatest dimensions of tube (excluding lugs):	
Diagonal	548.7 ± 2.4mm
Width	458.2 ± 2.4mm
Height	362.2 ± 2.4mm

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Useful screen dimensions (projected)	
Diagonal	508.0min.mm
Horizontal axis	406.4min.mm
Vertical axis	304.8min.mm
Area	1,239 sq. cm
Base and pin connection designation (note 2)	EIA No.B10-277-AB
Anode contact	EIA No.J1-21
Pin position alignment:	
Angle between pin No.10 and vertical	
Axis of CRT (approx.)	See sheet 12
Operating position	Horizontal
	Anode contact on top
Weight(approx.)	16.0kg
Internal magnetic shield	Built-in
Implosion protection	Tension-band type
Mounting means	Lugs at corners

MAXIMUM AND MINIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES:Unless otherwise specified, voltage values are positive with respect to grid No.1.

Anode voltage	30,000 max. V 20,000min. V
Total anode current:	
Short-term average (with ABL circuitry)	1,000 max. $\mu$ A
Focusing electrode (grid No.3) voltage	
Peak grid No.2 voltage, including video signal	10,000 max.V
Voltage	1,000 max. V
Cathode voltage: (7)	
Positive bias value	400 max. V
Positive operating cut-off value	175 max.V
Negative bias value	0 max.V
Negative peak value	2 max.V
Heater voltage (AC or DC; between heater terminals):	6.3 max. V
Under operating conditions	5.7 min. V
Peak heater to cathode voltage: (note 4)	
Heater negative with respect to cathode:	
During equipment warm-up period not exceeding 15 seconds.	385 max.V
After equipment warm-up period	275 max.V
Heater positive with respect to cathode:	200 max.V
Peak	0 max.V
DC component	

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EQUIPMENT DESIGN RANGES:

Unless otherwise specified, voltage values are positive with respect to grid No.1

As for the items being under the influences of terrestrial magnetism, the equipment design ranges

Mentioned here are specified under the following magnetic field condition, unless otherwise stated.

Horizontal component=0  $\mu$  T, Vertical component = 0  $\mu$  T

For anode voltages between 20,000 and 30,000V

Focusing electrode (grid No.3) Voltage	:	24.0% to 28.0% of anode voltage
Control voltage for visual extinction of Focused spot		See Cut-off Design Chart In Figure 1
Maximum ratio of cathode spot cut-off voltages, Highest gun to lowest gun in any tube		1.16 max
Heater Voltage:		
Under operating conditions (note3)		6.0V
Focusing electrode (grid No.3) current		-10 to +10 $\mu$ A
Grid No.2 current		-5 to +5 $\mu$ A
Grid No.1 current		-5 to +5 $\mu$ A

To produce white light of 9600K+5M.P.C.D.(CIE Coordinates X=0.282, Y=0.294):

Percentage of total anode current supplied by	<u>Red</u>	<u>Green</u>	<u>Blue</u>
Each beam (typical)	37%	33%	30%
Ratio of cathode currents	<u>Min.</u>	<u>Max.</u>	
Red/Green	0.8	1.4	
Red/Blue	0.9	1.5	
Blue/Green	0.6	1.2	

Displacements, measured at the center of the screen:

Raster centering displacemant:	Horizontal	$\pm 6.0$ max.mm
	Vertical	$\pm 6.0$ max.mm

Center convergence displacemant of the blue and

Red beams is contained within a circle; max. diameter  
of circle (after focus voltage optimized)

5.2 max.mm

Center convergence displacement between the green

Beam and converged blue and red beams is contained  
Within a circle; maximum diameter of circle  
(after focus voltage optimized)

1.8max.mm

Maximum required correction for register (using

recommended components) as measured at the center  
of the screen in horizontal direction

0.080max.mm

(note 5)

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TYPICAL OPERATION CONDITIONS:

Unless otherwise specified, voltage values are positive with respect to grid No.1.

Anode voltage	27,500 V
Focusing electrode (grid No.3) voltage(6)	6,600 to 7,700 V
Grid No.2 voltage for visual extinction of focused spot when circuit design utilizes cathode voltage of 160V	423 to 883 V
Cathode voltage (positive operating cut-off value):	
Highest cut-off voltage among the 3 guns	160V
Heater voltage: (AC or DC;) between heater terminals):	
Under operating conditions (note 4)	6.0 V
Luminance at center of the screen *	95 cd/m <sup>2</sup>

\*Tube setting adjusted to produce white (CIE coordinates X=0.282,Y=0.294)  
 focused raster, current density 0.4  $\mu$  A/cm<sup>2</sup>

LIMITING CIRCUIT VALUE:

## 1. High-voltage circuits:

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the high voltage/grid No.3 voltage power supplies should be of the limited energy type, in which the short-circuit current does not exceed 20 mA.

Grid No.3 circuit resistance:-----30max.M  $\Omega$

## 2. Low-voltage circuits:

Effective grid No.1 to cathode

circuit resistance-----0.75max. M  $\Omega$

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Notes:

- (1) The X phosphor designation in the WTDS is equivalent to P22 in the EIA type designation system.
- (2) The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than 450g.
- (3) To secure good emission characteristics through the life, it is recommended to regulate the heater voltage at 6.0V.  
If the heater is fed from the windings in the fly back transformer, the requirements in the "Common items of CRT" should be satisfied.
- (4) It is recommended to keep the cathode potential slightly positive to the heater.(Connect one heater-end to the chassis, when the cathode is used with positive potential to chassis, as in typical circuit design.)
- (5) Register is defined as the relative position of the beam trios with respect to the associated phosphor-line trios.  
Because of continuous vertical phosphor line arrangement this screen dose not need vertical purity shift. When adjusting horizontal purity shift, purity correction magnetic field must always be given vertical direction only.
- (6) Adjust for optimum focus vertical line in half east and half west, using cross-hatch pattern, when the beam current (black background) is adjusted to 1,000  $\mu$  A(p-p)/gun for white.
- (7) Drive voltage must be kept less than 85% of positive cut-off voltage anytime including the moment of switch-in.  
It is to avoid electron beam from hitting any grids when cathode operating area increases with cathode emissivity decreased.

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X-RADIATION CHARACTERISTICS: Please refer to the “Common items of CRT”

From these curves, maximum anode voltage at which the X-radiation emitted will not exceed 36pA/kg {0.5 mR/h} at an anode current of 300  $\mu$  A is:

for entire tube-----37.0kV

Maximum voltage difference between anode and focus electrode at which the X-radiation will not exceed 36pA/kg {0.5mR/h} is: -----30.0kV

COMPONENT CONSIDERATIONS: Please refer to the “common items of CRT”

The raster running preconditioning: Sixty minutes.

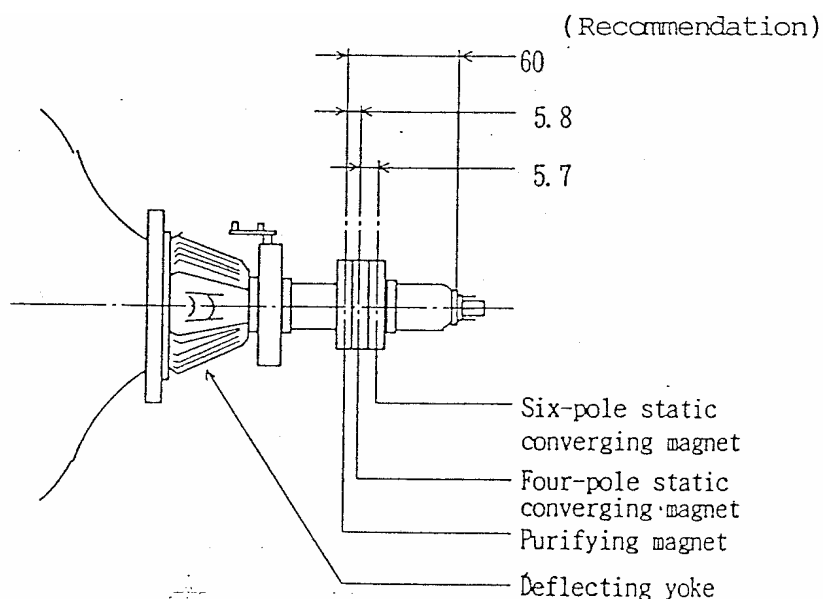
Deflection Yoke : TLY 25372F or equivalent

Purifying Magnet and

Static Converging Magnet: TLC2024-2S or equivalent

Fig.A RELATIVE PLACEMENT OF TYPICAL COMPONENTS

Dimensions in mm

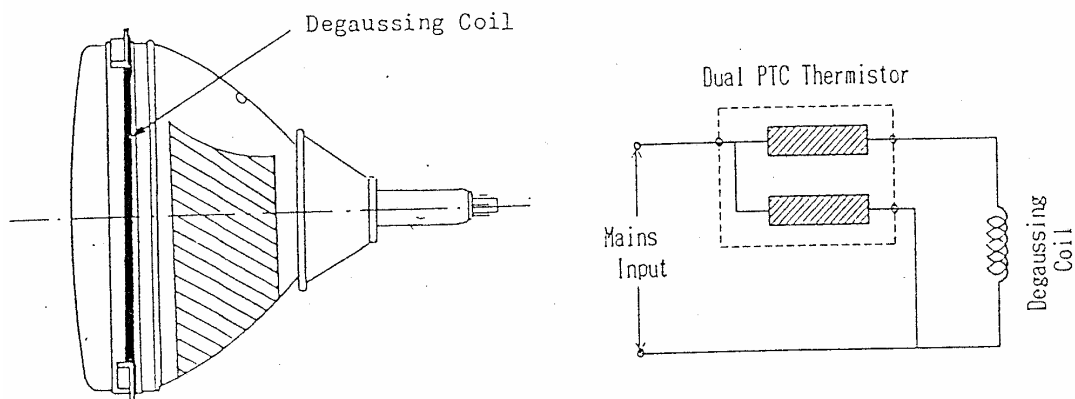


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DEGAUSSING SYSTEM

Requirement for the internal magnetic shield to function against ordinary magnetization at home (re-placing/move of receiver) is to give the degaussing coil an initial magnetomotive force of more than 1,400 peak-to-peak ampere-turns.

To avoid influence to beam landing or shaken image, residual magnetomotive force should be less than 0.7 peak-to-peak ampere-turns before vertical scan starts.

Location of Degaussing Coil

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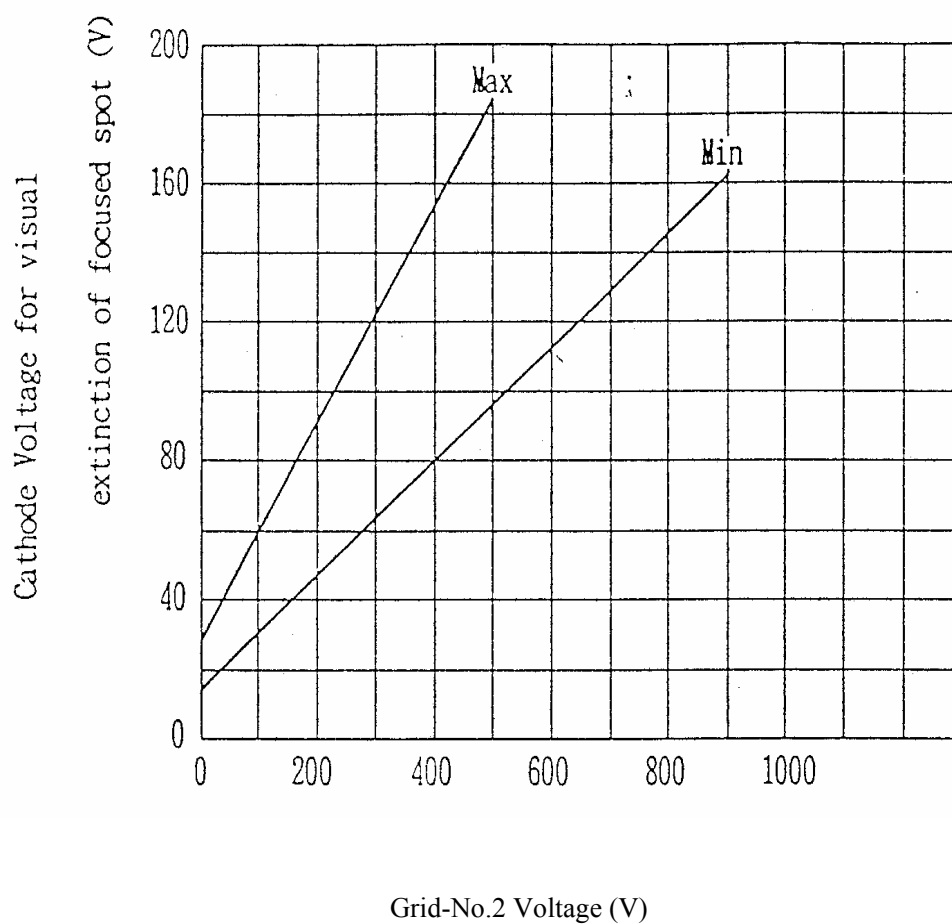


Fig.1 CUT-OFF DESIGN CHART

Heater Voltage: 6.0V

Anode Voltage: 20,000 to 30,000V

Grid-No.3 Voltage: adjusted for focus



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X-Radiation Characteristics

Fig.2 0.5mR/h Isoexposure-Rate Limit Curves

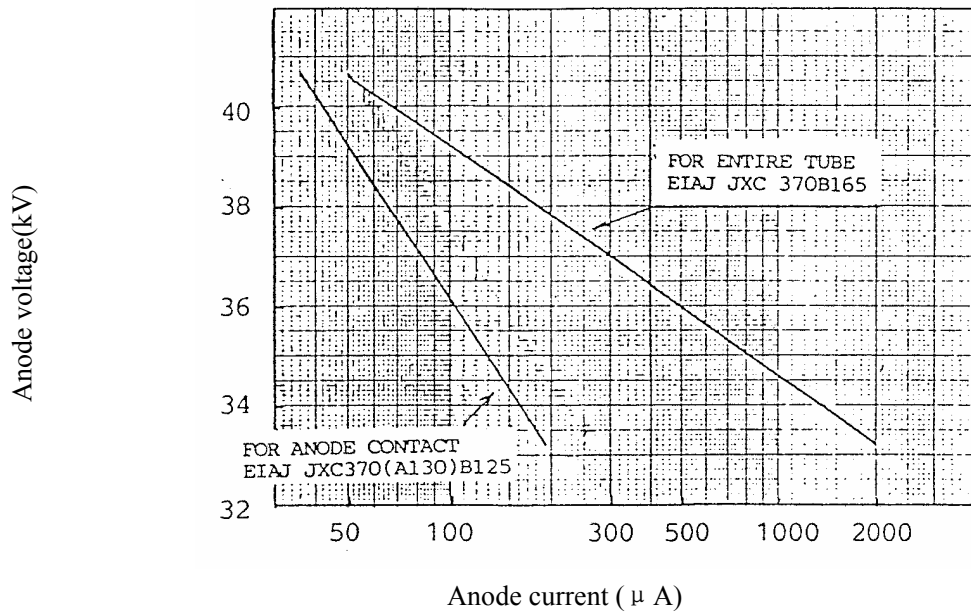
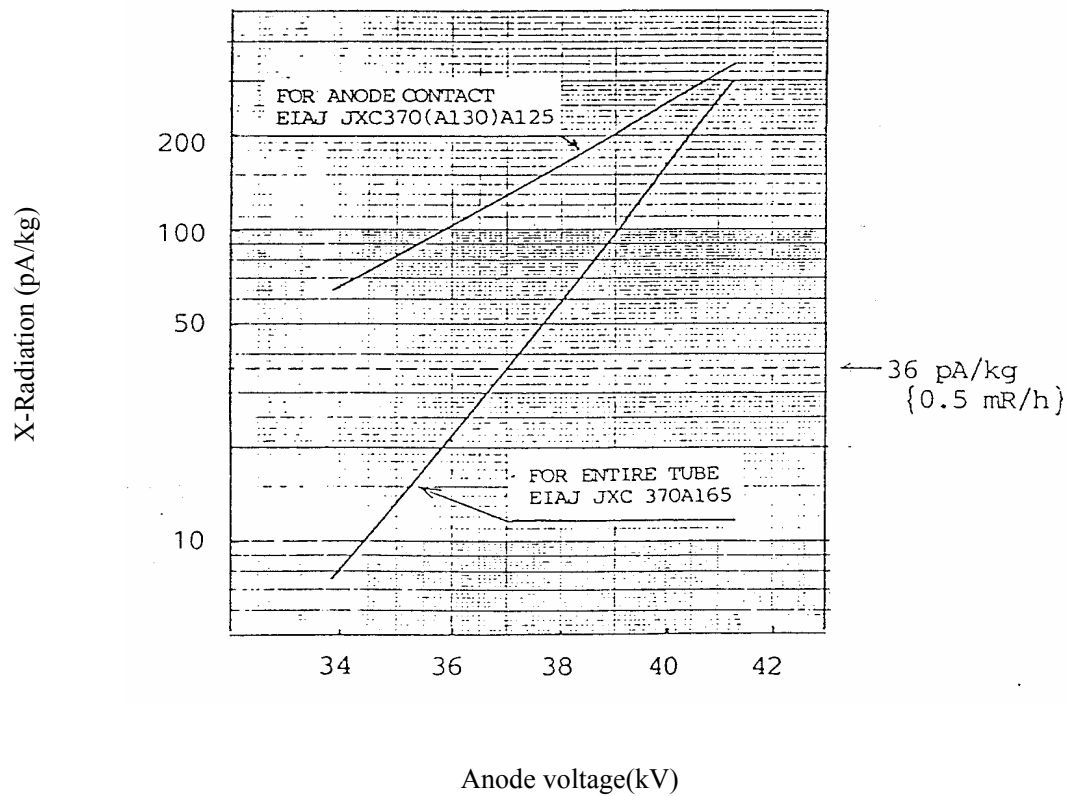
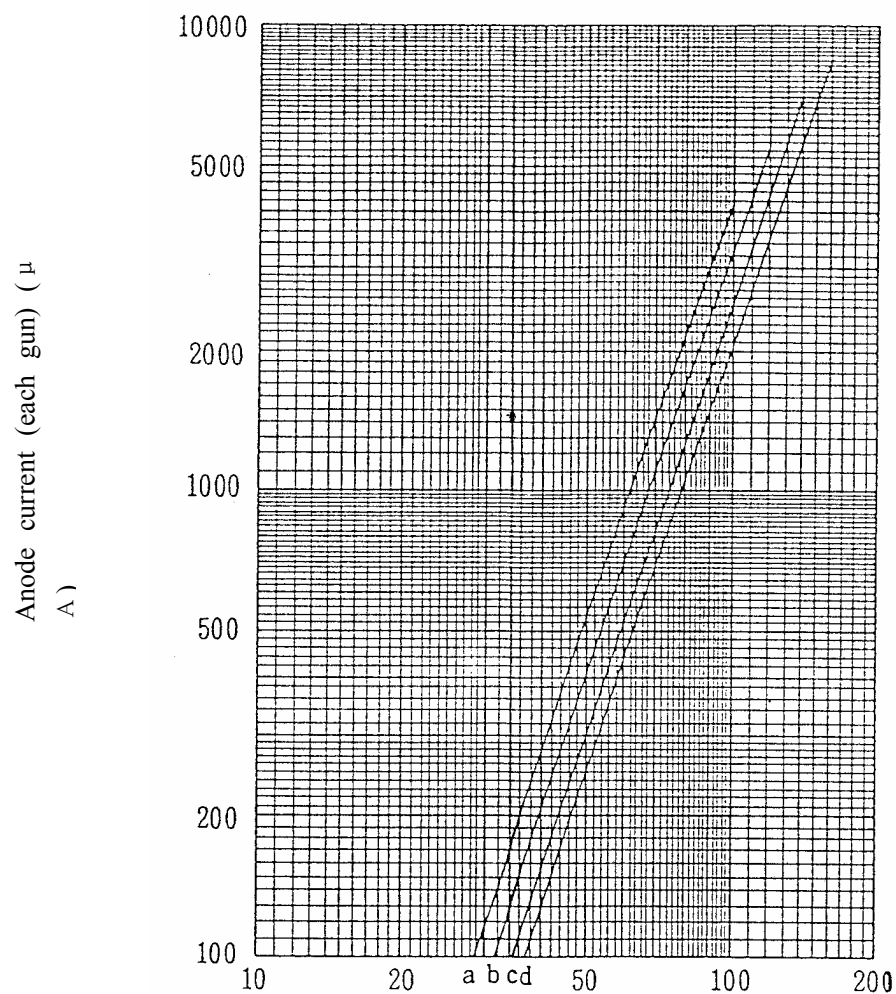


Fig.3 X-Radiation Limit Curves at a Constant Anode Current of 300 μA  
(X-Radiation at constant anode voltage varies linealy with anode current.)



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Fig.4 TYPICAL CATHODE DRIVE CHARACTERISTICS



Video drive volts from spot cut-off(V)

Anode voltage =20 to 30kV

Grid No.3 voltage=adjusted for focus

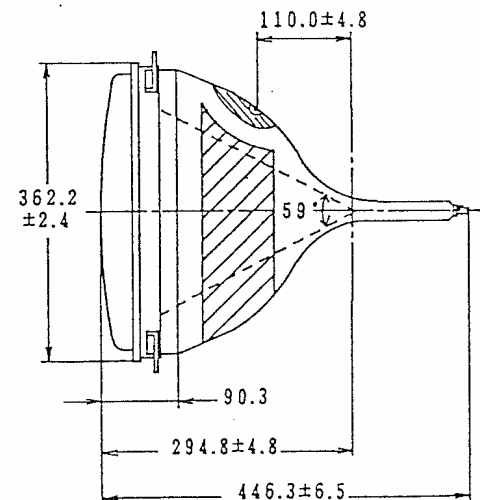
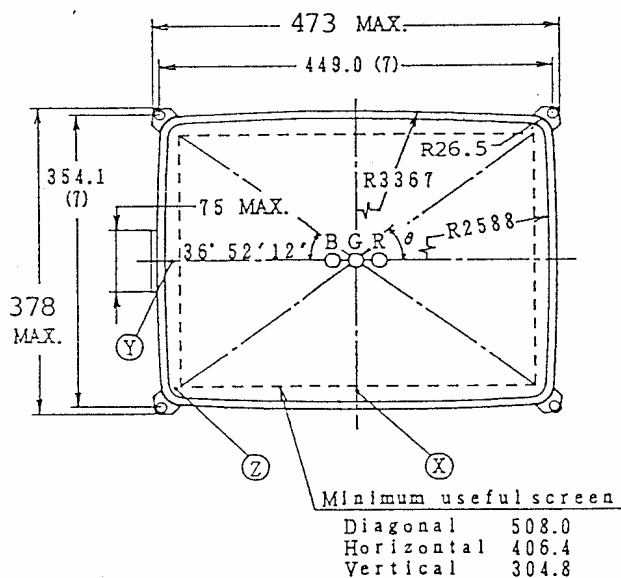
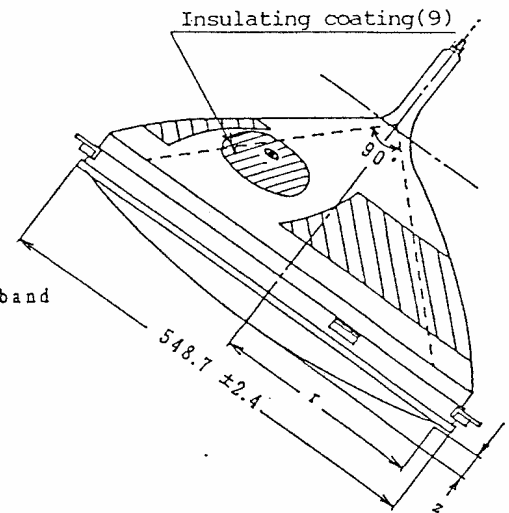
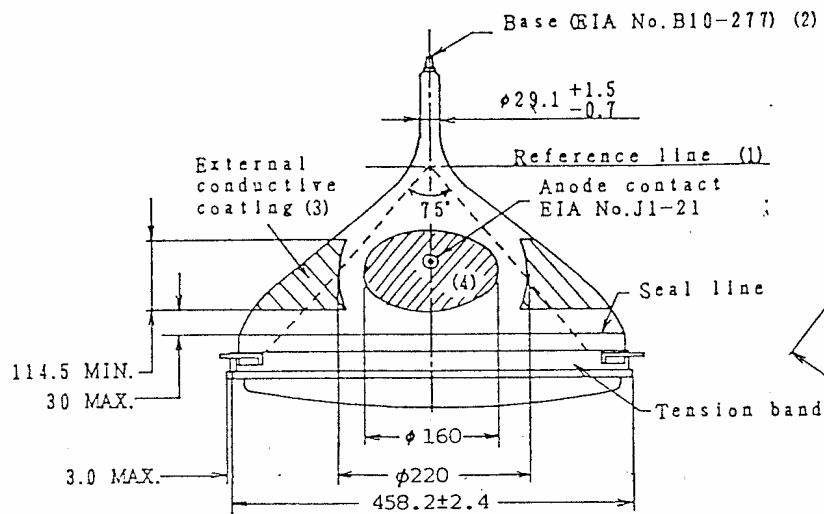
Grid No.2 voltage=adjusted to provide spot cut-off

- (a) at 100V spot cut-off voltage
- (b) at 120V spot cut-off voltage
- (c) at 140V spot cut-off voltage
- (d) at 160V spot cut-off voltage

Heater voltage=6.0V

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Dimensions in mm



$$Z = \frac{\sqrt{K(\theta)^2 + r^2} - K(\theta)}{B(\theta)}$$

$$B(\theta) = \sum_{i=0}^5 B_i \cdot \cos(2i \cdot \theta)$$

$$K(\theta) = \frac{1}{\sum_{i=0}^5 K_i \cdot \cos(2i \cdot \theta)}$$

$\theta$ : Angle from long axis

$K_0$	$1.4749552 \times 10^{-3}$	$B_0$	1.4864893
$K_1$	$3.2112317 \times 10^{-4}$	$B_1$	0.3898226
$K_2$	$-1.3490449 \times 10^{-3}$	$B_2$	-1.3564897
$K_3$	$-2.6322822 \times 10^{-4}$	$B_3$	-0.3198227
$K_4$	$2.4927790 \times 10^{-6}$	$B_4$	$3.3945400 \times 10^{-7}$
$K_5$	$1.6746850 \times 10^{-6}$	$B_5$	$8.0771000 \times 10^{-8}$

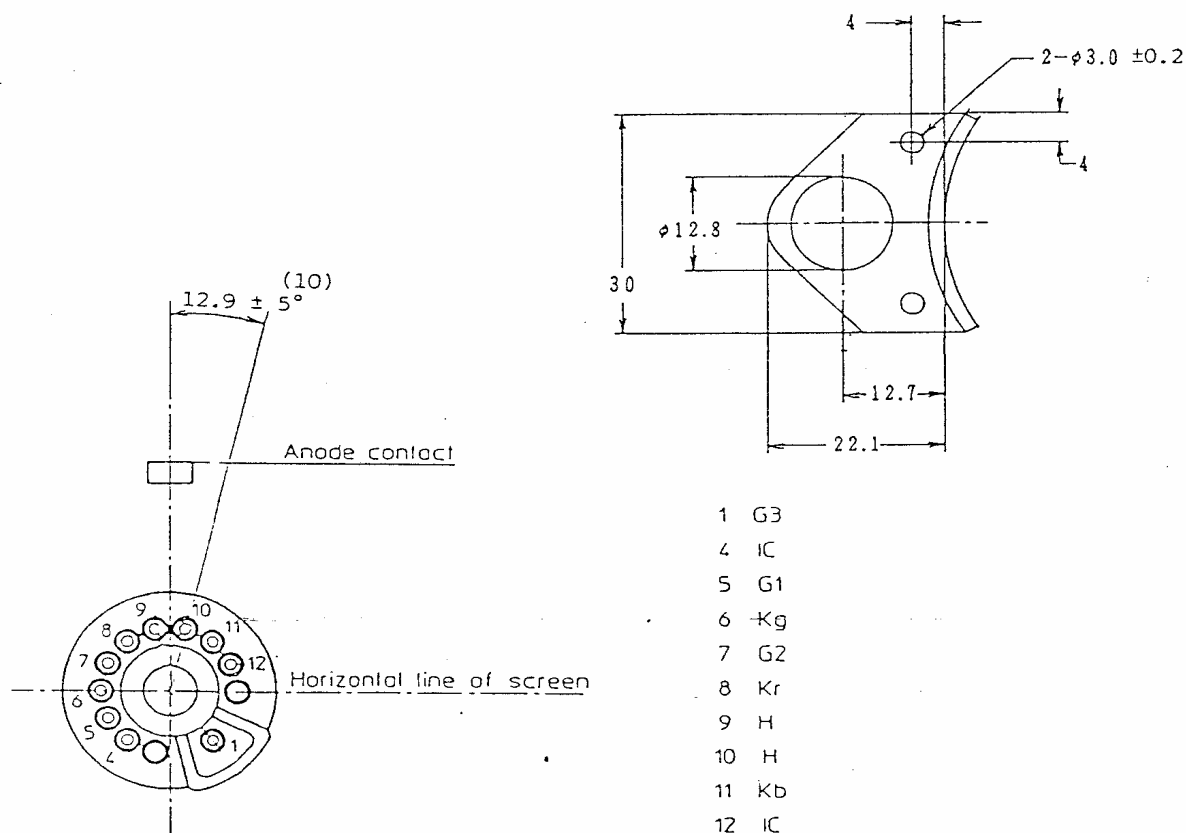
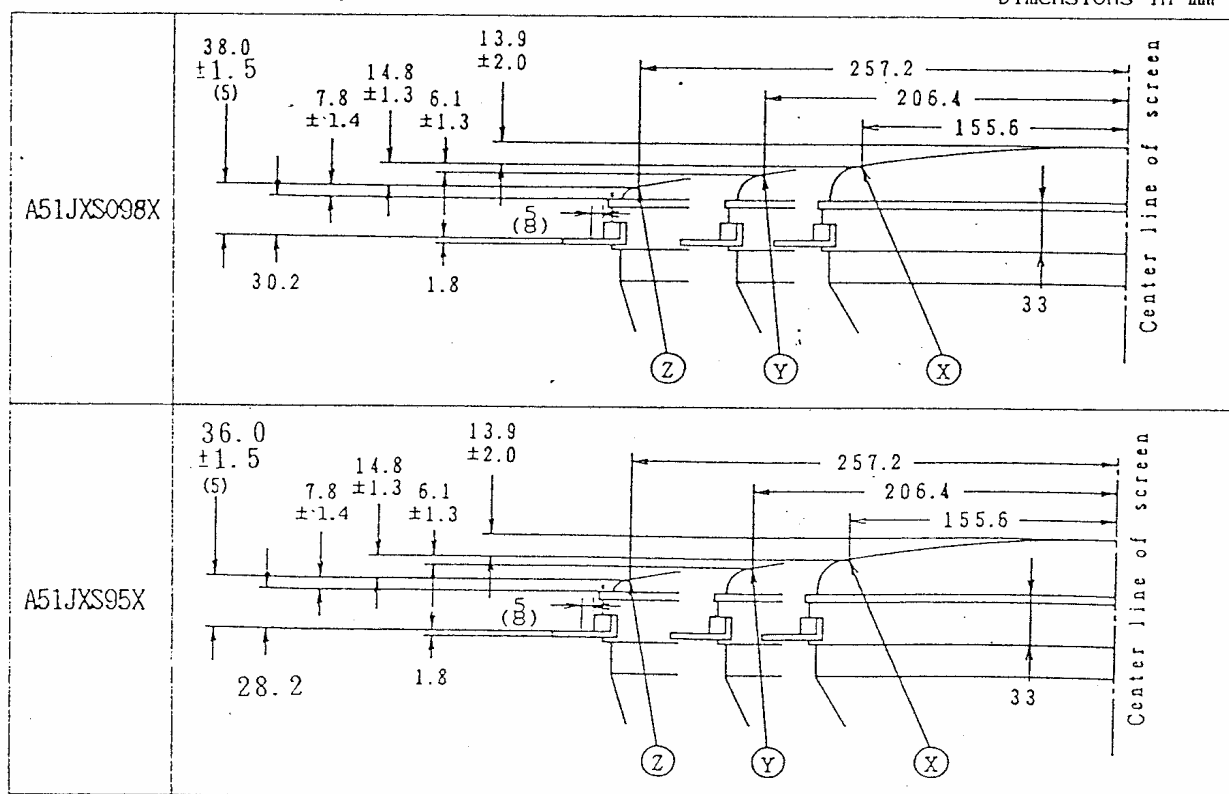
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Dimensions in mm



Bottom view of base

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NOTES: (concerning sheet 12,13)

- (1) Reference line, determined by the plane of the upper edge of the flange of the reference line gauge when the gauge is resting on the cone.(Reference line gauge EIAJ No. G-R90CJ4)
- (2) The socket for the base should not be rigidly mounted, it should have flexible leads and be allowed to move freely. Bottom circumference of the base will fall within a 55mm-dia.-circle concentric with the bulb axis.
- (3) Configuration of outer conductive coating optional, but must contain the contact area shown in the drawing.
- (4) This area must be kept clean, wipe only with soft dry lintless cloth.
- (5) The displacement of any lug with respect to the plane through the three other lugs is max. 1.0mm.
- (6) –
- (7) The mounting screws in the cabinet must be situated inside a circle of 5.6mm diameter drawn around the true geometrical positions, i.e. at the corners of a rectangle of 449.0mm×354.1mm.
- (8) Measuring point for the displacement from z-point lugs.
- (9) Minimum space to be reserved for transparent insulating coating.
- (10) The angle formed by the flat surface of the anode bottom's center and the pin No.10 through the bulb center axis.

The direction of angle is positive toward clock wise.

(Based on EIAJ ED-2131)

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