Electronic Industries Association

Announcement

of

Device Type Registration

Release No. 7241

April 3, 1995

The Electronics Industries Association announces the registration of the following device designations:

A68AD25X01
A68ADT25X02
A663DT15X06

according to the attached data sheets. The sponsor is:

RCA/Thomson

Lancaster, PA

2500 Wilson Boulevard • Arlington, Virginia 22201-3834 • (703) 907-7500 • FAX (703) 907-7501

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RCA

Color Picture Tube
A68ADT25X01

68 cm (27V) 111° Pin-Free Precision In-Line Color Picture Tube Assembly

- **Factory Adjusted Yoke and Neck Components**
- **New Dark-Glass Faceplate – Improved Contrast**
- **COTY-FS – Full Square – Straight Sides and Square Corners**
- **Saddle/Toroidal Yoke – Lower Deflection Power Fully Pincushion Corrected**
- **XL Bipotential Precision In-Line Gun – Optimized Beam-Forming Region for Excellent Focus Uniformity and Good Resolution**
- **Standard 29 mm Neck Diameter – Proven Reliability**
- **Excellent Convergence and Register Performance**
- **Other Features –**
  - **Matrix Line Screen**
  - **Internal Magnetic Shield**
  - **Super-Arch Mask**
  - **Soft-Arc Technology**
  - **Integral Mounting Lugs**

RCA A68ADT25X01 is a 68 cm (27V) 111° Pin-Free Precision In-Line Color Picture Tube Assembly. It features a new dark-glass faceplate for improved contrast. The yoke provides full correction for pincushion distortion. All neck components are assembled on the tube and factory adjusted for optimum performance. The COTY-FS features screen edges that are straight and form square corners – a true rectangle.

The bipotential precision in-line electron gun features an expanded diameter lens (XL). The expanded lens field encompasses all three beams and when combined with the fields from the individual apertures it produces a superior lens for focus performance with less aberrations than a standard gun. In this case the neck diameter, not the beam spacing, limits the focusing ability. Convergence performance is improved by the reduced beam spacing.

Picture Tube Data

Electrical Data

Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Preadjusted)	
Deflection Angles (approx.):		
Diagonal	111	deg
Horizontal	94	deg
Vertical	74	deg
Direct Interelectrode Capacitances (approx.):		
Grid no. 1 to all other electrodes	11	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	pF
Capacitance Between Anode and External Conductive Coating (including metal hardware):		
Maximum value	2700	pF
Minimum value	2200	pF
Resistance Between Metal Hardware and External Conductive Coating	50 min.	MΩ
Deflection Yoke (factory preset)	RCA No. 2G27012-01A	
Magnetic Shield	Internal	

Optical Data

Faceplate:	
Light transmittance at center (approx.)	39.4%
Surface	Polished
Screen	Matrix
Phosphor, rare-earth (red), sulfide (blue & green)	Type X
Persistence	Medium Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios at center (approx.)	0.87 mm

Formerly Developmental Type RCA J20969

Mechanical Data

Tube Dimensions:
- Overall length .... 441.95 ± 6.35 mm
- Reference line to center of face .... 297.93 ± 4.78 mm
- Neck length .... 144.02 ± 4.78 mm
- O.D. at shrinkband:
  - Diagonal .... 715.72 ± 2.36 mm
  - Horizontal .... 591.52 ± 2.36 mm
  - Vertical .... 468.73 ± 2.36 mm
- Minimum screen dimensions (projected):
  - Diagonal .... 675.01 mm
  - Horizontal .... 540.01 mm
  - Vertical .... 405.01 mm
  - Area .... 2187 sq cm

Bulb Funnel Designation .... EIA No. J704B
Bulb Panel Designation .... EIA No. F708D
Anode Bulb Contact Designation .... EIA No. J1-21
Base and Pin Connection Designation [1] .... EIA No. B9-297-AH
Pin Position Alignment .... Space Separating Pins 9 and 10 Aligns Approx. with Anode Bulb Contact
Operating Position, Preferred .... Anode Bulb Contact on Top
Gun Configuration .... Horizontal In Line
Weight (approx.) .... 25.5 kg

Implosion Protection

Type .... Shrinkband

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:		
Maximum value	32	kV
Anode Current:		
Long-Term Average	1500 max.	µA
Short-Term Average (beam limiter)	2000 max.	µA
Grid-No. 3 (focusing electrode) Voltage	12 max.	kV
Peak Grid-No. 2 Voltage	1850 max.	V
Cathode Voltage:		
Positive bias value	400 max.	V
Positive operating cutoff value	275 max.	V
Negative bias value	0 max.	V
Negative peak value	2 max.	V
Heater Voltage: [2]		
AC (rms) or DC:		
Maximum value	6.9	V
Minimum value	5.7	V
Peak pulse value	50 max.	V
Surge value, during 15-second warm-up period (rms)	9.5 max.	V
Heater-Cathode Voltage:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	V
After equipment warm-up period:		
DC component value	300 max.	V
Peak value	350 max.	V
Heater positive with respect to cathode:		
DC component value	100 max.	V
Peak value	200 max.	V

Typical Design Values (for anode voltage of 25 kV)

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

Grid-No. 3 (focusing electrode) Voltage .... 23 to 27% of Anode Voltage

Grid-No. 2 Voltage for Visual Extinction of Undeflected Focused Spot .... See CUTOFF DESIGN CHART in **Figure 1**
- At cathode voltage of 150 V .... 420 to 820 V
- At cathode voltage of 200 V .... 575 to 1105 V
  - Under normal operating conditions, the cathode voltages should not go within 10 volts relative to the grid-no. 1.

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) 1.25
Heater Voltage [2] .... 6.3 V
Grid-No. 3 Current [3] .... ± 3 µA
Grid-No. 2 Current .... ± 3 µA
Grid-No. 1 Current .... ± 5 µA
To Produce White Light of 9300 K + 0 M.P.C.D.
CIE Coordinates:
- X 0.285
- Y 0.294

Percentage of total anode current supplied by each beam (average):
- Red .... 38 %
- Blue .... 30 %
- Green .... 32 %

Ratio of cathode currents:
- Red/blue:
  - Minimum 0.95
  - Typical 1.25
  - Maximum 1.65
- Red/green:
  - Minimum 0.91
  - Typical 1.20
  - Maximum 1.58
- Blue/green:
  - Minimum 0.73
  - Typical 0.96
  - Maximum 1.27

Raster Centering Displacement Measured at Center of Screen: [4]
- Horizontal .... 0 ± 5.0 mm
- Vertical .... 0 ± 3.0 mm

Deflection Yoke Data

Maximum Ratings, Absolute-Maximum Values

Peak Pulse Voltage Across Horizontal Coils at 15,750 Hz for a Maximum Pulse Duration of 12 µs .... 1400 max. V

Peak Pulse Voltage Across Vertical Coils at 60 Hz for a Maximum Pulse Duration of 0.7 ms .... 200 max. V

Peak Pulse Voltage Between Horizontal and Vertical Coils at 15,750 Hz for a Maximum Pulse Duration of 12 µs .... 1400 max. V

Care must be exercised when designing the deflection circuits so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is never exceeded.

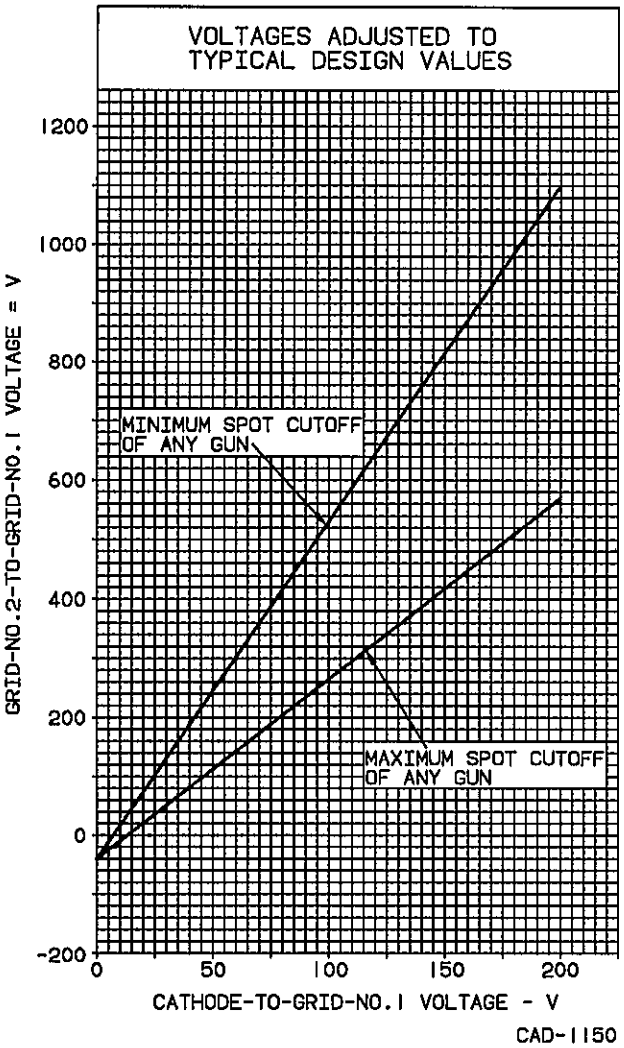
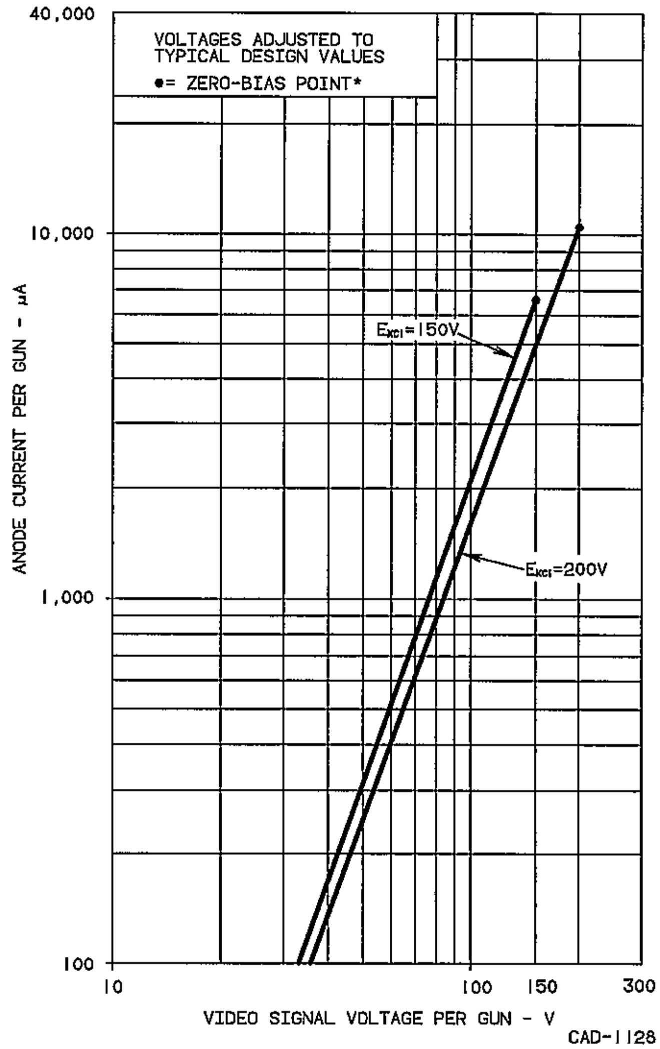


Figure 1 – Cutoff Design Chart



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

Figure 2 – Typical Drive Characteristics, Cathode-Drive Service

Typical Yoke Design Values

Horizontal Deflection Coils:
Parallel-Connected:
Inductance at 1 V rms and 1 kHz .... 1.30 ± 5% mH
Resistance at 25° C .... 1.40 ± 10% Ω
Typical operation with edge-to-edge scan at 25 kV:
Peak-to-peak deflection current .... 4.86 A
Stored energy .... 3.83 mJ
Vertical Deflection Coils:
Series-Connected:
Inductance at 1 V rms and 1 kHz .... 17.60 ± 10% mH
Resistance at 25° C .... 5.60 ± 10% Ω
Typical operation with edge-to-edge scan at 25 kV:
Peak-to-peak deflection current .... 1.63 A
Peak dissipation .... 3.70 W
Raster Pincushion Distortion at a Distance 5 Times the Picture Height: [5]
East / West .... 0 ± 1.5%
North / South .... − 1.00 ± 1.5%

Yoke Connector

This tube is supplied without yoke connectors or lead harness assembly. The following manufacturers are suggested as having the capability of making suitable connector parts. The listing of these manufacturers shall not be construed as giving approval for connectors supplied by these manufacturers. Approval criteria must be established by the individual receiver manufacturer. The set manufacturer may also choose to directly attach a lead harness assembly to the yoke terminals.

AMP, Inc.
Box 3608
Harrisburg, PA 17105–3608
(800) 522-6752
or (717) 564–0100

Molex, Inc.
2222 Wellington CT
Lisle, IL 60532
(708) 969-4550

Cinch Connectors
Division of Labinal Components & Systems, Inc.
1501 Morse Ave.
Elk Grove Village, IL 60007
(708) 981-6000

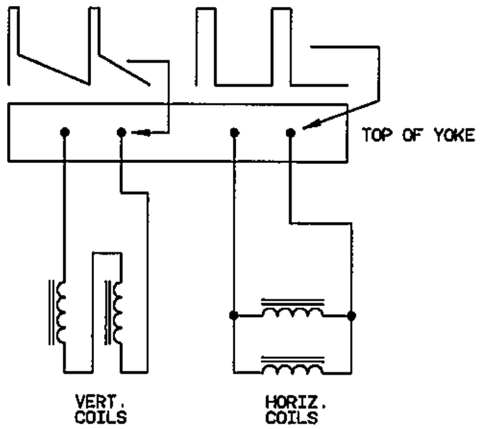


Figure 3 – Connection Diagram For Yoke (as viewed from top rear of yoke)

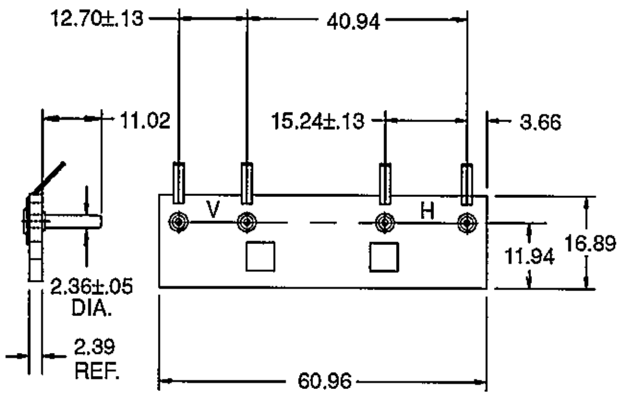


Figure 4 – Yoke Terminal Board

1. For mating socket considerations, see Note 1 under Notes for Dimensional Outline.
2. For maximum tube life, the heater supply voltage should be regulated to minimize heater voltage changes due to variations in line voltage, beam current, and other parameters. The heater voltage should be 6.3 V (within a measurement accuracy of ± 0.1 V). 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 an unregulated source. If this option is chosen and the unregulated voltage varies with beam current, the circuit parameters should be selected so that the heater voltage is 6.3 V (within a measurement accuracy of ± 0.1 V) when the beam current is one-half of the Long-Term Average Anode Current as shown in the tabulated data. The operating conditions should be such that the Absolute-Maximum and Minimum Ratings can never be exceeded when including all variations. Long-term operation at or near the Absolute-Maximum limit will substantially reduce tube life.

   For specific considerations, consult your Thomson Consumer Electronics representative.
3. 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.
4. Measurements are taken with the tube operating with recommended components and procedures, and in a magnetic field having a 470 mG vertical component and a zero cross-axial horizontal component.
5. Measured in accordance with IEC Recommendation – Publication 107 – 1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmission.

X-Radiation Characteristics

These measurements are made in accordance with the procedure of EIA Standard RS-503.

A picture tube should never be operated beyond its Absolute-Maximum Ratings (such operation may shorten tube life or have other permanent adverse effects on its performance).

The x-radiation emitted from this picture tube will not exceed 0.5 mR/h for anode voltage and current combinations given by the isoexposure-rate limit curves as shown in **Figure 5**. Operation above the values shown by the curves may result in failure of the television receiver to comply with the Federal Performance Standard for Television Receivers, Part 1020 of Code of Federal Regulations, Title 21, Chapter I, Subchapter J. Maximum x-radiation as a function of anode voltage at 300 µA anode current is shown by the curves in **Figure 6**. X-radiation at a constant anode voltage varies linearly with anode current.

From These Curves, Maximum Anode Voltage at Which the X-Radiation Emitted Will Not Exceed 0.5 mR/h at an Anode Current of 300 µA:
For entire tube .... 38.5 kV*

Maximum Voltage Difference Between Anode and Focus Electrode at Which the X-Radiation Emitted Will Not Exceed 0.5 mR/h .... 35 kV

WARNING: If the voltage value shown above can be exceeded in the receiver, additional attenuation of the x-radiation through the tube neck may be required.

*This rating applies only if the anode connector used by the receiver manufacturer provides the necessary attenuation to reduce the x-radiation from the anode bulb contact by a factor equivalent to the difference between the anode bulb contact isoexposure-rate limit curve (**Figure 5**) and the isoexposure-rate limit curve for the entire tube.

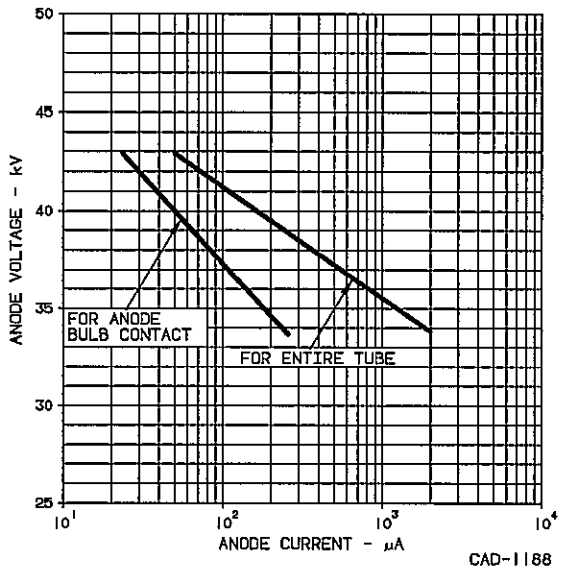


Figure 5 – 0.5 mR/h Isoexposure-Rate Limit Curves

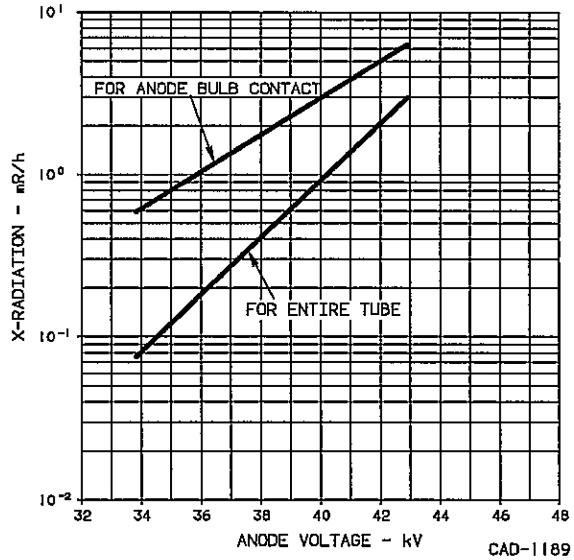


Figure 6 – X-Radiation Limit Curves at a Constant Anode Current of 300 µA (x-radiation at a constant anode voltage varies linearly with anode current)

Sagittal Heights With Reference to Centerface at the Edge of the Minimum Screen.

Location	Coordinates X mm	Coordinates Y mm	Sagittal Height mm
Minor Axis	0.00	202.50	18.17
	25.40	202.50	18.53
	50.80	202.50	19.60
	76.20	202.50	21.36
	101.60	202.50	23.76
	127.00	202.50	26.79
	152.40	202.50	30.42
	177.80	202.50	34.65
	203.20	202.50	39.49
	228.60	202.50	44.94
	254.00	202.50	51.03
Diagonal	270.00	202.50	55.21
	270.00	177.80	50.52
	270.00	152.40	46.32
	270.00	127.00	42.76
	270.00	101.60	39.83
	270.00	76.20	37.56
	270.00	50.80	35.93
	270.00	25.40	34.95
Major Axis	270.00	0.00	34.63

Pin 1: Grid No. 3
Pin 4: IC (Do Not Use)
Pin 5: Grid No. 1
Pin 6: Cathode for Green Beam
Pin 7: Grid No. 2
Pin 8: Cathode for Red Beam
Pin 9: Heater
Pin 10: Heater
Pin 11: Cathode for Blue Beam

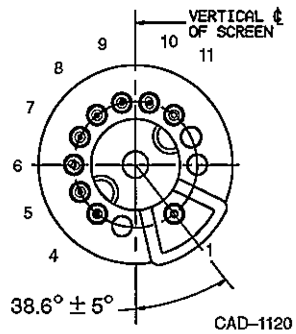


Figure 7 – Pin Connections and Rear View of Base EIA No. B9-297-AH

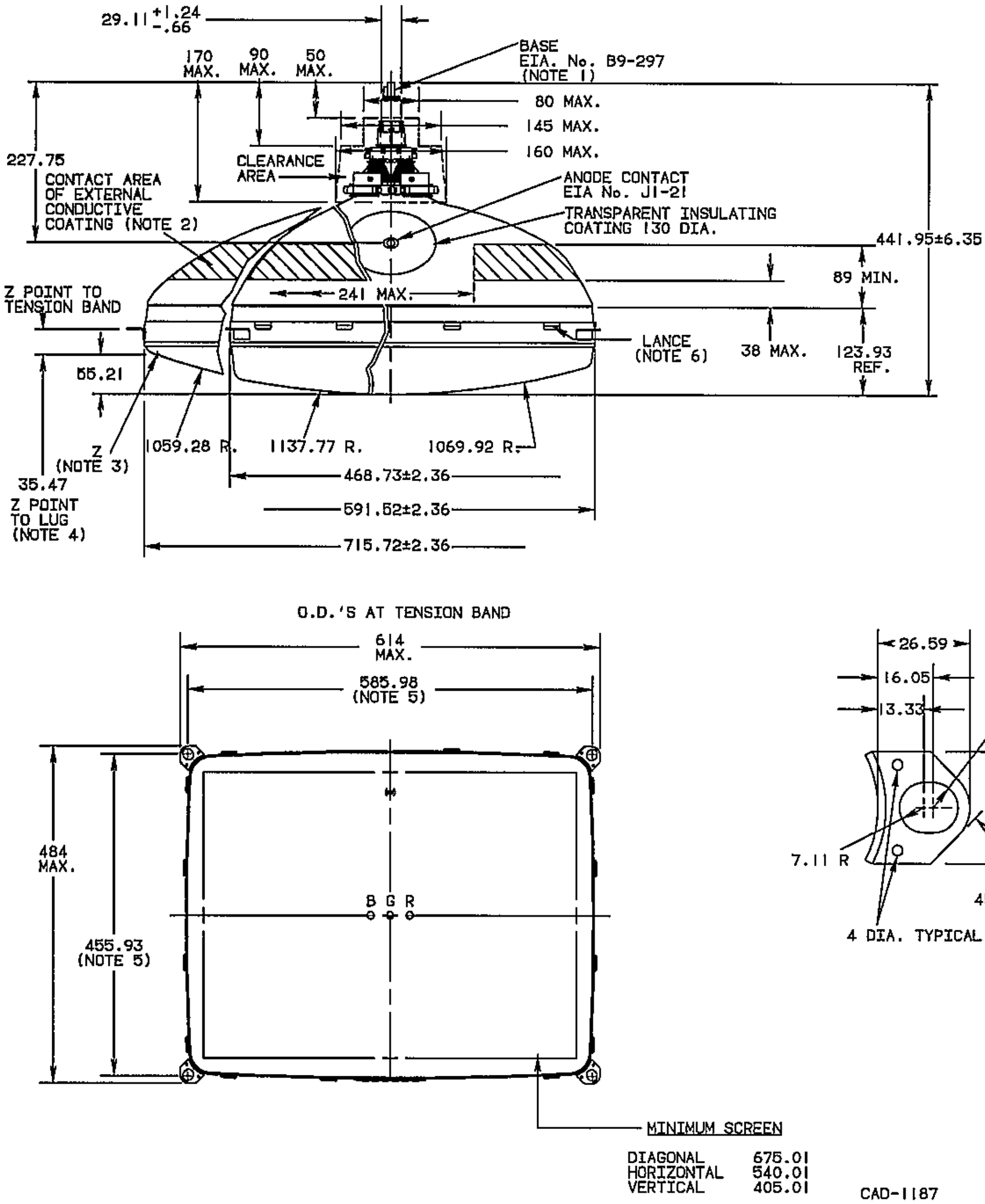


Figure 8 – Dimensional Outline (Dimensions in mm unless otherwise noted)

Notes For Dimensional Outline

Note 1– The mating socket assembly with associated circuit board and mounted components must not weigh more than 0.5 kg. To minimize the torsional forces on the tube base pins, the center of gravity of this assembly should be located on the vertical plane through the picture-tube axis. Caution should also be exercised so that connecting leads to the assembly do not exert excessive torsional forces.

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 in order to provide the required capacitance. The external conductive coating must be connected to the chassis with multiple contacts.

Note 3– "Z" is located on the outside surface of the faceplate on the screen diagonal at the edge of the minimum published screen. This point is used as a reference for the mounting lugs.

Note 4– None of the four mounting lugs will deviate from the plane of the other three by more than 1.6 mm.

Note 5– These dimensions locate the true geometric hole centers for the mounting screws in the receiver. The tolerance of the tube mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when the screws are positioned at these locations.

Note 6– Clearance dimensions for mounting the degaussing coils: 3.2 mm x 8.0 mm. See full-scale drawing for lance locations.

WARNING

X-Radiation – This color picture tube incorporates integral x-radiation shielding and must be replaced with a tube of the same type number or a replacement type recommended by Thomson Consumer Electronics to assure continued safety.

Operation of this color picture tube at abnormal conditions which exceed the 0.5 mR/h isoexposure-rate limit curves shown in **Figure 5** may produce soft X rays and may constitute a health hazard by prolonged exposure at close range unless adequate external x-radiation shielding is provided. Therefore, precautions must be exercised during servicing of TV receivers employing this tube to assure that the anode voltage and other tube voltages are adjusted to the recommended values so that the Absolute-Maximum Ratings will not be exceeded.

Implosion Protection – This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a replacement type recommended by Thomson Consumer Electronics to assure continued safety.

Shock Hazard – The high voltage at which the tube is 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 charges from the picture tube, "bleed off" the charge by shorting the anode bulb contact, 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 control brackets may produce a shock hazard. Also see **Tube Mounting** on page 9.

Tube Handling – Keep picture tubes 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 panel-to-funnel seal.

It is the sole responsibility of the manufacturer of television receivers and other equipment utilizing this color picture tube to provide appropriate design and circuitry that will limit the possible effects of failure of the color picture tube.

The equipment manufacturer should provide a warning label in an appropriate position on the equipment to advise service personnel of all safety precautions.

Magnetic Shield and Degaussing

An internal magnetic shield is provided in this t When properly degaussed, this shield in conjunc with the shadow-mask assembly prov compensation for the effects of the earth's magnetic on the electron beams. After installation of the pic tube into the receiver cabinet, it is recommended tha picture tube be externally degaussed by a minir degaussing field of 20 gauss measured at the facep of the tube. The external degaussing procedure sh be followed by the receiver's internal degaussing ir normal manner. It is recommended that this take p in a magnetic field having a 470 mG vertical compo and a zero horizontal component. If this field is available, it is essential that the tube be degaussed ir specific earth's magnetic field (strength and orienta in which it is to be set up. Both the external degaus and the receiver's internal degaussing must performed with the receiver turned "off" or with vertical scan removed. Proper degaussing will as satisfactory performance for color field purity.

Degaussing Coils

For optimum automatic degaussing, either of different degaussing-coil arrangements should incorporated in the TV receiver – top and bottom coi twisted loop. Lances are provided in the rimband o tube to facilitate mounting the degaussing coil(s) tc tube funnel.

Two-Coil, Top and Bottom System – The two should be symmetrically placed on the tube funne shown in **Figure 9** and series-connected in such a that the fields will add to produce the requ degaussing field. If this coil configuration is improp phased, the magnetic fields will not provide pr degaussing.

Twisted-Loop System – The twisted-loop coil sh be placed on the tube funnel as shown in **Figure 10.** single-coil configuration produces a degaussing e similar to the two-coil system.

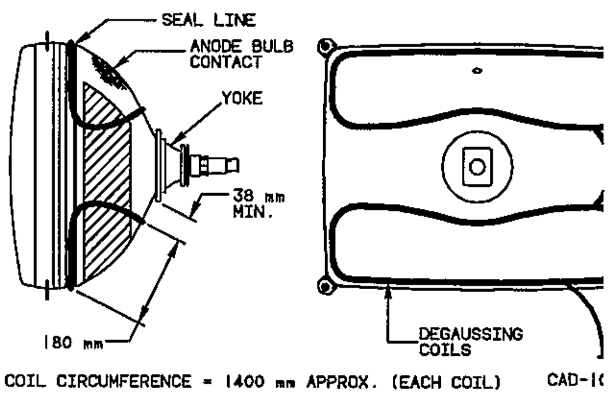


Figure 9 – Relative Placement of Typical Top and Bottom Degaussing Coils

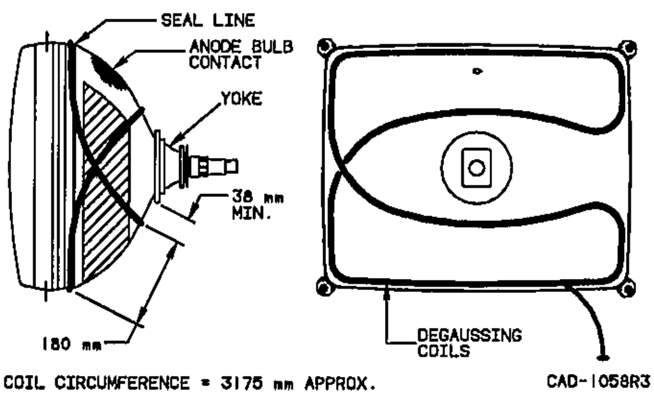


Figure 10 – Relative Placement of Typical Twisted-Loop Degaussing Coil

Degaussing Circuit

The degaussing circuit should provide a minimum of 1500 peak-to-peak ampere-turns (AT) in the degaussing coil. 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.

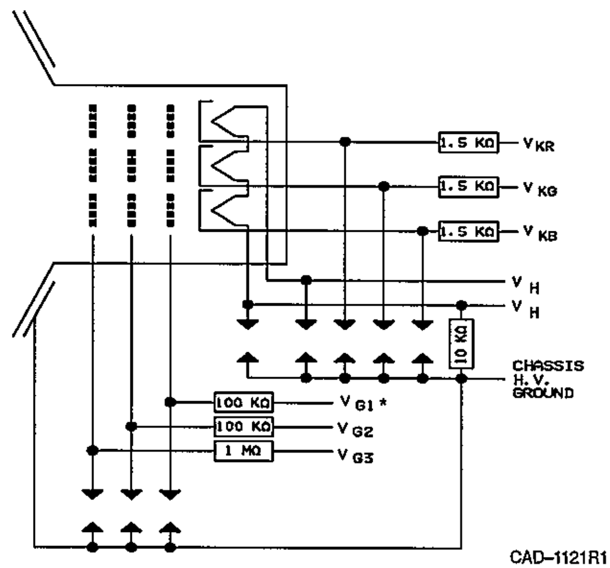
With any degaussing circuit it is necessary to eliminate interactions which occur between the deflection yoke fields and the degaussing coil(s). The induced current can be minimized by careful positioning of the degaussing coil(s). For this reason, and in order to achieve optimal degaussing recovery, coil placement should follow the recommendations shown in **Figure 9** or **Figure 10.** This will provide a minimum distance of 38 mm measured from the yoke liner. 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.

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 noninductive 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 1.5 to 3.0 kV. 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 **Figure 11**) . 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 of circulating currents in the chassis and excessive currents in the picture-tube elements.



* 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.

Figure 11 – Picture-Tube Connections Showing Spark-Gap Recommendations and Typical Isolation-Resistor Values

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 other low-voltage spark gaps. 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.

Tube Mounting

Integral mounting lugs are provided to facilitate mounting the picture tube in the receiver. To prevent a possible shock hazard, it is recommended that the integral mounting lugs and other metal hardware of the tube be connected to the receiver chassis through one of the mounting lugs. If the chassis is not at ground potential, the connection should be made through a 1 MΩ current-limiting resistor. The mounting system and other receiver hardware should not place mechanical stress on, or cause abrasion of, the tube; particularly to the panel-to-funnel seal.

The TV receiver mounting system should incorporate sufficient cushioning so that under conditions of shipment or handling, forces applied to the picture tube should not create accelerations greater than 35 g's.

RCA

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Picture Tube Data

Electrical Data

Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Preadjusted)	
Deflection Angles (approx.):		
Diagonal	111	deg
Horizontal	94	deg
Vertical	74	deg
Direct Interelectrode Capacitances (approx.):		
Grid no. 1 to all other electrodes	11	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	pF
Capacitance Between Anode and External Conductive Coating (including metal hardware):		
Maximum value	2700	pF
Minimum value	2200	pF
Resistance Between Metal Hardware and External Conductive Coating	50 min.	MΩ
Deflection Yoke (factory preset)	RCA No. 2G27012-03A	
Magnetic Shield	Internal	

Optical Data

Faceplate:	
Light transmittance at center (approx.)	39.4%
Surface	Polished
Screen	Matrix
Phosphor, rare-earth (red), sulfide (blue & green)	Type X
Persistence	Medium Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios at center (approx.)	0.87 mm

Formerly Developmental Type RCA J20967

Printed in U.S.A./1-95

Mechanical Data

Tube Dimensions:
- Overall length .... 441.95 ± 6.35 mm
- Reference line to center of face .... 297.93 ± 4.78 mm
- Neck length .... 144.02 ± 4.78 mm
- O.D. at shrinkband:
  - Diagonal .... 715.72 ± 2.36 mm
  - Horizontal .... 591.52 ± 2.36 mm
  - Vertical .... 468.73 ± 2.36 mm
- Minimum screen dimensions (projected):
  - Diagonal .... 675.01 mm
  - Horizontal .... 540.01 mm
  - Vertical .... 405.01 mm
  - Area .... 2187 sq cm

Bulb Funnel Designation .... EIA No. J704B
Bulb Panel Designation .... EIA No. F708D
Anode Bulb Contact Designation .... EIA No. J1-21
Base and Pin Connection Designation [1] .... EIA No. B9-297-AH
Pin Position Alignment .... Space Separating Pins 9 and 10 Aligns Approx. with Anode Bulb Contact
Operating Position, Preferred .... Anode Bulb Contact on Top
Gun Configuration .... Horizontal In Line
Weight (approx.) .... 25.5 kg

Implosion Protection

Type .... Shrinkband

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:			
Maximum value	32		kV
Anode Current:			
Long-Term Average	1500	max.	µA
Short-Term Average (beam limiter)	2000	max.	µA
Grid-No. 3 (focusing electrode) Voltage	12	max.	kV
Peak Grid-No. 2 Voltage	1850	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	275	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage: [2]			
AC (rms) or DC:			
Maximum value	6.9		V
Minimum value	5.7		V
Peak pulse value	50	max.	V
Surge value, during 15-second warm-up period (rms)	9.5	max.	V
Heater-Cathode Voltage:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	450	max.	V
After equipment warm-up period:			
DC component value	300	max.	V
Peak value	350	max.	V
Heater positive with respect to cathode:			
DC component value	100	max.	V
Peak value	200	max.	V

Typical Design Values (for anode voltage of 25 kV)

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

Grid-No. 3 (focusing electrode) Voltage. .... 23 to 27% of Anode Voltage

Grid-No. 2 Voltage for Visual Extinction of Undeflected Focused Spot .... See CUTOFF DESIGN CHART in **Figure 1**
- At cathode voltage of 150 V .... 420 to 820 V
- At cathode voltage of 200 V .... 575 to 1105 V
  - Under normal operating conditions, the cathode voltages should not go within 10 volts relative to the grid-no. 1.

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) 1.25
Heater Voltage [2] .... 6.3 V
Grid-No. 3 Current [3] .... ±3 µA
Grid-No. 2 Current .... ±3 µA
Grid-No. 1 Current .... ±5 µA
To Produce White Light of .... 9300 K + 0 M.P.C.D.
CIE Coordinates:
- X 0.285
- Y 0.294
- Percentage of total anode current supplied by each beam (average):
  - Red .... 38 %
  - Blue .... 30 %
  - Green .... 32 %
- Ratio of cathode currents:
  - Red/blue:
    - Minimum 0.95
    - Typical 1.25
    - Maximum 1.65
  - Red/green:
    - Minimum 0.91
    - Typical 1.20
    - Maximum 1.58
  - Blue/green:
    - Minimum 0.73
    - Typical 0.96
    - Maximum 1.27

Raster Centering Displacement Measured at Center of Screen: [4]
- Horizontal .... 0 ± 5.0 mm
- Vertical .... 0 ± 3.0 mm

Deflection Yoke Data

Maximum Ratings, Absolute-Maximum Values

Peak Pulse Voltage Across Horizontal Coils at 15,750 Hz for a Maximum Pulse Duration of 12 µs .... 1400 max. V

Peak Pulse Voltage Across Vertical Coils at 60 Hz for a Maximum Pulse Duration of 0.7 ms .... 200 max. V

Peak Pulse Voltage Between Horizontal and Vertical Coils at 15,750 Hz for a Maximum Pulse Duration of 12 µs .... 1400 max. V

Care must be exercised when designing the deflection circuits so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is never exceeded.

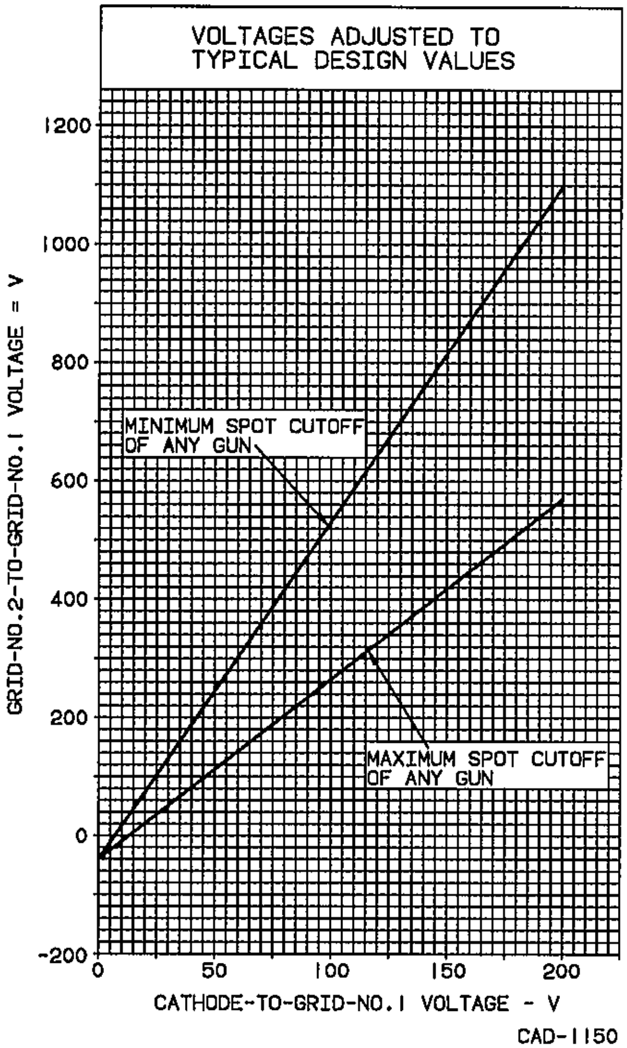
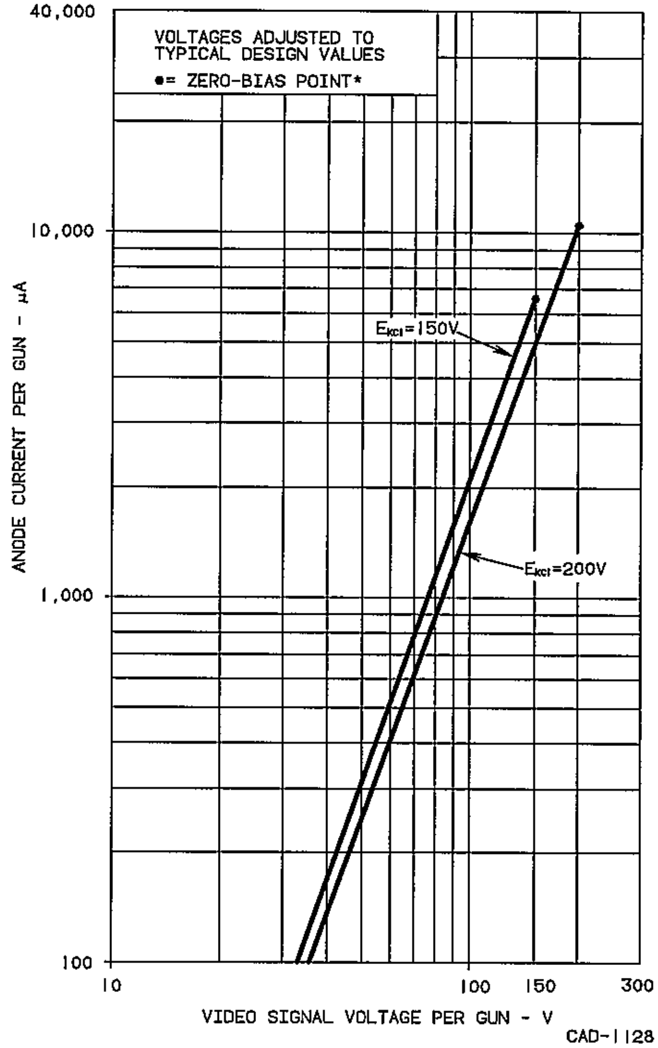


Figure 1 – Cutoff Design Chart



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

Figure 2 – Typical Drive Characteristics, Cathode-Drive Service

Typical Yoke Design Values

Horizontal Deflection Coils:
Parallel-Connected:
Inductance at 1 V rms and 1 kHz .... 0.98 ± 5% mH
Resistance at 25° C .... 1.10 ± 10% Ω
Typical operation with edge-to-edge scan at 25 kV:
Peak-to-peak deflection current .... 5.61 A
Stored energy .... 3.86 mJ

Vertical Deflection Coils:
Series-Connected:
Inductance at 1 V rms and 1 kHz .... 17.60 ± 10% mH
Resistance at 25° C .... 5.60 ± 10% Ω
Typical operation with edge-to-edge scan at 25 kV:
Peak-to-peak deflection current .... 1.63 A
Peak dissipation .... 3.70 W

Raster Pincushion Distortion at a Distance 5 Times the Picture Height: 5
East / West .... 0 ± 1.5%
North / South .... – 1.00 ± 1.5%

Yoke Connector

This tube is supplied without yoke connectors or lead harness assembly. The following manufacturers are suggested as having the capability of making suitable connector parts. The listing of these manufacturers shall not be construed as giving approval for connectors supplied by these manufacturers. Approval criteria must be established by the individual receiver manufacturer. The set manufacturer may also choose to directly attach a lead harness assembly to the yoke terminals.

AMP, Inc.
Box 3608
Harrisburg, PA 17105–3608
(800) 522-6752
or (717) 564–0100

Molex, Inc.
2222 Wellington CT
Lisle, IL 60532
(708) 969-4550

Cinch Connectors
Division of Labinal Components & Systems, Inc.
1501 Morse Ave.
Elk Grove Village, IL 60007
(708) 981-6000

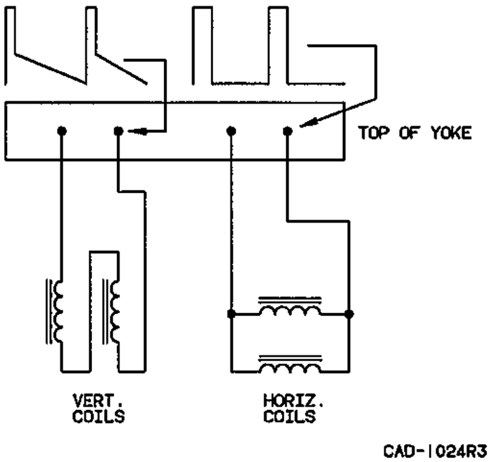


Figure 3 – Connection Diagram For Yoke (as viewed from top rear of yoke)

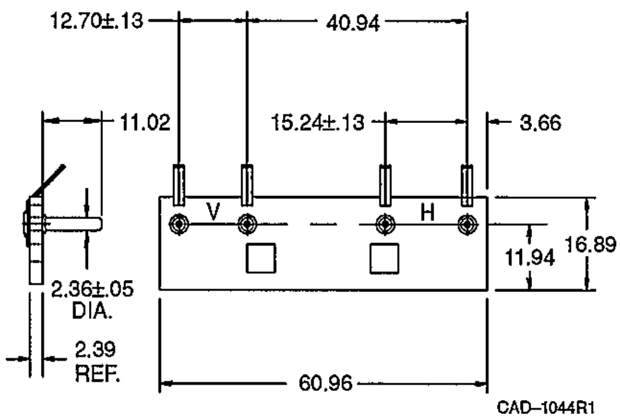


Figure 4 – Yoke Terminal Board

1. For mating socket considerations, see Note 1 under Notes for Dimensional Outline.
2. For maximum tube life, the heater supply voltage should be regulated to minimize heater voltage changes due to variations in line voltage, beam current, and other parameters. The heater voltage should be 6.3 V (within a measurement accuracy of ±0.1 V). 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 an unregulated source. If this option is chosen and the unregulated voltage varies with beam current, the circuit parameters should be selected so that the heater voltage is 6.3 V (within a measurement accuracy of ± 0.1 V) when the beam current is one-half of the Long-Term Average Anode Current as shown in the tabulated data. The operating conditions should be such that the Absolute-Maximum and Minimum Ratings can never be exceeded when including all variations. Long-term operation at or near the Absolute-Maximum limit will substantially reduce tube life.

   For specific considerations, consult your Thomson Consumer Electronics representative.
3. 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.
4. Measurements are taken with the tube operating with recommended components and procedures, and in a magnetic field having a 470 mG vertical component and a zero cross-axial horizontal component.
5. Measured in accordance with IEC Recommendation – Publication 107 – 1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmission.

X-Radiation Characteristics

These measurements are made in accordance with the procedure of EIA Standard RS-503.

A picture tube should never be operated beyond its Absolute-Maximum Ratings (such operation may shorten tube life or have other permanent adverse effects on its performance).

The x-radiation emitted from this picture tube will not exceed 0.5 mR/h for anode voltage and current combinations given by the isoexposure-rate limit curves as shown in **Figure 5**. Operation above the values shown by the curves may result in failure of the television receiver to comply with the Federal Performance Standard for Television Receivers, Part 1020 of Code of Federal Regulations, Title 21, Chapter I, Subchapter J. Maximum x-radiation as a function of anode voltage at 300 µA anode current is shown by the curves in **Figure 6**. X-radiation at a constant anode voltage varies linearly with anode current.

From These Curves, Maximum Anode Voltage at Which the X-Radiation Emitted Will Not Exceed 0.5 mR/h at an Anode Current of 300 µA:
For entire tube .... 38.5 kV*

Maximum Voltage Difference Between Anode and Focus Electrode at Which the X-Radiation Emitted Will Not Exceed 0.5 mR/h .... 35 kV

WARNING: If the voltage value shown above can be exceeded in the receiver, additional attenuation of the x-radiation through the tube neck may be required.

*This rating applies only if the anode connector used by the receiver manufacturer provides the necessary attenuation to reduce the x-radiation from the anode bulb contact by a factor equivalent to the difference between the anode bulb contact isoexposure-rate limit curve (**Figure 5**) and the isoexposure-rate limit curve for the entire tube.

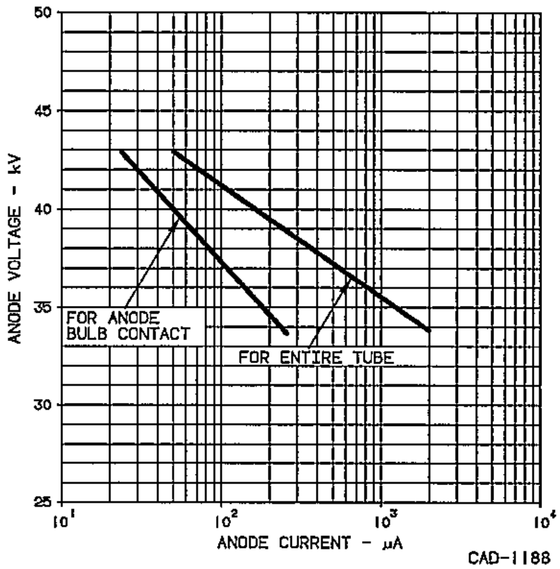


Figure 5 – 0.5 mR/h Isoexposure-Rate Limit Curves

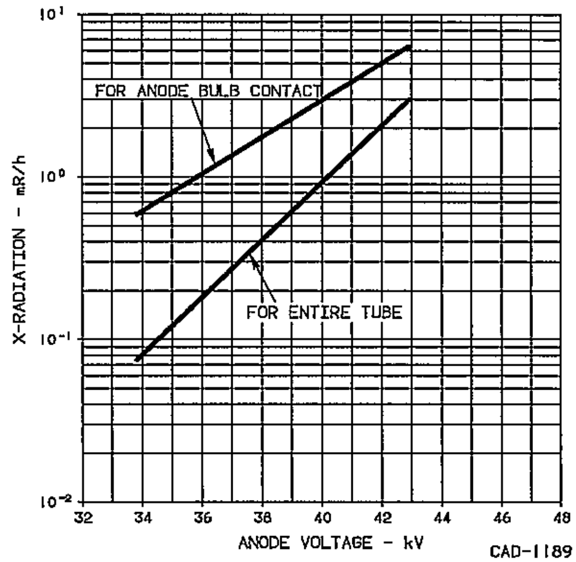


Figure 6 – X-Radiation Limit Curves at a Constant Anode Current of 300 µA (x-radiation at a constant anode voltage varies linearly with anode current)

Sagittal Heights With Reference to Centerface at the Edge of the Minimum Screen.

Location	Coordinates X mm	Coordinates Y mm	Sagittal Height mm
Minor Axis	0.00	202.50	18.17
	25.40	202.50	18.53
	50.80	202.50	19.60
	76.20	202.50	21.36
	101.60	202.50	23.76
	127.00	202.50	26.79
	152.40	202.50	30.42
	177.80	202.50	34.65
	203.20	202.50	39.49
	228.60	202.50	44.94
	254.00	202.50	51.03
Diagonal	270.00	202.50	55.21
	270.00	177.80	50.52
	270.00	152.40	46.32
	270.00	127.00	42.76
	270.00	101.60	39.83
	270.00	76.20	37.56
	270.00	50.80	35.93
	270.00	25.40	34.95
Major Axis	270.00	0.00	34.63

Pin 1: Grid No. 3
Pin 4: IC (Do Not Use)
Pin 5: Grid No. 1
Pin 6: Cathode for Green Beam
Pin 7: Grid No. 2
Pin 8: Cathode for Red Beam
Pin 9: Heater
Pin 10: Heater
Pin 11: Cathode for Blue Beam

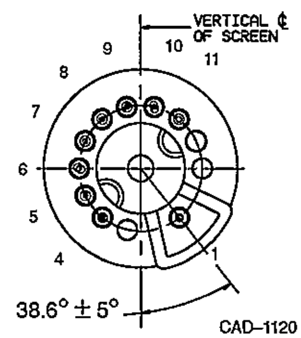


Figure 7 – Pin Connections and Rear View of Base EIA No. B9-297-AH

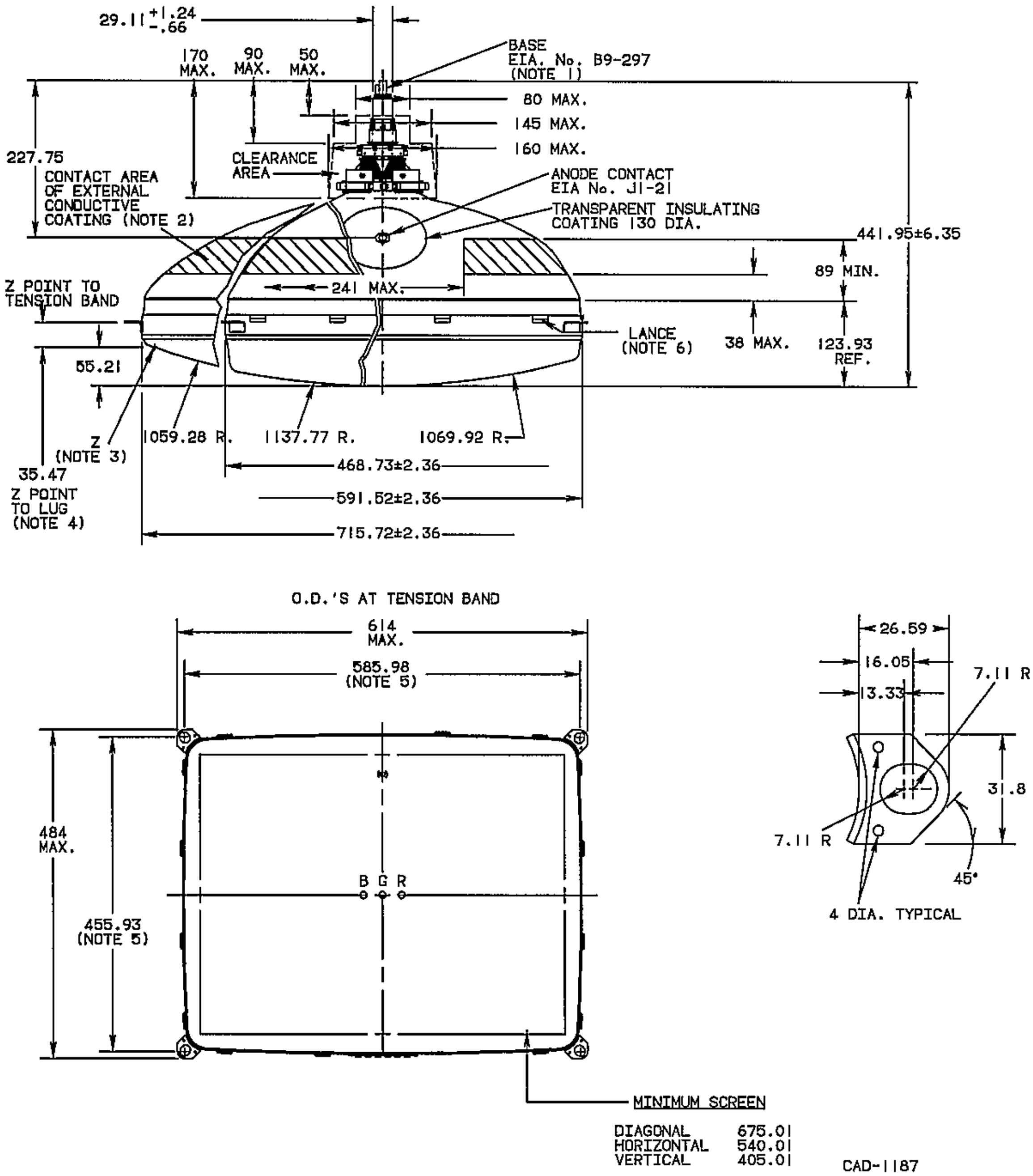


Figure 8 – Dimensional Outline (Dimensions in mm unless otherwise noted)

Notes For Dimensional Outline

Note 1– The mating socket assembly with associated circuit board and mounted components must not weigh more than 0.5 kg. To minimize the torsional forces on the tube base pins, the center of gravity of this assembly should be located on the vertical plane through the picture-tube axis. Caution should also be exercised so that connecting leads to the assembly do not exert excessive torsional forces.

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 in order to provide the required capacitance. The external conductive coating must be connected to the chassis with multiple contacts.

Note 3– "Z" is located on the outside surface of the faceplate on the screen diagonal at the edge of the minimum published screen. This point is used as a reference for the mounting lugs.

Note 4– None of the four mounting lugs will deviate from the plane of the other three by more than 1.6 mm.

Note 5– These dimensions locate the true geometric hole centers for the mounting screws in the receiver. The tolerance of the tube mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when the screws are positioned at these locations.

Note 6– Clearance dimensions for mounting the degaussing coils: 3.2 mm x 8.0 mm. See full-scale drawing for lance locations.

WARNING

X-Radiation – This color picture tube incorporates integral x-radiation shielding and must be replaced with a tube of the same type number or a replacement type recommended by Thomson Consumer Electronics to assure continued safety.

Operation of this color picture tube at abnormal conditions which exceed the 0.5 mR/h isoexposure-rate limit curves shown in **Figure 5** may produce soft X rays and may constitute a health hazard by prolonged exposure at close range unless adequate external x-radiation shielding is provided. Therefore, precautions must be exercised during servicing of TV receivers employing this tube to assure that the anode voltage and other tube voltages are adjusted to the recommended values so that the Absolute-Maximum Ratings will not be exceeded.

Implosion Protection – This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a replacement type recommended by Thomson Consumer Electronics to assure continued safety.

Shock Hazard – The high voltage at which the tube is 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 charges from the picture tube, "bleed off" the charge by shorting the anode bulb contact, 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 control brackets may produce a shock hazard. Also see **Tube Mounting** on page 9.

Tube Handling – Keep picture tubes 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 panel-to-funnel seal.

It is the sole responsibility of the manufacturer of television receivers and other equipment utilizing this color picture tube to provide appropriate design and circuitry that will limit the possible effects of failure of the color picture tube.

The equipment manufacturer should provide a warning label in an appropriate position on the equipment to advise service personnel of all safety precautions.

Magnetic Shield and Degaussing

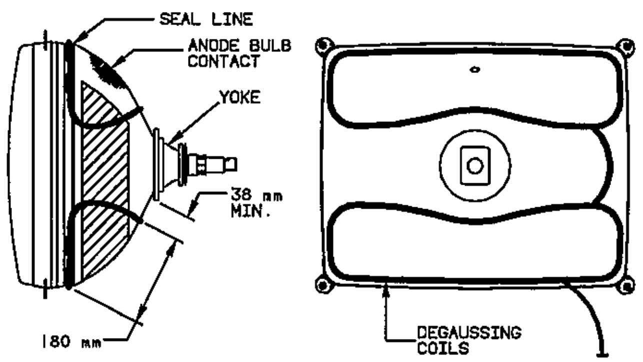
An internal magnetic shield is provided in this tube. When properly degaussed, this shield in conjunction with the shadow-mask assembly provides compensation for the effects of the earth's magnetic field on the electron beams. After installation of the picture tube into the receiver cabinet, it is recommended that the picture tube be externally degaussed by a minimum degaussing field of 20 gauss measured at the faceplate of the tube. The external degaussing procedure should be followed by the receiver's internal degaussing in the normal manner. It is recommended that this take place in a magnetic field having a 470 mG vertical component and a zero horizontal component. If this field is not available, it is essential that the tube be degaussed in the specific earth's magnetic field (strength and orientation) in which it is to be set up. Both the external degaussing and the receiver's internal degaussing must be performed with the receiver turned "off" or with the vertical scan removed. Proper degaussing will assure satisfactory performance for color field purity.

Degaussing Coils

For optimum automatic degaussing, either of two different degaussing-coil arrangements should be incorporated in the TV receiver – top and bottom coils or twisted loop. Lances are provided in the rimband of the tube to facilitate mounting the degaussing coil(s) to the tube funnel.

Two-Coil, Top and Bottom System – The two coils should be symmetrically placed on the tube funnel as shown in **Figure 9** and series-connected in such a way that the fields will add to produce the required degaussing field. If this coil configuration is improperly phased, the magnetic fields will not provide proper degaussing.

Twisted-Loop System – The twisted-loop coil should be placed on the tube funnel as shown in **Figure 10.** This single-coil configuration produces a degaussing effect similar to the two-coil system.



COIL CIRCUMFERENCE = 1400 mm APPROX. (EACH COIL) CAD-1057R2

Figure 9 – Relative Placement of Typical Top and Bottom Degaussing Coils

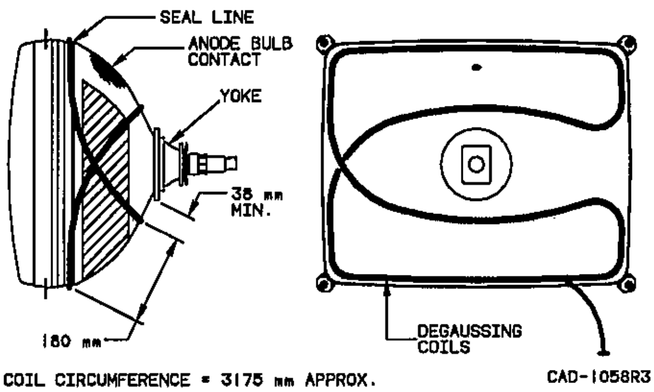


Figure 10 – Relative Placement of Typical Twisted-Loop Degaussing Coil

Degaussing Circuit

The degaussing circuit should provide a minimum of 1500 peak-to-peak ampere-turns (AT) in the degaussing coil. 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.

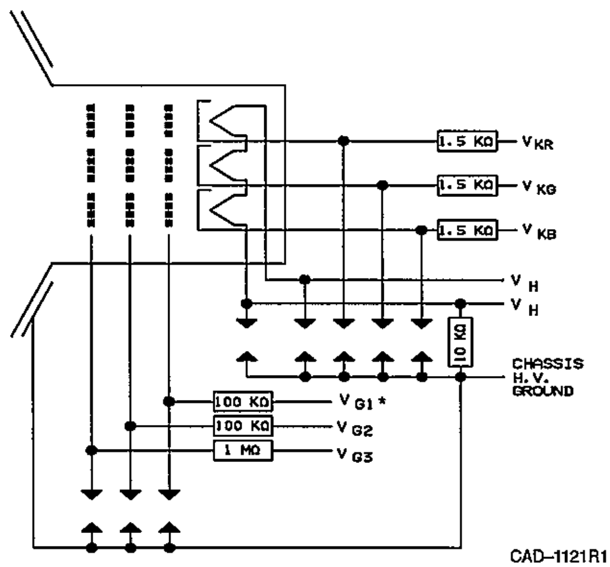
With any degaussing circuit it is necessary to eliminate interactions which occur between the deflection yoke fields and the degaussing coil(s). The induced current can be minimized by careful positioning of the degaussing coil(s). For this reason, and in order to achieve optimal degaussing recovery, coil placement should follow the recommendations shown in **Figure 9** or **Figure 10.** This will provide a minimum distance of 38 mm measured from the yoke liner. 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.

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 noninductive 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 1.5 to 3.0 kV. 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 **Figure 11**) . 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 of circulating currents in the chassis and excessive currents in the picture-tube elements.



* 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.

Figure 11 – Picture-Tube Connections Showing Spark-Gap Recommendations and Typical Isolation-Resistor Values

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 other low-voltage spark gaps. 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.

Tube Mounting

Integral mounting lugs are provided to facilitate mounting the picture tube in the receiver. To prevent a possible shock hazard, it is recommended that the integral mounting lugs and other metal hardware of the tube be connected to the receiver chassis through one of the mounting lugs. If the chassis is not at ground potential, the connection should be made through a 1 MΩ current-limiting resistor. The mounting system and other receiver hardware should not place mechanical stress on, or cause abrasion of, the tube; particularly to the panel-to-funnel seal.

The TV receiver mounting system should incorporate sufficient cushioning so that under conditions of shipment or handling, forces applied to the picture tube should not create accelerations greater than 35 g's.

W

RCA

Color Picture Tube
A63ADT15X06

63 cm (25V) 110° COTY-SS Precision In-Line Color Picture Tube Assembly

- **Factory Adjusted Yoke and Neck Components**
- **New Dark-Glass Faceplate – Improved Contrast**
- **COTY-SS – Straight Screen Sides**
- **Saddle/Toroidal Yoke – Fully Pincushion Corrected**
- **XL Bipotential Precision In-Line Gun – Optimized Beam-Forming Region for Excellent Focus Uniformity and Good Resolution**
- **Standard 29 mm Neck Diameter – Proven Reliability**
- **Excellent Convergence and Register Performance**
- **Other Features –**
  - **Matrix Line Screen**
  - **Internal Magnetic Shield**
  - **Super-Arch Mask**
  - **Soft-Arc Technology**
  - **Integral Mounting Lugs**

RCA A63ADT15X06 is a 63 cm (25V) 110° COTY-SS Precision In-Line Color Picture Tube Assembly featuring a new dark-glass faceplate for improved contrast. The yoke provides full correction for pincushion distortion. All neck components are assembled on the tube and factory adjusted for optimum performance. The COTY-SS features screen edges that are straight.

The bipotential precision in-line electron gun features an expanded diameter lens (XL). The expanded lens field encompasses all three beams and when combined with the fields from the individual apertures it produces a superior lens for focus performance with less aberrations than a standard gun. In this case the neck diameter, not the beam spacing, limits the focusing ability. Convergence performance has been improved by reducing the beam spacing.

Picture Tube Data

Electrical Data

Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Preadjusted)	
Deflection Angles (approx.):		
Diagonal	110	deg
Horizontal	95	deg
Vertical	74	deg
Direct Interelectrode Capacitances (approx.):		
Grid no. 1 to all other electrodes	11	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	pF
Capacitance Between Anode and External Conductive Coating (including metal hardware):		
Maximum value	2700	pF
Minimum value	2000	pF
Resistance Between Metal Hardware and External Conductive Coating	50 min.	MΩ
Deflection Yoke (factory preset)	RCA No. 2G27009-06A	
Magnetic Shield	Internal	

Optical Data

Faceplate:	
Light transmittance at center (approx.)	39.5%
Surface	Polished
Screen	Matrix
Phosphor, rare-earth (red), sulfide (blue & green)	Type X
Persistence	Medium Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios at center (approx.)	0.84 mm

Formerly Developmental Type RCA J20958

Mechanical Data

Tube Dimensions:

Overall length	424.91 ± 6.35 mm
Reference line to center of face	280.44 ± 4.78 mm
Neck length	140.43 ± 4.78 mm
O.D. at tension band:	
Diagonal	673.84 ± 2.36 mm
Horizontal	577.32 ± 2.36 mm
Vertical	445.06 ± 2.36 mm
Minimum screen dimensions (projected):	
Diagonal	626.31 mm
Horizontal	515.92 mm
Vertical	378.50 mm
Area	1950 sq cm
Bulb Funnel Designation	EIA No. J663K
Bulb Panel Designation	EIA No. F667A
Anode Bulb Contact Designation	EIA No. J1-21
Base and Pin Connection Designation [1]	EIA No. B9-297-AH
Pin Position Alignment	Space Separating Pins 9 and 10 Aligns Approx. with Anode Bulb Contact
Operating Position, Preferred	Anode Bulb Contact on Top
Gun Configuration	Horizontal In Line
Weight (approx.)	23.2 kg

Implosion Protection

Type	Shrinkband

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:			
Maximum value	32		kV
Anode Current:			
Long-Term Average	1500	max.	µA
Short-Term Average (beam limiter)	2000	max.	µA
Grid-No. 3 (focusing electrode) Voltage	12	max.	kV
Peak Grid-No. 2 Voltage	1850	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	275	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage: [2]			
AC (rms) or DC:			
Maximum value	6.9		V
Minimum value	5.7		V
Peak pulse value	50	max.	V
Surge value, during 15-second warm-up period (rms)	9.5	max.	V
Heater-Cathode Voltage:			
Heater negative with respect to cathode:			
During equipment warm-up period not exceeding 15 seconds	450	max.	V
After equipment warm-up period:			
DC component value	300	max.	V
Peak value	350	max.	V
Heater positive with respect to cathode:			
DC component value	100	max.	V
Peak value	200	max.	V

Typical Design Values (for anode voltage of 25 kV)

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

Grid-No. 3 (focusing electrode) Voltage	23 to 27% of Anode Voltage	
Grid-No. 2 Voltage for Visual Extinction of Undeflected Focused Spot	See CUTOFF DESIGN CHART in **Figure 1**	
At cathode voltage of 150 V	420 to 820 V	

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

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)	1.25	
Heater Voltage [2]	6.3 V	
Grid-No. 3 Current [3]	± 3µA	
Grid-No. 2 Current	± 3µA	
Grid-No. 1 Current	± 5µA	
To Produce White Light of	9300 K + 0 M.P.C.D.	
CIE Coordinates:		
X	0.285	
Y	0.294	
Percentage of total anode current supplied by each beam (average):		
Red	38	%
Blue	30	%
Green	32	%
Ratio of cathode currents:		
Red/blue:		
Minimum	0.95	
Typical	1.25	
Maximum	1.65	
Red/green:		
Minimum	0.91	
Typical	1.20	
Maximum	1.58	
Blue/green:		
Minimum	0.73	
Typical	0.96	
Maximum	1.27	
Raster Centering Displacement Measured at Center of Screen: [4]		
Horizontal	0 ± 5.0 mm	
Vertical	0 ± 3.0 mm	

Deflection Yoke Data

Maximum Ratings, Absolute-Maximum Values

Peak Pulse Voltage Across Horizontal Coils at 15,750 Hz for a Maximum Pulse Duration of 12 µs	1400 max.	V
Peak Pulse Voltage Across Vertical Coils at 60 Hz for a Maximum Pulse Duration of 0.7 ms	200 max.	V
Peak Pulse Voltage Between Horizontal and Vertical Coils at 15,750 Hz for a Maximum Pulse Duration of 12 µs	1400 max.	V

Care must be exercised when designing the deflection circuits so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is never exceeded.

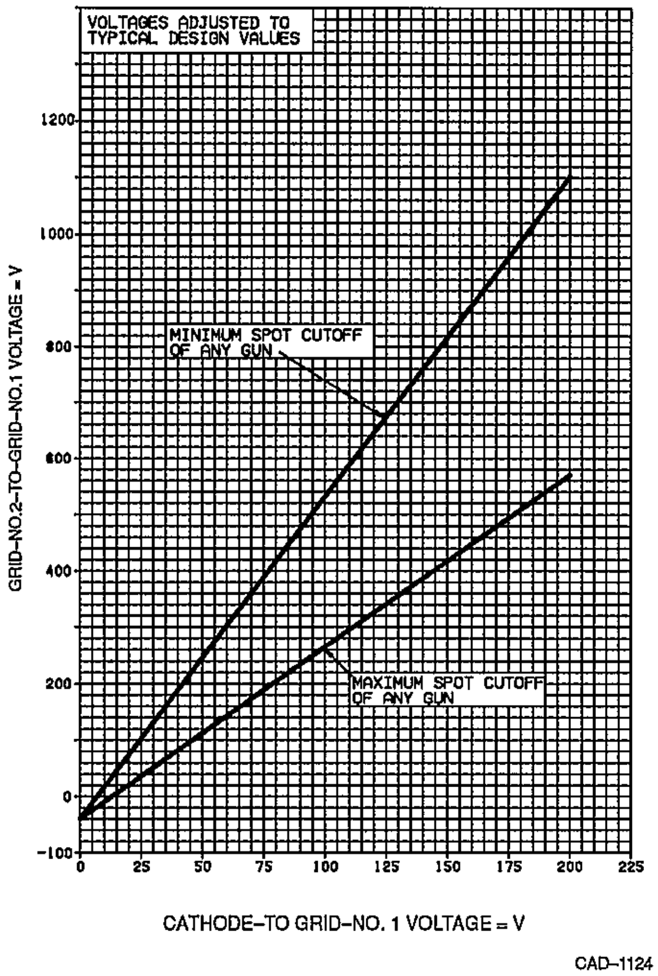
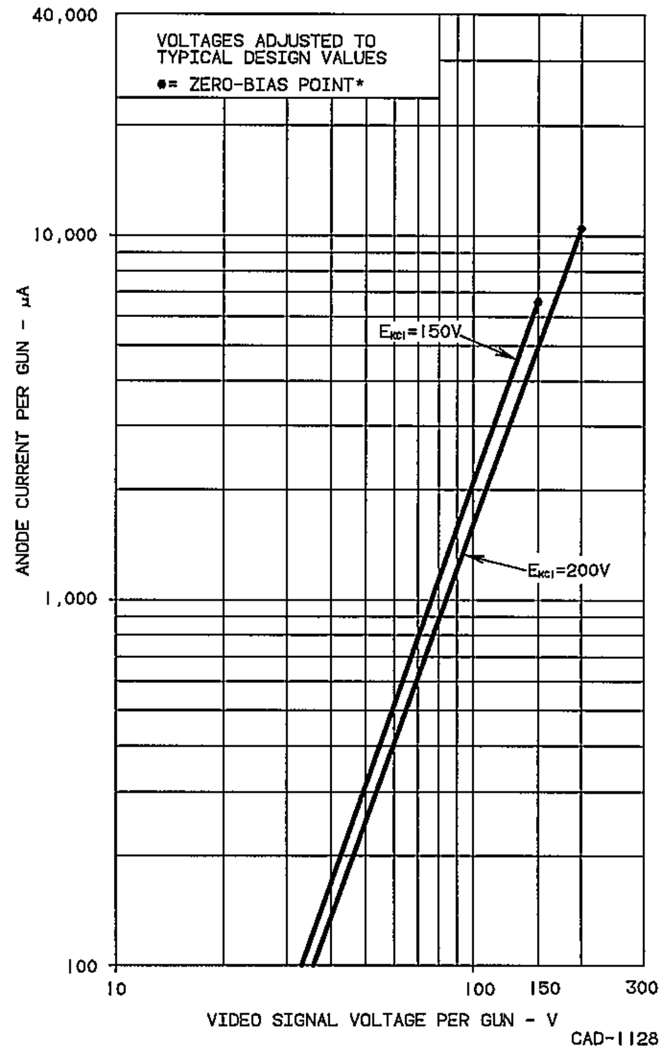


Figure 1 – Cutoff Design Chart



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

Figure 2 – Typical Drive Characteristics, Cathode-Drive Service

Typical Yoke Design Values

Horizontal Deflection Coils:
- Parallel-Connected:
  - Inductance at 1 V rms and 1 kHz .... 1.19 ± 5% mH
  - Resistance at 25° C .... 1.40 ± 10% Ω
  - Typical operation with edge-to-edge scan at 25 kV:
    - Peak-to-peak deflection current .... 5.18 A
    - Stored energy .... 3.99 mJ

Vertical Deflection Coils:
- Series-Connected:
  - Inductance at 1 V rms and 1 kHz .... 17.60 ± 10% mH
  - Resistance at 25° C .... 5.60 ± 10% Ω
  - Typical operation with edge-to-edge scan at 25 kV:
    - Peak-to-peak deflection current .... 1.68 A
    - Peak dissipation .... 3.93 W

Raster Pincushion Distortion at a Distance 5 Times the Picture Height: [5]
- East / West .... – 0.3 ± 1.5 %
- North / South .... – 1.2 ± 1.5 %

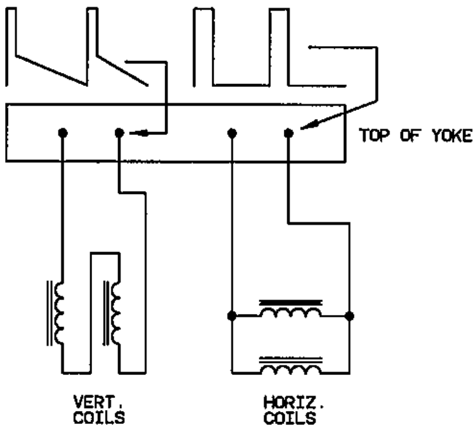
Yoke Connector

This tube is supplied without yoke connectors or lead harness assembly. The following manufacturers are suggested as having the capability of making suitable connector parts. The listing of these manufacturers shall not be construed as giving approval for connectors supplied by these manufacturers. Approval criteria must be established by the individual receiver manufacturer. The set manufacturer may also choose to directly attach a lead harness assembly to the yoke terminals.

AMP, Inc.
Box 3608
Harrisburg, PA 17105–3608
(800) 522-6752
or (717) 564–0100

Molex, Inc.
2222 Wellington CT
Lisle, IL 60532
(708) 969-4550

Cinch Connectors
Division of Labinal Components & Systems, Inc.
1501 Morse Ave.
Elk Grove Village, IL 60007
(708) 981-6000



CAD-1024R3

Figure 3 – Connection Diagram For Yoke (as viewed from top rear of yoke)

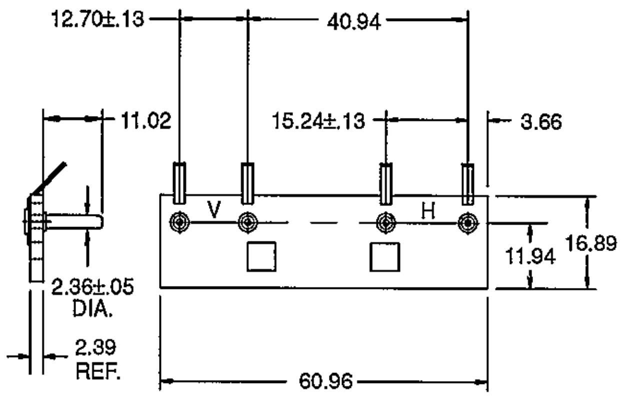


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Figure 4 – Yoke Terminal Board

1. For mating socket considerations, see Note 1 under Notes for Dimensional Outline.
2. For maximum tube life, the heater supply voltage should be regulated to minimize heater voltage changes due to variations in line voltage, beam current, and other parameters. The heater voltage should be 6.3 V (within a measurement accuracy of ± 0.1 V). 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 an unregulated source. If this option is chosen and the unregulated voltage varies with beam current, the circuit parameters should be selected so that the heater voltage is 6.3 V (within a measurement accuracy of ± 0.1 V) when the beam current is one-half of the Long-Term Average Anode Current as shown in the tabulated data. The operating conditions should be such that the Absolute-Maximum and Minimum Ratings can never be exceeded when including all variations. Long-term operation at or near the Absolute-Maximum limit will substantially reduce tube life.

   For specific considerations, consult your Thomson Consumer Electronics representative.
3. 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.
4. Measurements are taken with the tube operating with recommended components and procedures, and in a magnetic field having a 470 mG vertical component and a zero cross-axial horizontal component.
5. Measured in accordance with IEC Recommendation – Publication 107 – 1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmission.

X-Radiation Characteristics

These measurements are made in accordance with the procedure of EIA Standard RS-503.

A picture tube should never be operated beyond its Absolute-Maximum Ratings (such operation may shorten tube life or have other permanent adverse effects on its performance).

The x-radiation emitted from this picture tube will not exceed 0.5 mR/h for anode voltage and current combinations given by the isoexposure-rate limit curves as shown in **Figure 5**. Operation above the values shown by the curves may result in failure of the television receiver to comply with the Federal Performance Standard for Television Receivers, Part 1020 of Code of Federal Regulations, Title 21, Chapter I, Subchapter J. Maximum x-radiation as a function of anode voltage at 300 µA anode current is shown by the curves in **Figure 6**. X-radiation at a constant anode voltage varies linearly with anode current.

From These Curves, Maximum Anode Voltage
at Which the X-Radiation Emitted Will Not Exceed
0.5 mR/h at an Anode Current of 300 µA:
For entire tube .... 37 kV*
For tube face only .... 39.5 kV

WARNING: If the value for the tube face only is used as design criterion, adequate shielding must be provided in the receiver for the anode bulb contact and/or certain portions of the tube funnel and panel skirt to insure that the x-radiation from the receiver is attenuated to a value equal to or lower than that specified for the face of the tube.

Maximum Voltage Difference Between Anode
and Focus Electrode at Which the X-Radiation
Emitted Will Not Exceed 0.5 mR/h .... 35 kV

WARNING: If the voltage value shown above can be exceeded in the receiver, additional attenuation of the x-radiation through the tube neck may be required.

*This rating applies only if the anode connector used by the receiver manufacturer provides the necessary attenuation to reduce the x-radiation from the anode bulb contact by a factor equivalent to the difference between the anode bulb contact isoexposure-rate limit curve (**Figure 5**) and the isoexposure-rate limit curve for the entire tube.

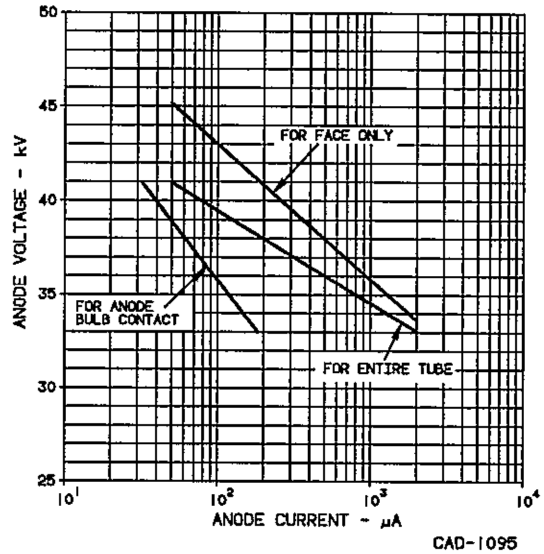


Figure 5 – 0.5 mR/h Isoexposure-Rate Limit Curves

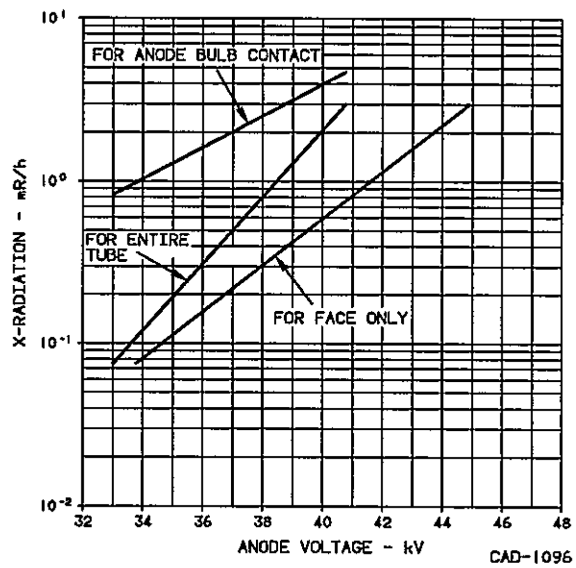


Figure 6 – X-Radiation Limit Curves at a Constant Anode Current of 300 µA (x-radiation at a constant anode voltage varies linearly with anode current)

Sagittal Heights With Reference to Centerface at the Edge of the Minimum Screen.

Location	Coordinates X mm	Coordinates Y mm	Sagittal Height mm
Minor Axis	0.00	189.25	15.85
	25.40	189.25	16.21
	50.80	189.25	17.28
	76.20	189.25	19.02
	101.60	189.25	21.41
	127.00	189.25	24.41
	152.40	189.25	28.00
	177.80	189.25	32.19
	203.20	189.25	36.99
	228.60	189.25	42.41
	240.87	189.25	45.26
Diagonal	254.78	182.10	47.35
	257.96	172.16	46.40
	257.96	152.40	43.21
	257.96	127.00	39.66
	257.96	101.60	36.75
	257.96	76.20	34.48
	257.96	50.80	32.86
	257.96	25.40	31.89
Major Axis	257.96	0.00	31.56

Pin 1: Grid No. 3
Pin 4: IC (Do Not Use)
Pin 5: Grid No. 1
Pin 6: Cathode for Green Beam
Pin 7: Grid No. 2
Pin 8: Cathode for Red Beam
Pin 9: Heater
Pin 10: Heater
Pin 11: Cathode for Blue Beam

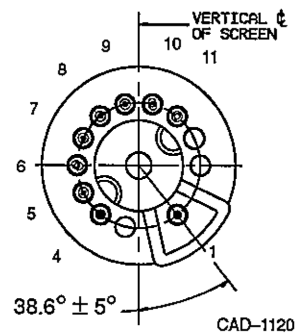


Figure 7 – Pin Connections and Rear View of Base EIA No. B9-297-AH

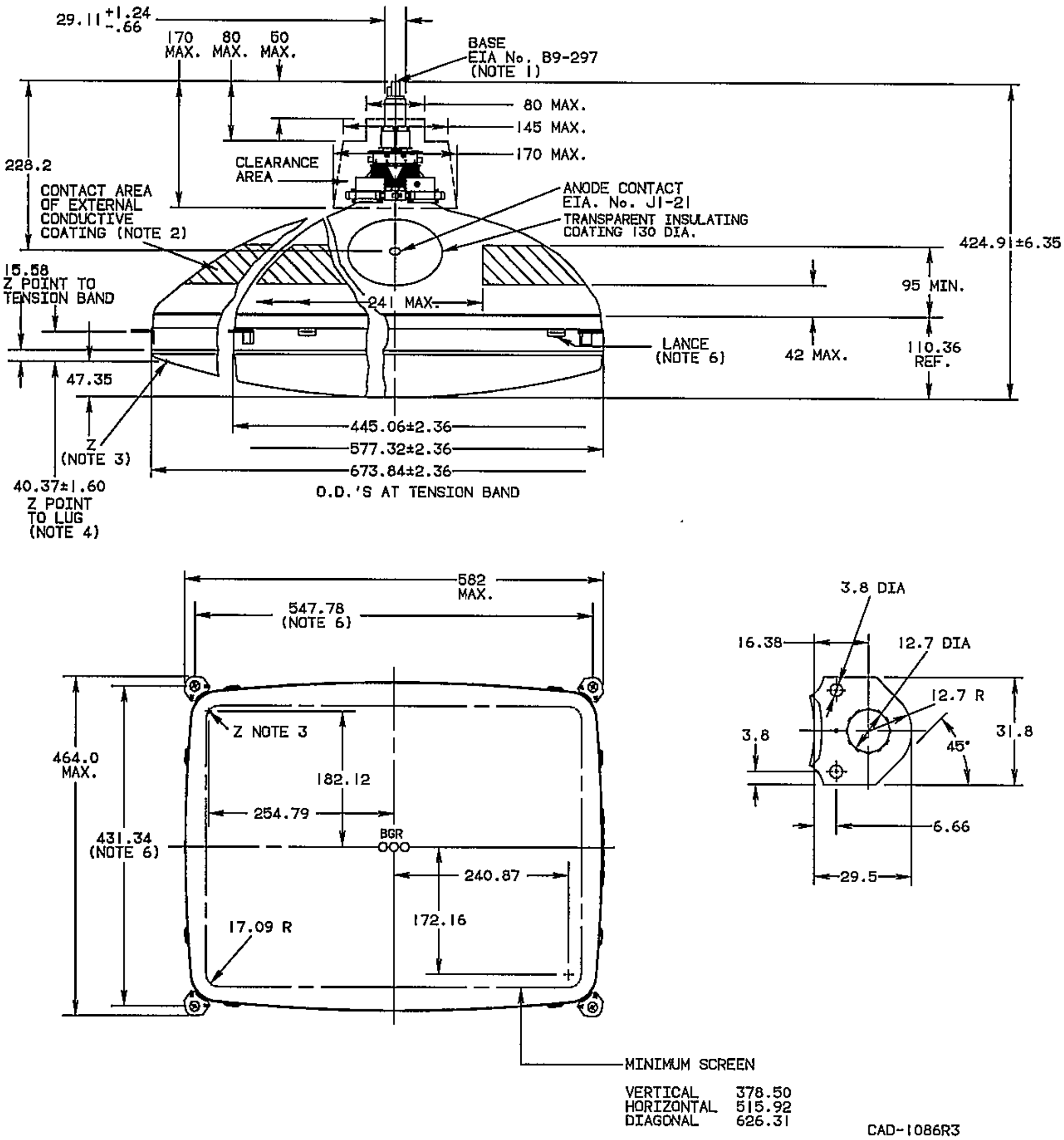


Figure 8 – Dimensional Outline (Dimensions in mm unless otherwise noted)

Notes For Dimensional Outline

Note 1– The mating socket assembly with associated circuit board and mounted components must not weigh more than 0.5 kg. To minimize the torsional forces on the tube base pins, the center of gravity of this assembly should be located on the vertical plane through the picture-tube axis. Caution should also be exercised so that connecting leads to the assembly do not exert excessive torsional forces.

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 in order to provide the required capacitance. The external conductive coating must be connected to the chassis with multiple contacts.

Note 3– "Z" is located on the outside surface of the faceplate on the screen diagonal at the edge of the minimum published screen. This point is used as a reference for the mounting lugs.

Note 4– None of the four mounting lugs will deviate from the plane of the other three by more than 1.6 mm.

Note 5– These dimensions locate the true geometric hole centers for the mounting screws in the receiver. The tolerance of the tube mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when the screws are positioned at these locations.

Note 6– Clearance dimensions for mounting the degaussing coils: 3.2 mm x 8.0 mm. See full-scale drawing for lance locations.

WARNING

X-Radiation – This color picture tube incorporates integral x-radiation shielding and must be replaced with a tube of the same type number or a replacement type recommended by Thomson Consumer Electronics to assure continued safety.

Operation of this color picture tube at abnormal conditions which exceed the 0.5 mR/h isoexposure-rate limit curves shown in **Figure 5** may produce soft X rays and may constitute a health hazard by prolonged exposure at close range unless adequate external x-radiation shielding is provided. Therefore, precautions must be exercised during servicing of TV receivers employing this tube to assure that the anode voltage and other tube voltages are adjusted to the recommended values so that the Absolute-Maximum Ratings will not be exceeded.

Implosion Protection – This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a replacement type recommended by Thomson Consumer Electronics to assure continued safety.

Shock Hazard – The high voltage at which the tube is 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 charges from the picture tube, "bleed off" the charge by shorting the anode bulb contact, 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 control brackets may produce a shock hazard. Also see **Tube Mounting** on page 9.

Tube Handling – Keep picture tubes 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 panel-to-funnel seal.

It is the sole responsibility of the manufacturer of television receivers and other equipment utilizing this color picture tube to provide appropriate design and circuitry that will limit the possible effects of failure of the color picture tube.

The equipment manufacturer should provide a warning label in an appropriate position on the equipment to advise service personnel of all safety precautions.

Magnetic Shield and Degaussing

An internal magnetic shield is provided in this tube. When properly degaussed, this shield in conjunction with the shadow-mask assembly provides compensation for the effects of the earth's magnetic field on the electron beams. After installation of the picture tube into the receiver cabinet, it is recommended that the picture tube be externally degaussed by a minimum degaussing field of 20 gauss measured at the faceplate of the tube. The external degaussing procedure should be followed by the receiver's internal degaussing in the normal manner. It is recommended that this take place in a magnetic field having a 470 mG vertical component and a zero horizontal component. If this field is not available, it is essential that the tube be degaussed in the specific earth's magnetic field (strength and orientation) in which it is to be evaluated. Both the external degaussing and the receiver's internal degaussing must be performed with the receiver turned "off" or with the vertical scan removed. Proper degaussing will assure satisfactory performance for color field purity.

Degaussing Coils

For optimum automatic degaussing, either of two different degaussing-coil arrangements should be incorporated in the TV receiver – top and bottom coils or twisted loop. Lances are provided in the rimband of the tube to facilitate mounting the degaussing coil(s) to the tube funnel.

Two-Coil, Top and Bottom System – The two coils should be symmetrically placed on the tube funnel as shown in **Figure 9** and series-connected in such a way that the fields will add to produce the required degaussing field. If this coil configuration is improperly phased, the magnetic fields will not provide proper degaussing.

Twisted-Loop System – The twisted-loop coil should be placed on the tube funnel as shown in **Figure 10.** This single-coil configuration produces a degaussing effect similar to the two-coil system.

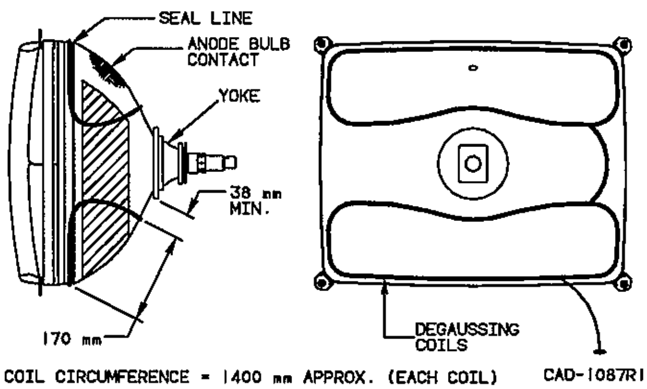


Figure 9 – Relative Placement of Typical Top and Bottom Degaussing Coils

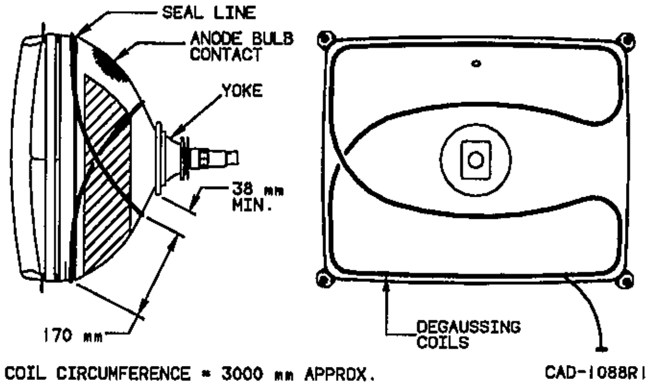


Figure 10 – Relative Placement of Typical Twisted-Loop Degaussing Coil

Degaussing Circuit

The degaussing circuit should provide a minimum of 1500 peak-to-peak ampere-turns (AT) in the degaussing coil. 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.

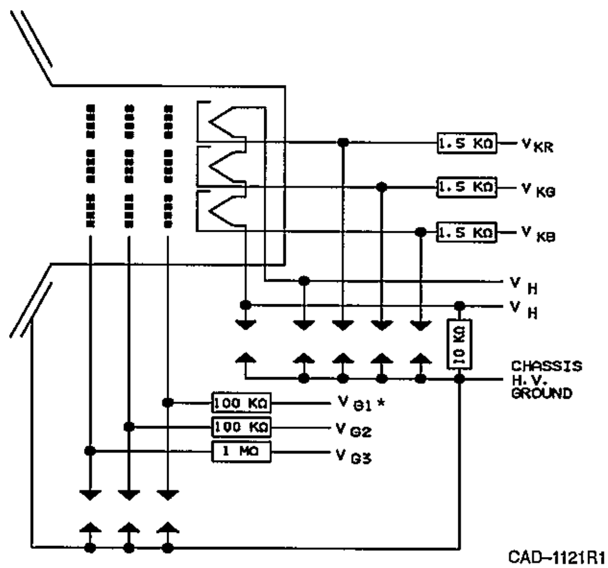
With any degaussing circuit it is necessary to eliminate interactions which occur between the deflection yoke fields and the degaussing coil(s). The induced current can be minimized by careful positioning of the degaussing coil(s). For this reason, and in order to achieve optimal degaussing recovery, coil placement should follow the recommendations shown in **Figure 9** or **Figure 10.** This will provide a minimum distance of 38 mm measured from the yoke liner. 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.

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 noninductive 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 1.5 to 3.0 kV. 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 **Figure 11**). 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 of circulating currents in the chassis and. excessive currents in the picture-tube elements.



* 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.

Figure 11 – Picture-Tube Connections Showing Spark-Gap Recommendations and Typical Isolation-Resistor Values

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 other low-voltage spark gaps. 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.

Tube Mounting

Integral mounting lugs are provided to facilitate mounting the picture tube in the receiver. To prevent a possible shock hazard, it is recommended that the integral mounting lugs and other metal hardware of the tube be connected to the receiver chassis through one of the mounting lugs. If the chassis is not at ground potential, the connection should be made through a 1 MΩ current-limiting resistor. The mounting system and other receiver hardware should not place mechanical stress on, or cause abrasion of, the tube; particularly to the panel-to-funnel seal.

The TV receiver mounting system should incorporate sufficient cushioning so that under conditions of shipment or handling, forces applied to the picture tube should not create accelerations greater than 35 g's.