THOMSON MULTI MEDIA
THOMSON TUBES & DISPLAYS

A59EHJ13X38

DATA SHEET

Color Picture Tube

110° Deflection – 59 cm (23 V)
Medium Planar Color Picture Tube Assembly

- **Yoke and Neck Components Preset for Northern Hemisphere**
- **THOMSON MP – Low Energy 110° Planar**
- **Full Square Design**
- **AK Shadow Mask**
- **Saddle – Toroidal Yoke**
- **Lower Deflection Power**
- **VECTOR Gun – Precision In Line Gun**
  Optimized Beam – Forming Region for Improved Focus Uniformity and Improved Resolution
- **Standard 29 mm Neck Diameter**
- **Improved Convergence Performance**
- **Internal Magnetic Shield**
- **Other Features:**
  - **Matrix Contoured – Line Screen**
  - **Tinted Phosphor**
  - **Super Arch Mask**
  - **Soft Arc Technology**
  - **Integral Mounting Lugs**
- **Integral Tube Components**
- **Multistandard Mask**

THOMSON A59EHJ13X (23 V) 110_ Precision In-Line Color Picture Tube is one of new generation of color picture tubes. It offers the advantages of a full square screen format, while maintaining picture quality and tube performance compatible with modern demands.

The multi-element focus precision in-line electron gun features an XL (expanded diameter lens) for improved focus performance and increased beam spacing.

The expanded lens field, when combined with the fields from the individual apertures and the increased beam spacing, produce a superior lens for focus performance and less aberrations. Due to the improved thermal stability of the shadow mask incorporated in the Medium Planar Tube typical operating conditions can be increased, giving also higher brightness.

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PCP 00-097
Rev. 00

Printed in Poland

Electrical Data

Heater:
- Voltage . . . . . 6.3 V
- Current . . . . . 700 mA

Focusing Method . . . . . Electrostatic
Focus Lens . . . . . Bipotential
Convergence Method . . . . . Magnetic
Deflection Angles (approx.):
- Diagonal . . . . . 110 deg
- Horizontal . . . . . 97 deg
- Vertical . . . . . 80 deg

Direct Interelectrode Capacitance (approx.):
- Grid No. 1 to all other electrodes . . . . . 10.0 pF
- Grid No. 3 to all other electrodes . . . . . 5.0 pF
- Each cathode to all other electrodes . . . . . 6.5 pF
- All cathodes to all other electrodes . . . . . 14.0 pF

Capacitance Between Anode and External Conductive Coating (including metal hardware) . . . . . 2000 pF min.
Resistance Between Metal Hardware and External Conductive Coating . . . . . 50 MΩ min.
Magnetic Shield . . . . . Internal

Optical Data

Faceplate:
- Light transmittance at center (approx.) . . . . . 48.5 %
- Surface . . . . . Polished

Screen:
- Matrix . . . . . Black Opaque Material
- Type . . . . . Negative Guard Band

Phosphor, rare – earth (red), sulfide (blue & green) . . . . . Type X(1)
- Type . . . . . Selectively Absorbent
- Persistence . . . . . Medium Short

Array . . . . . Vertical Line Trios
Spacing between corresponding points on line trios at center (approx.) . . . . . 0.8 mm

Mechanical Data

Tube dimensions:
- Overall length . . . . . 403.50 ± 6.4 mm
- Reference Line to center of face . . . . . 249.88 ± 4.8 mm
- Neck length . . . . . 154.62 mm
- O.D. at tension band:
  - Diagonal . . . . . 635.50 mm max.
  - Horizontal . . . . . 524.50 mm max.
  - Vertical . . . . . 415.60 mm max.
- Minimum screen dimensions (projected):
  - Diagonal . . . . . 590.00 mm
  - Horizontal . . . . . 478.00 mm
  - Vertical . . . . . 363.00 mm
  - Area . . . . . 1722 cm^2

Bulb Funnel Designation . . . . . EIA No. J627A
Bulb Panel Designation . . . . . EIA No. F630B
Anode Bulb Contact Designation . . . . . EIA No. J1–21
Base and Pin Connection Designation (2) . . . . . EIA No. B10–277
Pin Position Alignment . . . . . Space Separating Pins 9 and 10 Aligns Approx. with Anode Bulb Contact
Operating Position, Preferred . . . . . Anode Bulb Contact on Top
Weight (approx.) . . . . . 20.5 kg

Implosion Protection

Type . . . . . Shrink–fit rimband

Maximum and Minimum Ratings, Absolute-Maximum Values

Absolute–Maximum Ratings are specified for reliability and performance purposes. X-radiation characteristics should also be taken into consideration in the application of this tube type.
Unless otherwise specified, voltage values are positive with respect to grid No. 1.

Anode Voltage . . . . . 29.9 kV max.
Anode Current Long-Term Average . . . . . 1000 μA max.
Grid No. 3 and 5 (focusing electrode) Voltage . . . . . 12 kV max.
Peak Grid No. 2 Voltage . . . . . 1850 V max.
Cathode Voltage:
- Positive bias value . . . . . 400 V max.
- Positive operating cutoff value . . . . . 200 V max.
- Negative bias value . . . . . 0 V max.
- Negative peak value . . . . . 2 V max.

Heater Voltage: (3)
- AC (rms) or DC value
  - Maximum value . . . . . 6.9 V
  - Minimum value . . . . . 5.7 V
- Peak pulse value . . . . . 50 V max.
- Surge value, during 15-second warm-up period (rms) . . . . . 9.5 V max.

Heater Cathode Voltage:
- Heather negative with respect to cathode:
- During equipment warm-up period not exceeding 15 seconds . . . . . 450 V max.
- After equipment warm - up period:
  - DC component value . . . . . .200 V max.
  - Peak value . . . . . 300 V max.

Heater positive with respect to cathode:
- DC component value . . . . . .100 V max.
- Peak value . . . . . 200 V max.

Limiting Circuit Values:
- Grid No. 3 circuit resistance . . . . . 70 MΩ max.
- Grid No. 2 circuit resistance . . . . . 5 MΩ max.

Typical Design Values (4) (for Anode Voltage of 27.5 kV)

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

Grid No. 3 (focusing electrode) voltage . . . . . 27 to 31 % of Anode Voltage
Grid No. 2 Voltage for Visual Extinction of Undeflected Focused Spot . . . . . .See CUT OFF DESIGN CHART in Fig. 5
- At cathode voltage of 150 V . . . . . 600 to 1100 V
- At cathode voltage of 200 V . . . . . 800 to 1500 V

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Printed in Poland

Maximum Ratio of Cathode Cutoff Voltages, Highest Gun to Lowest Gun (with grid No. 2 of gun having highest cathode voltage adjusted to give 150 V spot cutoff) 1.15
Heater Voltage (3) . . . . . 6.3 V
Grid No. 3 & Grid No. 5 Current (5) . . . . . ± 2 µA
Grid No. 2 Current . . . . . ± 2 µA
Grid No. 1 Current . . . . . ± 2 µA
To Produce White Light of . . . . . 9300 K + 27 M.P.C.D.
CIE coordinates:
X 0.281
Y 0.311
Percentage of total anode current supplied by each beam (average):
Red . . . . . 36 %
Blue . . . . . 30 %
Green . . . . . 34 %
Ratio of cathode currents:
Red/Blue:
Minimum 0.95
Typical 1.20
Maximum 1.45
Red/Green:
Minimum 0.81
Typical 1.06
Maximum 1.31
Blue/Green:
Minimum 0.68
Typical 0.88
Maximum 1.08
Raster Centering Displacement Measured at Center of Screen (6)
Horizontal . . . . . 0.0 ± 4.0 mm
Vertical . . . . . 0.0 ± 4.0 mm

Deflection Yoke Data (at 27.5 kV)

Yoke Type 59M1EPZ/56
L_H . . . . . 1.50 ± 4 % mH
R_H . . . . . 1.75 ± 7 % Ω
$I_{H\ p\text{-}p}$ . . . . . 4.76 A
L_V . . . . . 12.0 ± 7 % mH
R_V . . . . . 6.0 ± 7 % Ω
$I_{V\ p\text{-}p}$ . . . . . 1.73 A
Pincushion (7)
E/W . . . . . 9 % max.
N/S . . . . . Free

Yoke Connector

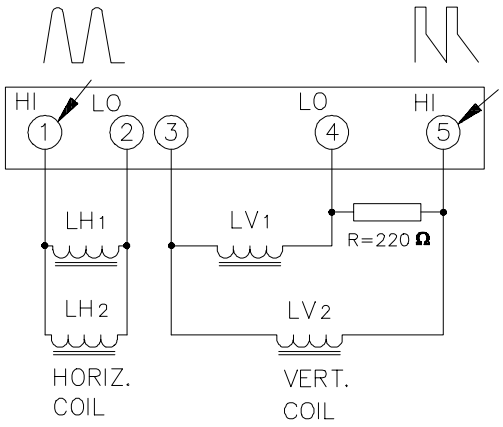

Fig. 1 Connection Diagram for Yoke (As viewed from rear of yoke)

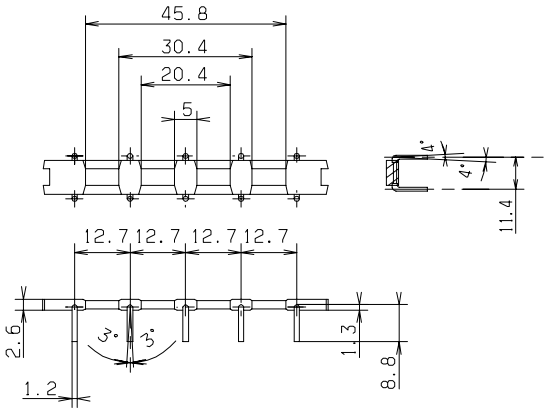

Fig. 2 Yoke Terminal Board

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X-Radiation Characteristics (8)

Operating within the absolute maximum rating,these color picture tubes do not emit X-Radiation above 0.1 mR/h, satisfying the international accepted dosage rate of 0.5 mR/h (at 5 cm from the cabinet) and the new German regulation (1 μSv/h at 10 cm from the glass).

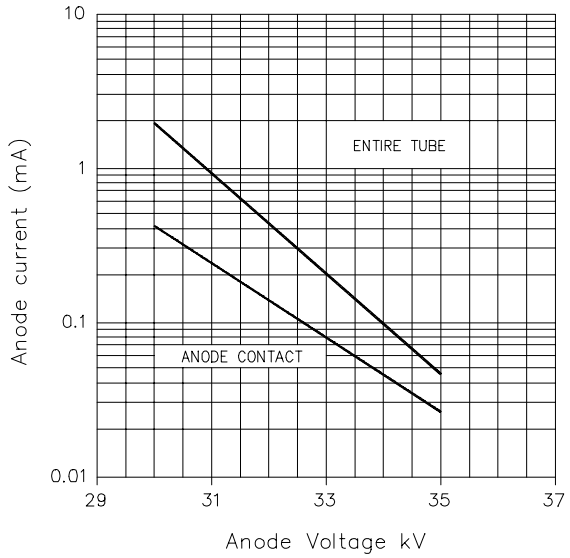

Fig. 3 0.1 mR/h Isoexposure - Rate Limit Curves

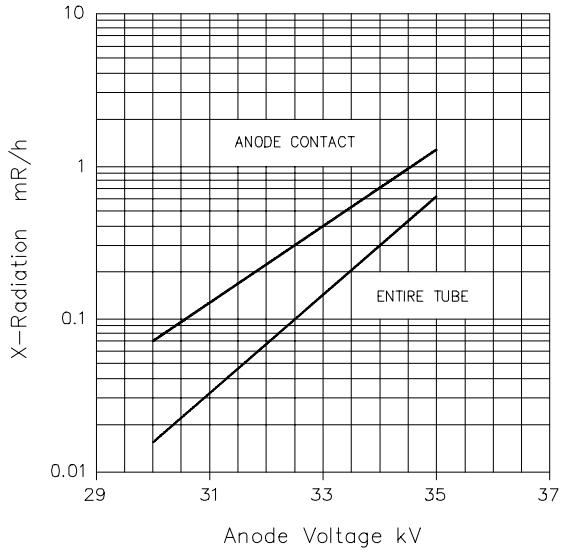

Fig. 4 X-Radiation Limit Curves at a Constant Anode Current of 300 μA (X-Radiation at a constant anode voltage varies linearly with anode current)

NOTES:

1. The X phosphor designation in the WTDS is equivalent to P22 in EIA type designation system.
2. For mating socket considerations, see Note 1 under Notes for Dimensional Outline.
3. For maximum tube life, the heater supply voltage should be regulated to minimize heater voltage changes due the variations in line voltage, beam current, and other parameters. The design center value of the heater voltage should be the Typical Design Value: however, in some applications it may be desirable to operate at a voltage slightly below this value. Cost considerations may suggest that the heater voltage be obtained from unregulated voltage varies with beam current, the circuit parameters should be selected so that the design center value of the heater voltage is equal to the Typical Design Value when the beam current is one-half of the Long Term Average Anode Current as shown in the tabulated data. The Absolute Maximum and Minimum Ratings should not be exceeded when including all variations.
4. The best tube performances are obtained under suggested operational condition.
5. A high source impedance in the focus circuit can result in a change in the focus voltage with a change in the grid No. 3 leakage current.
6. The design-center values are the values obtained when the tube is operated in an earth's magnetic field having a 420 mG vertical component and 0 mG cross axial horizontal component.
7. Typical values measured at a distance of 6 times picture height.
8. Measurements at 10 cm from the glass.

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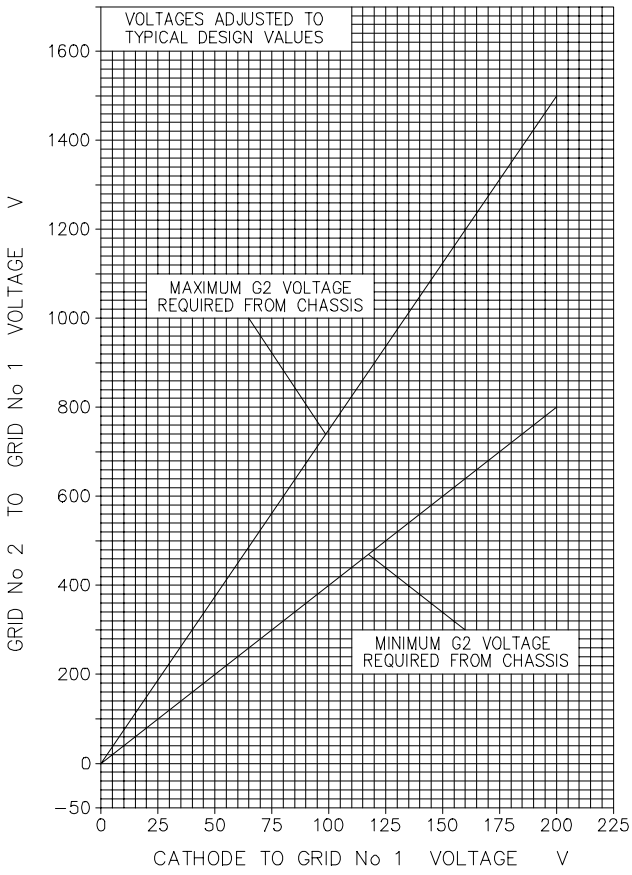
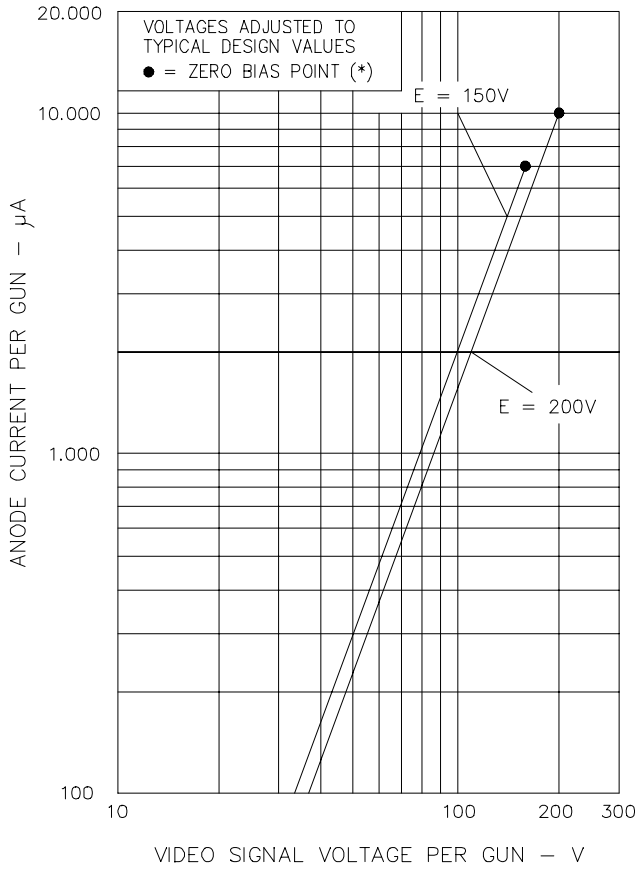
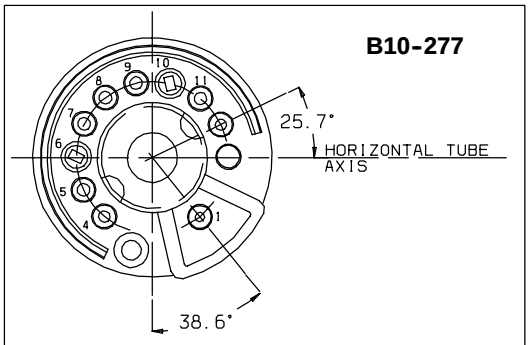


Fig. 5 Cutoff Design Chart



* Under normal operating conditions, the cathode voltages should not go within 10 volts relative to the grid No.1.

Fig. 6 Typical Drive Characteristics, Cathode – Drive Service



Basing Specifications EIA No. 13N

Pin	1	Grid No.3
Pin	4	IC (Do not use)
Pin	5	Grid No.1
Pin	6	Cathode of Green Beam
Pin	7	Grid No.2
Pin	8	Cathode of Red Beam
Pin	9	Heater
Pin	10	Heater
Pin	11	Cathode of Blue Beam

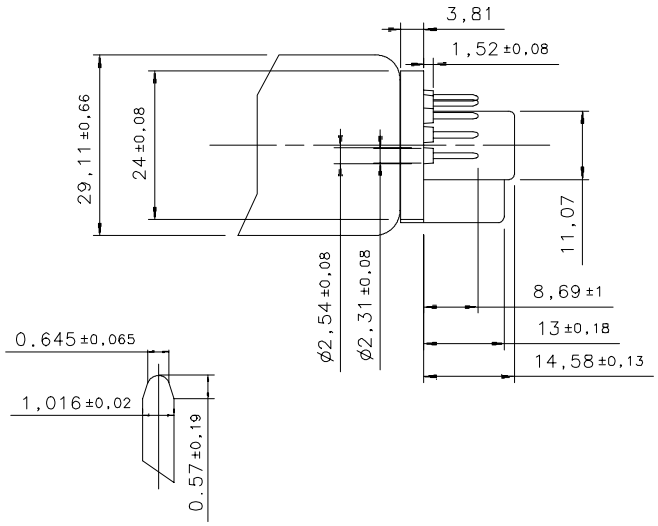


Fig. 7 Pin Connections and Rear View of Base

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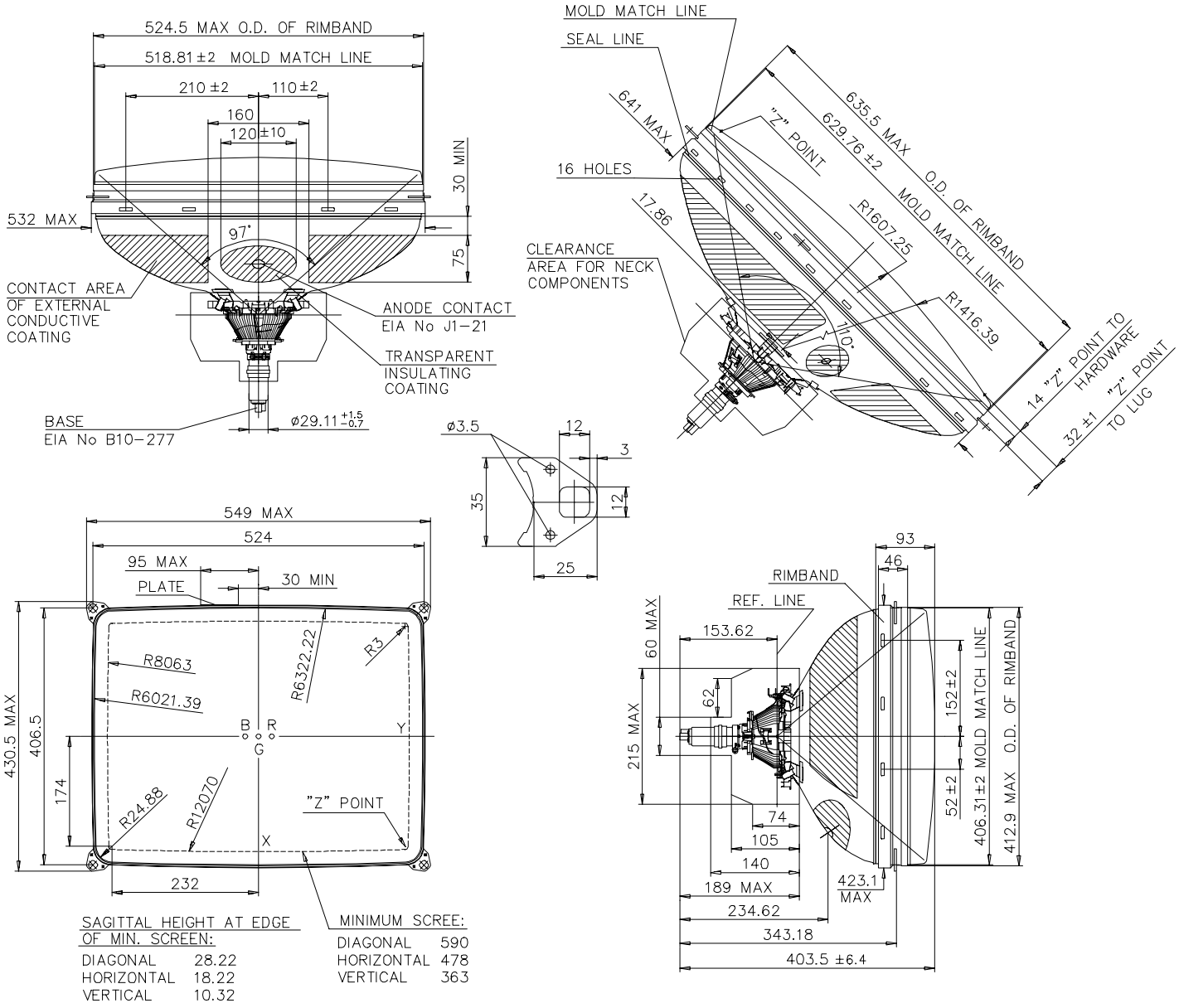

Fig. 8 Dimensional Outline

Dimensions in mm ounless otherwise specified

Notes for Dimensional Outline

Note 1 - Socket for the base should not be rigidly mounted: it should have flexible leads and be allowed to move freely.

Note 2 - The drawing shows the size and location of the contact area of the external conductive coating. The actual area of this coating will be greater than that of the contact area so as to provide the required capacitance. External conductive coating must be connected to chassis with multiple contacts.

Note 3 - To clean the faceplate, wipe only with soft, dry, lintless cloth.

Note 4 - "X", "Y", "Z" reference points are located on the outside surface of the faceplate at the intersection of the minimum published screen with the minor, major and diagonal axes, respectively.

Note 5 - The tolerance of the mounting lug holes will accommodate mounting screws up to 8.5 mm in diameter when the screws are positioned on the hole centers.

Note 6 - One of four brackets may deviate 1.5 mm max. from the plane of the other three.

Note 7 - The radius is to the outside of the glass at the mold-match -line and is intended to define the shape of the required cutout for "push-through" cabinet designs.

Note 8 - Mounting holes for degaussing coils 22.86 mm x 4.67 mm.

Note 9 - To facilitate cabinet design full size drawings and mecha-nical sample tubes are available on request.

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Convergence and purity

The yoke and other neck components are preassembled on the tube and factory preset for optimum performance.

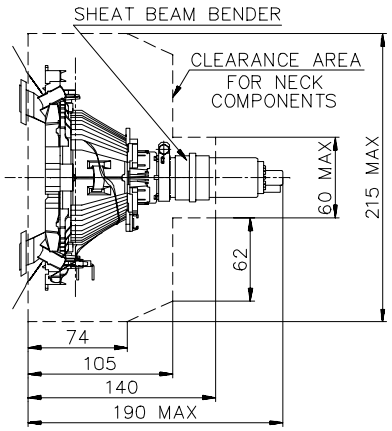


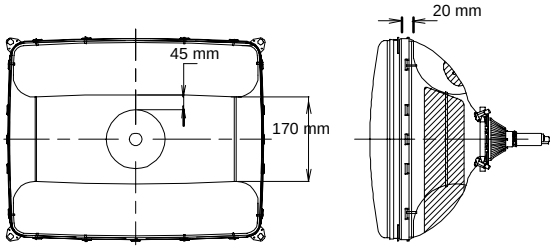
Fig. 9 Neck Component Detail

Degaussing Coils

Two different degaussing-coil arrangements can be incorporated in the TV receiver, top and bottom coils or twisted loop. Slots and bosses are provided in the rimband of the tube to facilitate mounting the degaussing coil(s) to the funnel.

Two-Coils, Top and Bottom System

The two coils should be symmetrically placed on the tube funnel as shown in Fig. 10.

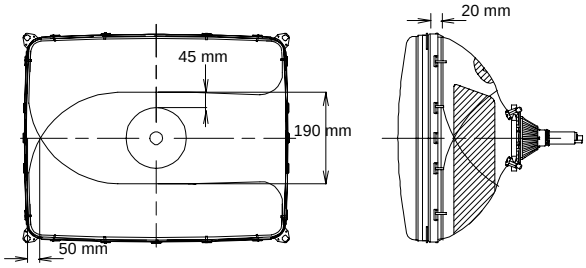


Coil circumference = 1480 mm approx.

Fig. 10 Relative Placement of Typical Top and Bottom Degaussing Coils

Twisted-Loop System

The twisted - loop coil should be placed on the tube funnel as shown in Fig. 11 to produce the same degaussing effect as the two coils system.



Coil circumference = 3150 mm approx.

Fig. 11 Relative Placement of Typical TwistedLoop Degaussing Coils

Degaussing Circuit

The degaussing circuit should provide a minimum of 1400 peak-to-peak ampere-turns (AT) in the degaussing coil(s). This current must decay in a gradual manner such that, at least 50% of the initial amplitude still flows after 5 cycles. In addition, at the completion of the degaussing cycle the residual current in the coil(s) must not exceed 1.0 peak-to-peak AT. With any degaussing circuit it is necessary to eliminate interactions which occur between the deflection yoke fields and the degaussing coil(s). The induced current can be minimized by careful positioning of the degaussing coil(s). For this reason, and in order to achieve optimal degaussing recovery, coil placement should follow the recommendations shown in Fig. 10 or Fig. 11. This will provide a minimum distance of 45 mm measured from the yoke. If the level of the induced horizontal frequency current is not reduced to an acceptable level by coil positioning, the degaussing coils should be shunted with a suitable capacitor.

Degaussing Procedures

After installation of the picture tube into the receiver cabinet on the production line, the complete receiver should be externally degaussed by a minimum degaussing field of 20 gauss at center of the coil. During the external degaussing, the receiver should be in an "off" condition or in an "on" condition with the vertical scan removed and the mains input to the internal degaussing circuit disconnected. In this latter case, the internal degaussing circuit must be reconnected after the external degaussing process is completed. The external degaussing procedure should be followed by the receiver's internal degaussing in the normal manner.

High Voltage Discharge Protection

The high-resistance internal coating incorporated in soft-arc picture-tube designs significantly reduces the peak energy during a high-voltage discharge. In spite of this and other improvements, high-voltage discharges are still capable of initiating ionized paths, both internal and external to the tube, that can couple high-energy low-voltage sources to the picture tube and associated circuit elements. These high-energy sources can cause varying degrees of picture-tube and/or circuit damage. With any color picture tube, maximum product reliability is obtained through the use of spark gaps with proper grounding, series isolation resistors, and good printed circuit board layouts. Spark gaps to ground should be connected to all socket contacts except as noted below for the heater circuits. The ground points for the focus-electrode spark gap and the low-voltage spark gaps should be connected with a heavy non inductive strap to a good grounding contact on the picture-tube external conductive coating. The focus-electrode spark gap should be designed to break down at a DC value of approximately 1.5 times the maximum design voltage of the focus circuit. The low-voltage spark gaps should be designed for a DC breakdown voltage of < 2.0 kV.

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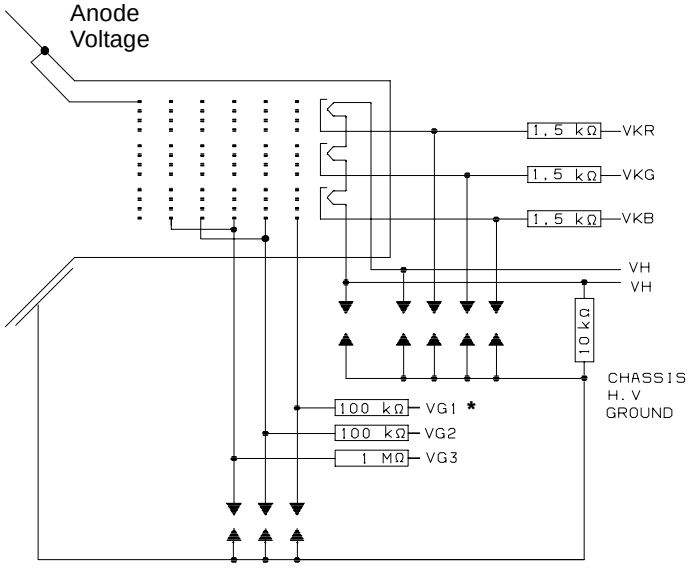
The high-voltage circuit chassis ground point should be connected to the low-voltage spark-gap ground at the picture-tube socket. It is recommended that no other connections be made between the picture-tube external conductive coating and grounds of the main chassis or spark gaps. This will minimize circulating currents in the chassis during high-voltage discharge. Isolation resistors should be used in series with each grid and cathode lead. The resistance values should be as high as possible without degrading circuit performance (see Fig. 12). These resistors should be capable of withstanding an instantaneous application of 12 kV for the low-voltage circuits and 20 kV for the focus circuit without arcing over, arcing through the body, or significantly changing in resistance value during repeated applications of these voltages. Most half-watt carbon composition resistors are suitable for the low-voltage circuits and most one-watt carbon composition resistors are suitable for the focus circuit. Use of these resistors reduces the possibility o*f circulating currents in the chassis and excessive currents in the picture-tube elements. For best reliability, the heater circuit should be isolated from chassis ground and/or voltage sources by a minimum resistance of 10 kΩ. Spark gaps should be connected to both heater-socket contacts. These spark gaps should have the same characteristics as the otherlow-voltage spark gaps.



* If a G_1 bias voltage source is used, the isolation resistor and spark gap is required. Direct grounding of the G_1 to the low voltage spark gap ground at the tube socket is permissible. In this case, a G_1 spark gap is not required.

Fig. 12 Picture Tube Connections Showing Spark-Gaps Recommendations and Typical Isolation-Resistor Values

When the heater voltage is supplied from an isolated source, such as the horizontal deflection circuit or another high-frequency pulse source, a capacitor may be required between one side of the heater and ground to eliminate undesirable interference on the picture-tube screen. If a capacitance value in excess of 0.01 μF is required, the spark gaps to the heater leads should not be used. Very reliable performance can also be obtained with nonisolated heater circuits. In these cases, only the high side of the heater circuit needs a spark gap. Printed circuit board and socket designs which inherently provide spark gaps for both heater leads are also satisfactory.

WARNING

X - Radiation

These color picture tubes do not emit X-radiation above the dosage rate of 0.1 mR/h if it is operated within the Absolute Maximum Ratings.

Implosion Protection

These picture tubes employ integral implosion protection and must be replaced with tubes of the same type number or a recommended replacement to assure continued safety.

Shock Hazard

The high voltage at which the tubes are operated may be very dangerous. Design of the TV receiver should include safeguards to prevent the user from coming in contact with the high voltage. Extreme care should be taken in the servicing or adjustment of any high voltage circuit.
Caution must be exercised during the replacement or servicing of the picture tube since a residual electrical charge may be contained on the high voltage capacitor formed by the external and internal conductive coatings of the picture tube funnel. To remove any undesirable residual high-voltage charge from the picture tube, "bleed-off" the charge by shorting the anode contact button, located in the funnel of the picture tube, to the external conductive coating before handling the tube. Discharging the high voltage to isolated metal parts such as cabinets and the control brackets may produce a shock hazard. Contact to the external conductive coating should be made by multiple fingers to prevent possible damage to the tube from localized overheating due to poor contact.

Mounting

Integral mounting lugs are provided to facilitate mounting the A59EHJ13X in the receiver. If the integral mounting system is accessible in the receiver it is recommended that it be connected to the receiver chassis through one of the mounting lugs. If the chassis is not at earth potential the connection should be made through a current limiting resistor (1MΩ).
The color receiver mounting system should incorporate sufficient cushioning so that under normal conditions of shipment or handling an impact force of more than 35 g is never applied to the picture tube.

Tube Handling

Picture tubes should be kept in the shipping box or similar protective container until just prior to installation. Wear heavy protective clothing, including gloves and safety goggles with side shields, in areas containing unpacked and unprotected tubes to prevent possible injury from flying glass in the event a tube breaks. Handle the picture tube with extreme care. Do not strike, scratch or subject the tube to more than moderate pressure. Particular care should be taken to prevent damage to the seal area. The picture tube assembly should never be handled by the neck, yoke or other components.

General

It is the sole responsibility of the manufacturer of television receivers and other equipment utilizing this color picture tube assembly to provide protective circuitry and design in the event of failure or this color picture tube assembly.
The equipment manufacturer should provide a warning label in an appropriate position on the equipment to advise the serviceman of all safety precautions.

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