Color Picture Tube Assembly

A51-610X

110° Deflection-29mm Neck -51 cm Diagonal Precision In-Line Color Picture Tube Assembly-

Includes Factory Preset Yoke and Neck Components

- Self-Converging System
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type Yoke with Low Impedance — Ideal for Solid-State Deflection Circuits
- Integral Tube Components — Yoke and Other Neck Components Mounted and Preset at Factory
- Quick-Heat Cathodes
- Internal Magnetic Shield
- Line Screen — Minimizes Vertical Register Sensitivity
- Moiré Minimized for 625 TV-Line Systems
- Short Overall Length — 337 mm Allows Improved Cabinet Styling
- Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs
- Integral Mounting Lugs

Videocolor A51-610X is a 110° Color Picture Tube Assembly consisting of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke system, and a permanent magnet purity and static convergence device. The picture tube incorporates an internal magnetic shield and quick-heat cathodes. The quick-heat cathode design provides a typical warmup time of 7.5 seconds to produce 50 per cent of stabilized emission current when operated at nominal heater voltage from a source impedance of 1 ohm.

The A51-610X 110° precision in-line color picture tube assembly features a lower deflection power requirement than most commercial 110° color picture tube systems of the same size. It maintains most of the inherently self-converging features of the 90° precision in-line system. Additional convergence correction is accomplished by an integral quadrupole yoke winding excited by the vertical drive. Simple circuitry provided within the yoke housing has only two controls, preset at the factory.

The PST yoke system in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self-convergence. Simple permanent-magnet devices are used to accomplish static convergence and purity.

The yoke and other neck components are preassembled on the tube and factory preset for optimum performance. The precision in-line tube assembly can normally be installed in the receiver by the manufacturer or field serviceman without making any convergence or purity adjustments—saving installation and adjustment costs. The integral tube-component construction provides reliable and stable convergence, purity, and white uniformity performance throughout tube life.

Picture Tube Data

Electrical:		
Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Preset)	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110	deg
Horizontal	97	deg
Vertical	77	deg

Picture Tube Data (Cont'd)

Direct Interelectrode Capacitance (Approx.)		
Grid No.1 to all other electrodes	11.4	pF
Grid No.3 to all other electrodes	5.6	pF
Green cathode to all other electrodes	6.7	pF
Red or blue cathode to all other electrodes	5.5	pF
Capacitance Between Anode and External Conductive Coating	1750 max. 1350 min.	pF pF
Resistance Between Metal Hardware and External Conductive Coating	50	MΩ

Optical:

Faceplate:	
Light transmission at center (Approx.)	52%
Surface	Polished
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green)	P22
Persistence	Medium Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios (Approx.)	0.826 mm

Mechanical:

Tube Dimensions:	
Overall length	336.88 ± 6.35 mm
At mold-match line:	
Diagonal	513.46 ± 2.36 mm
Horizontal	440.46 ± 2.36 mm
Vertical	341.76 ± 2.36 mm
Minimum Screen Dimensions (Projected):	
Diagonal	479.98 mm
Horizontal	404.42 mm
Vertical	303.30 mm
Area	1194 sq cm
Bulb Funnel Designation	JEDEC No.J510C
Bulb Panel Designation	JEDEC No.F513A
Anode Bulb Contact Designation	Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)
Base Designation[a]	JEDEC No.B12-260
Pin Position Alignment	Pin No.1 Aligns Approx. with Anode Bulb Contact
Operating Position, Preferred	Anode Bulb Contact on Top
Gun Configuration	Horizontal In-Line
Weight (Approx.)	12.2 kg

Implosion Protection:

Type	Reinforcing Bars and Tension Bands

Maximum and Minimum Ratings, Absolute-Maximum Values[b]:

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

Anode Voltage	27.5 max. 20 min.	kV kV
Anode Current, Long-Term Average[c]	1000 max.	μA
Grid No.3 (Focusing electrode) Voltage	6000 max.	V
Peak Grid No.2 Voltage	1000 max.	V
Cathode Voltage:		
Positive bias value	400 max.	V
Positive operating cutoff value	200 max.	V
Negative bias value	0 max.	V
Negative peak value	2 max.	V
Heater Voltage (AC or DC)[d,e]	6.9 max. 5.7 min.	V 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	200 max.	V
Peak value	200 max.	V
In service mode	300 max.	V
Heater positive with respect to cathode:		
DC component value	0 max.	V
Peak value	200 max.	V

Typical Design Values:

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

For anode voltage of 25 kV	
Grid-No.3 (Focusing electrode) Voltage	16.8% to 20% of Anode voltage
Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot	See CUTOFF DESIGN CHART in Figure 2
At cathode voltage of 125 V	335 to 670 V
At cathode voltage of 150 V	425 to 820 V
At cathode voltage of 175 V	510 to 975 V
Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun with Cathode Voltage Adjusted for Spot Cutoff	1.50
Heater Voltage[d,e]	6.3 V
Grid-No.3 Current	±15 μA
Grid-No.2 Current	±5 μA
Grid-No.1 Current	±5 μA

	Illum. D 6550° K + 7 M.P.C.D.	Color 9300° K + 27 M.P.C.D.	
To Produce White Light of			
CIE Coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:	
Horizontal	±8.0 mm
Vertical	±8.0 mm

Limiting Circuit Values:

High-Voltage Circuits:	
Grid-No.3 circuit resistance	7.5 max. MΩ
Low-Voltage Circuits:	
Effective grid-No.1-to cathode-circuit resistance	0.75 max. MΩ

Deflection Yoke Data

Horizontal Section:[f]		
Inductance at 1 V rms and 1 kHz	0.28 ± 5%	mH
Resistance at 25° C	0.36 ± 7%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	12.0	A
Stored energy	5.1	mJ
Vertical Section, Including Quadrupole Coil Circuit:[g]		
Inductance at 1 V rms and 1 kHz	3.2 ± 5%	mH
Resistance at 25° C:		
At vertical current = 0 A dc	4.8 ± 10%	Ω
At vertical current = 1.55 A dc	3.9 ± 10%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	3.1	A
Raster Pincushion Distortion:[h]		
East/West	9.0%	
North/South	8.5%	

Maximum Ratings, Absolute-Maximum Values:[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs	700 max. V
Peak Pulse Voltage Between Horizontal and Vertical or Quadrupole Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs	700 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

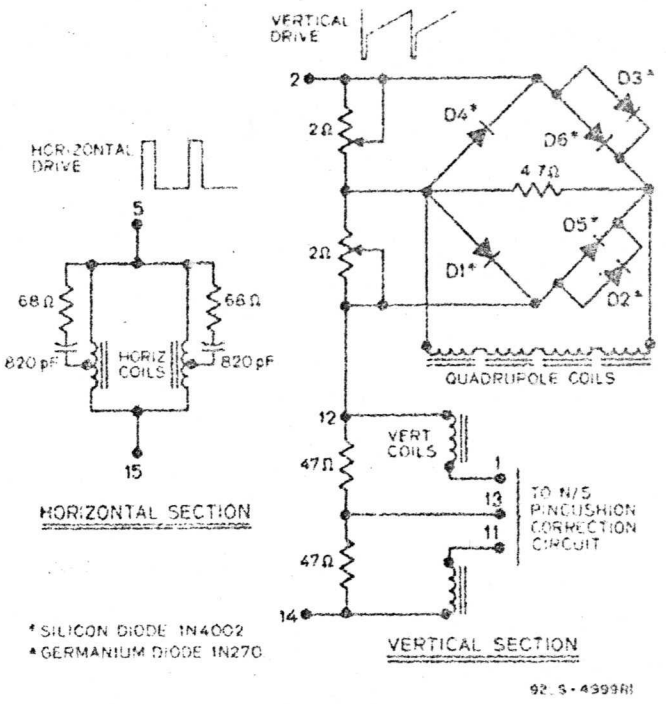


Figure 1 — Circuit of the Deflection Yoke

a The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one-half kilogram.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short term average anode current should be limited by circuitry of 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

e Although the tube incorporates a "quick heat" design, a faster turn-on can be accomplished with "instant on" operation. If "instant on" operation is utilized, the Absolute-Maximum heater voltage under standby conditions is 5.5 volts. The Typical Design heater voltages for "instant on" operation are: 6.0 volts under operating conditions and 5.0 volts under standby conditions. All other voltages normally applied to the tube must be removed during standby operation.

f Measured between terminals 5 and 15.

g Measured between terminals 2 and 14 with terminals 1, 11, and 13 connected together. The vertical section of the yoke includes the quadrupole coil circuit with nonlinear elements. Therefore, the vertical deflection circuit should employ suitable circuit techniques such as current feedback to ensure that the small nonlinear impedance of the quadrupole coil does not distort the deflection current waveform.

h Measured in accordance with IEC Recommendation – Publication 107-1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

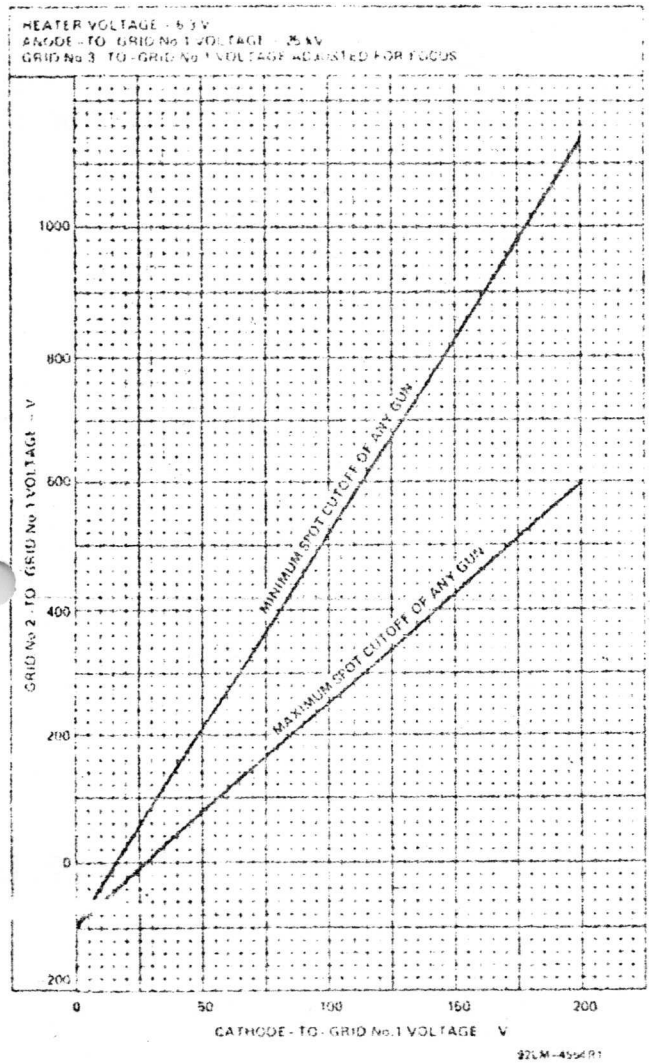


Figure 2 – Cutoff Design Chart

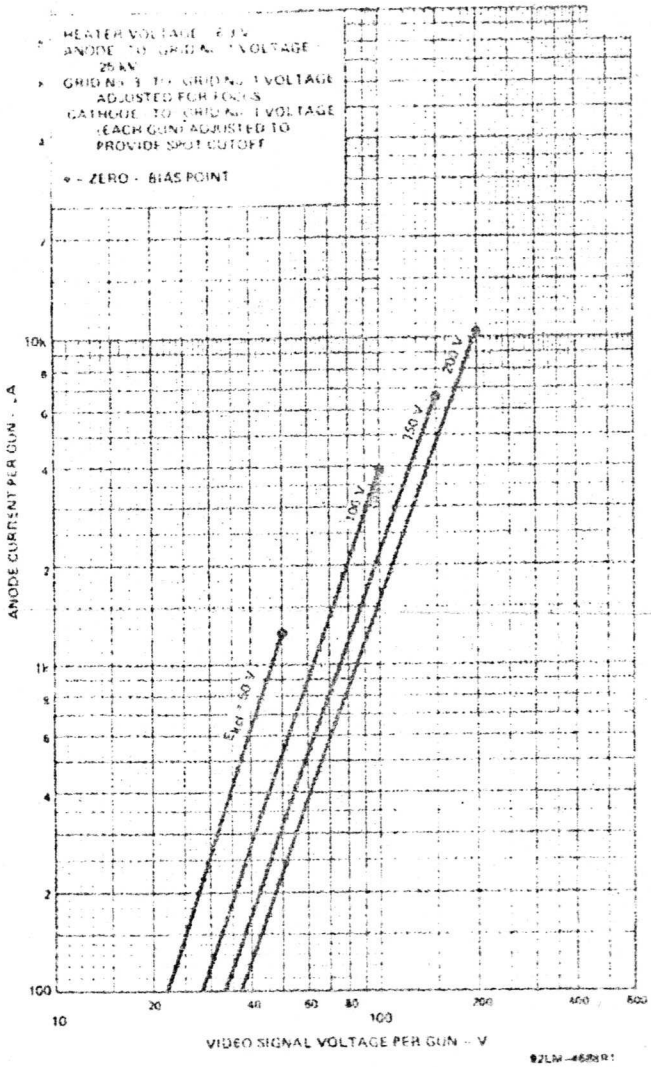


Figure 3 – Typical Drive Characteristics, Cathode-Drive Service

Basing Specification JEDEC No.13D

Pin 1: Grid No.3
Pin 3: Cathode of Blue Gun
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Gun
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Gun
Pin 13: NC
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

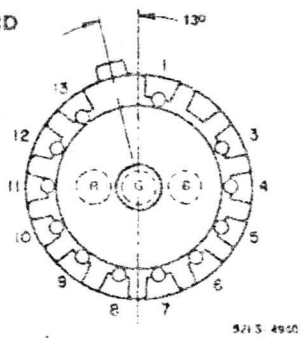
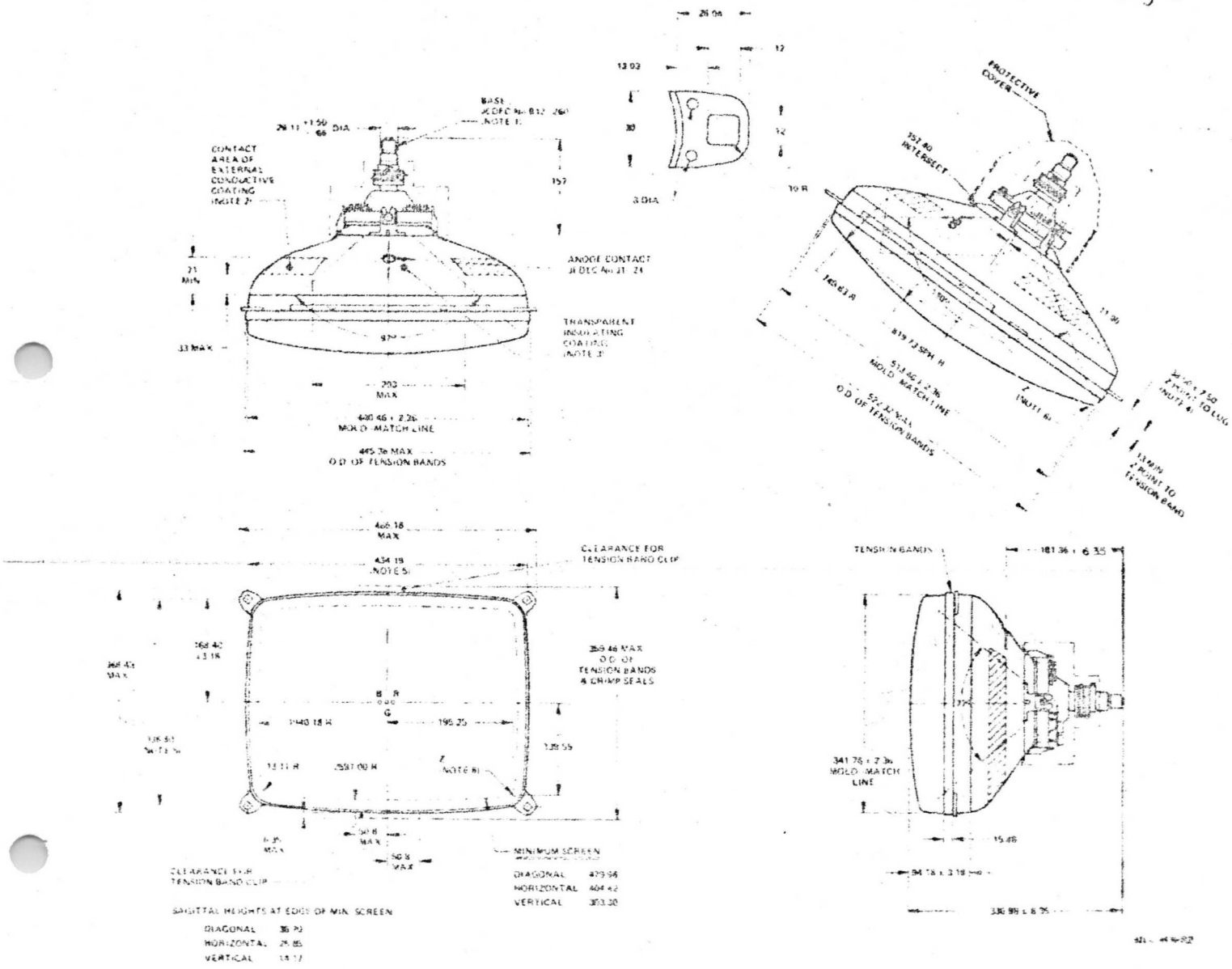


Figure 4 – Bottom View of Base



Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

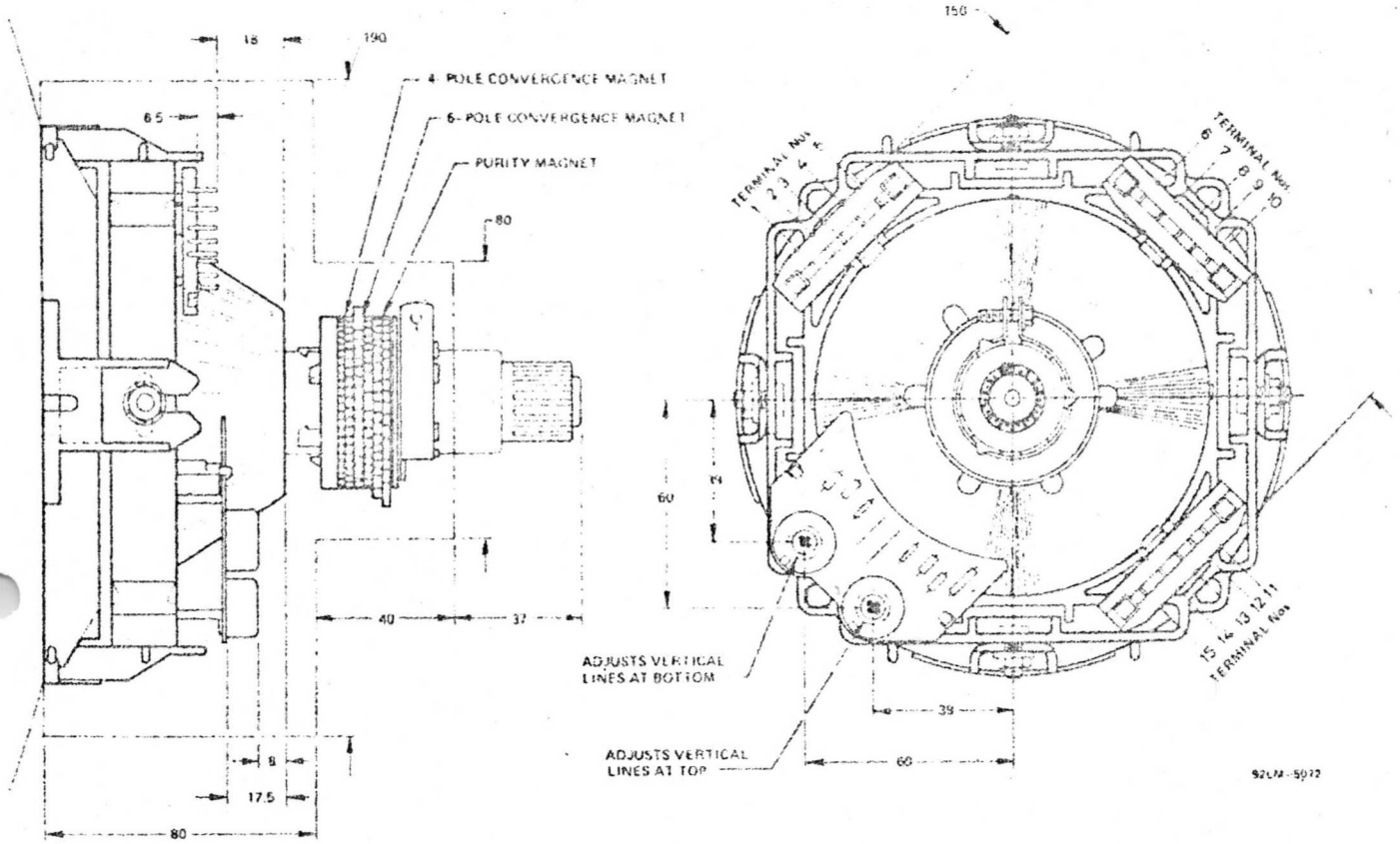
Note 4 – One of four brackets may deviate 2 mm max. from the plane of the other three.

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

Note 6 – "Z" is located on the outside surface of the faceplate at the intersection of the minimum published screen with the diagonal axis. This point is used as a reference for the mounting lugs.

Dimensions in mm unless otherwise shown

Figure 5 – Dimensional Outline



Term. 1: Pin Correction	Term. 6: IC	Term. 11: Pin Correction
Term. 2: Vertical High	Term. 7: NC	Term. 12: IC
Term. 3: IC	Term. 8: IC	Term. 13: Pin Correction CT
Term. 4: IC	Term. 9: IC	Term. 14: Vertical Low
Term. 5: Horizontal High	Term. 10: IC	Term. 15: Horizontal Low

Figure 6 — Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

Convergence and Purity

The slight correction required for static convergence and color purity in the precision in-line system is supplied by three pairs of permanent magnets in one assembly which is mounted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of approximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished by varying the magnetic strength in the pair of magnets nearest the base to produce a vertical field. The other two pairs of magnets are used for static convergence, a four-pole magnet as shown in Figure 7 (the pair nearest the yoke) to move the outside beams equally in opposite directions and a six pole magnet as shown in Figure 8 (the middle pair) to move the outside beams equally in the same direction. In both the four-pole and six-pole devices the field in the center is zero so the center beam is unaffected. These devices are used to converge any orientation of the outside beams to the center beam at the center of the screen with substantially no motion of the center beam and without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

Convergence of the three beams over the entire screen is accomplished by (1) positioning of the yoke with respect to the beams and (2) application of vertical-frequency correction current through a quadrupole winding on the yoke. The yoke is adjusted and secured in its optimum position in the tube factory. The quadrupole coils on the yoke are driven by a small circuit included in the vertical section of the deflection yoke. This circuit is internally connected in series with the vertical deflection coils and forms an integral part of the self-convergence system. The two controls provided are adjusted at the same time the mechanical position of the yoke is established. The convergence action of these controls is shown in Figure 9. One control adjusts the two outside beams in a horizontal direction to converge the vertical crosshatch lines in the upper half of the raster. The other control performs a similar function in the lower half of the raster. These controls are located in an accessible position, as shown in Figure 6, for readjustment in the receiver as required for optimum performance.

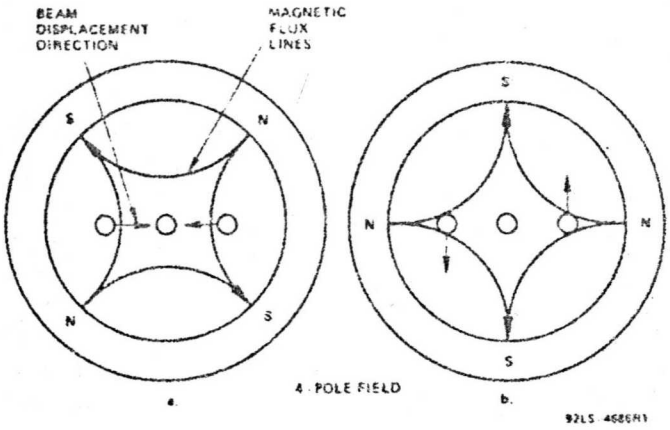
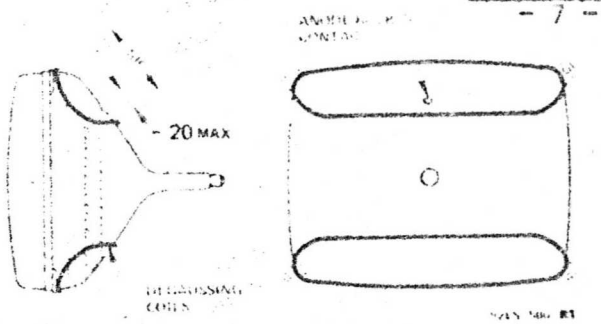


Figure 7 – Beam Motion Produced by the Four-Pole Convergence Magnet



Dimensions in mm

Figure 10 – Relative Placement of Typical Degaussing Coil

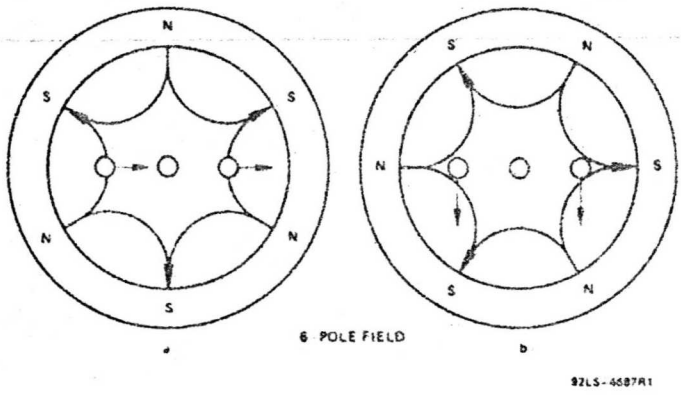


Figure 8 – Beam Motion Produced by the Six-Pole Convergence Magnet

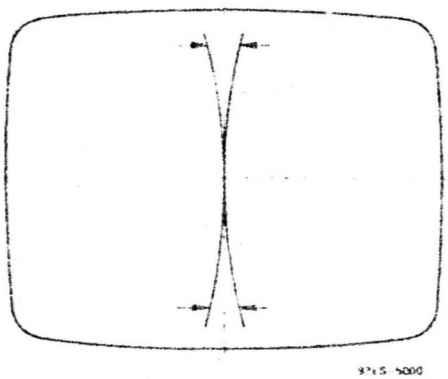


Figure 9 – Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

Magnetic Shield and Degaussing

The A51-610X is provided with an internal magnetic shield. In order to be effective, the shield and the shadow-mask assembly should be thoroughly degaussed in the presence of the vertical component of the earth's magnetic field. This initial degaussing should be performed with the tube mounted in the TV receiver. The treatment will correct for localized areas of misregister resulting from magnetization of the metal shield and other tube parts. The vertical component of the earth's field is essentially constant with any receiver's orientation and the degaussing will compensate for this field also.

After the initial degaussing, automatic degaussing may be accomplished by two coils mounted on the top and bottom of the funnel, as shown in Figure 10, and connected to produce a vertical, crossaxial degaussing field. For proper degaussing, an initial value of 1200 peak-to-peak ampere-turns (equivalent to an mmf of 300 ampere-turns in each coil) is required. The degaussing circuit must gradually reduce this mmf to a quiescent level not exceeding 2.0 peak-to-peak ampere-turns. For optimum performance, the degaussing coils should always be connected to a very low source impedance to the horizontal frequency. Rectangular holes are provided in the rim bands to facilitate mounting of the automatic degaussing coils.

WARNING

X-Radiation:
This color picture tube does not emit x-radiation above the internationally accepted dosage rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

Implosion Protection:
This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a recommended replacement 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 safe guards 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 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 control brackets may produce a shock hazard.

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. To maintain the preset adjustments of the neck components, the assembly is shipped with a protective cover over these components. The cover should be left on the assembly until it is mounted in the receiver. The picture tube assembly should never be handled by the neck, yoke or other components. The mounting lugs or mounting holes in the implosion protection hardware may be used to aid in the installation of the tube assembly in the cabinet.

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

Color Picture Tube

RCA

A56-610X

110° Deflection-29mm Neck-56cm Diagonal Precision In-Line Color Picture Tube Assembly-

Includes Factory Preset Yoke and Neck Components

- Self-Converging System
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type Yoke with Low Impedance — Ideal for Solid-State Deflection Circuits
- Integral Tube Components — Yoke and Other Neck Components Mounted and Preset at Factory
- Quick-Heat Cathodes
- Internal Magnetic Shield
- Line Screen — Minimizes Vertical Register Sensitivity
- Moiré Minimized for 625 TV-Line Systems
- Short Overall Length — 358 mm Allows Improved Cabinet Styling
- Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs
- Integral Mounting Lugs

RCA A56-610X is a 110° Color Picture Tube Assembly consisting of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke system, and a permanent magnet purity and static convergence device. The picture tube incorporates an internal magnetic shield and quick-heat cathodes. The quick-heat cathode design provides a typical warmup time of 7.5 seconds to produce 50 per cent of stabilized emission current when operated at nominal heater voltage from a source impedance of 1 ohm.

The A56-610X 110° precision in-line color picture tube assembly features a lower deflection power requirement than any commercial 110° color picture tube system of the same size. It maintains most of the inherently self-converging features of the 90° precision in-line system. Additional convergence correction is accomplished by an integral quadrupole yoke winding excited by the vertical drive. Simple circuitry provided within the yoke housing has only two controls, preset at the factory.

The PST yoke system in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self-convergence. Simple permanent-magnet devices are used to accomplish static convergence and purity.

The yoke and other neck components are preassembled on the tube and factory preset for optimum performance. The precision in-line tube assembly can normally be installed in the receiver by the manufacturer or field serviceman without making any convergence or purity adjustments—saving installation and adjustment costs. The integral tube-component construction provides reliable and stable convergence, purity, and white uniformity performance throughout tube life.

Picture Tube Data

Electrical:		
Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Preset)	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110	deg
Horizontal	97	deg
Vertical	77	deg

Printed in U.S.A./11-75

Deflection Yoke Data

Horizontal Section:[f]		
Inductance at 1 V rms and 1 kHz	0.27 ± 5%	mH
Resistance at 25° C	0.35 ± 7%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	12.0	A
Stored energy	4.9	mJ
Vertical Section, Including Quadrupole Coil Circuit:[g]		
Inductance at 1 V rms and 1 kHz	3.3 ± 5%	mH
Resistance at 25° C:		
At vertical current = 0 A dc	4.5 ± 10%	Ω
At vertical current = 1.5 A dc	4.0 ± 10%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	3.0	A
Raster Pincushion Distortion:[h]		
East/West	9.0%	
North/South	8.5%	

Maximum Ratings, Absolute-Maximum Values:[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs	700 max. V
Peak Pulse Voltage Between Horizontal and Vertical or Quadrupole Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs	700 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

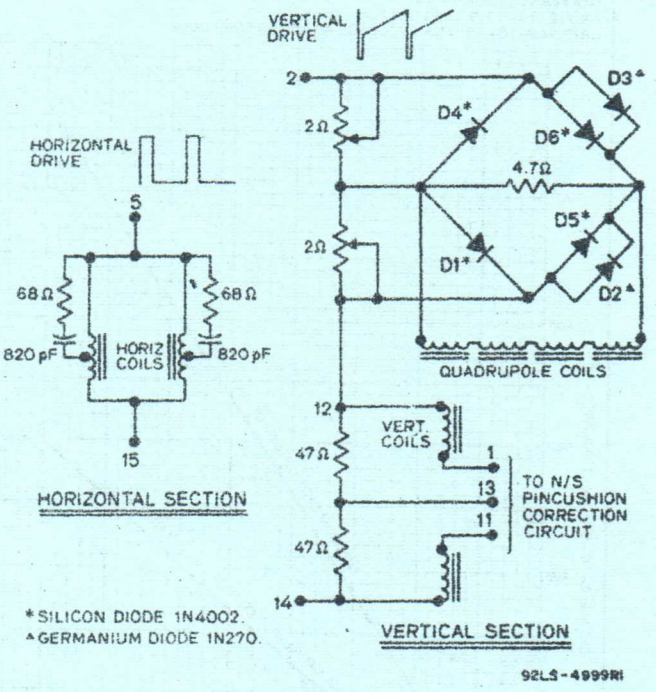


Figure 1 — Circuit of the Deflection Yoke

a The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one-half kilogram.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry of 1500 microamperes.

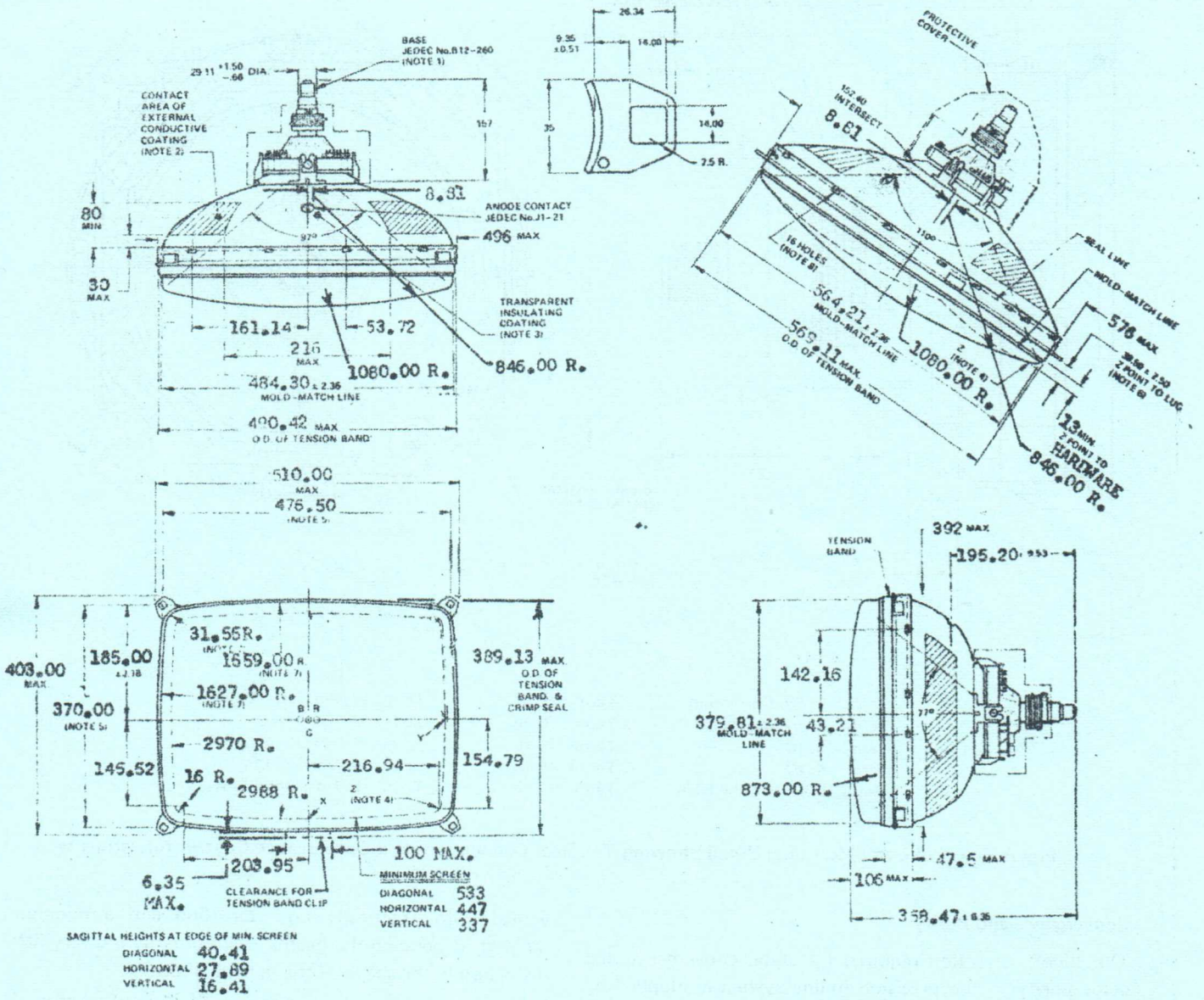
d For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

e Although the tube incorporates a "quick heat" design, a faster turn-on can be accomplished with "instant on" operation. If "instant on" operation is utilized, the Absolute-Maximum heater voltage under standby conditions is 5.5 volts. The Typical Design heater voltages for "instant on" operation are: 6.0 volts under operating conditions and 5.0 volts under standby conditions. All other voltages normally applied to the tube must be removed during standby operation.

f Measured between terminals 5 and 15.

g Measured between terminals 2 and 14 with terminals 1, 11, and 13 connected together. The vertical section of the yoke includes the quadrupole coil circuit with nonlinear elements. Therefore, the vertical deflection circuit should employ suitable circuit techniques such as current feedback to ensure that the small nonlinear impedance of the quadrupole coil does not distort the deflection current waveform.

h Measured in accordance with IEC Recommendation — Publication 107-1960 — Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.



Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

Note 4 – "X", "Y", and "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 9.5 mm in diameter when positioned on the hole centers.

Note 6 – One of four brackets may deviate 2 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 14.73 mm x 5.08 mm.

Dimensions in mm unless otherwise noted

Figure 5 – Dimensional Outline

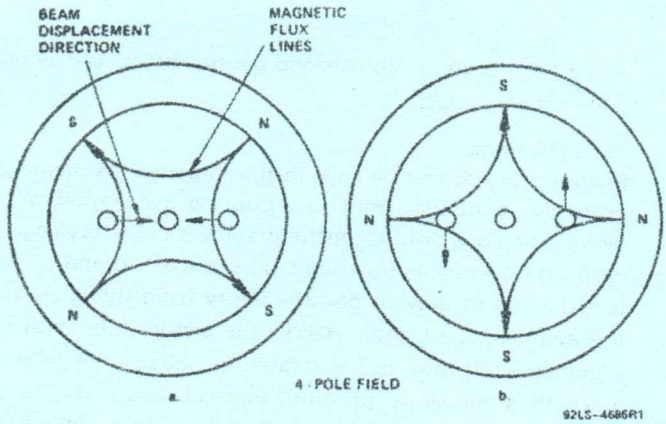


Figure 7 — Beam Motion Produced by the Four-Pole Convergence Magnet

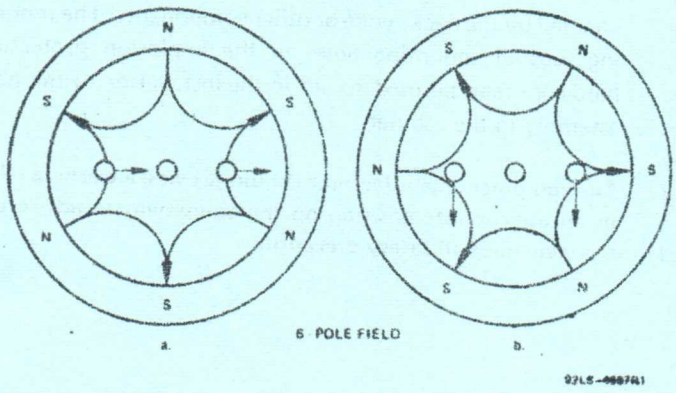


Figure 8 — Beam Motion Produced by the Six-Pole Convergence Magnet

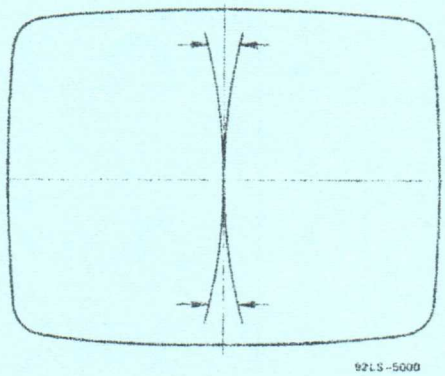
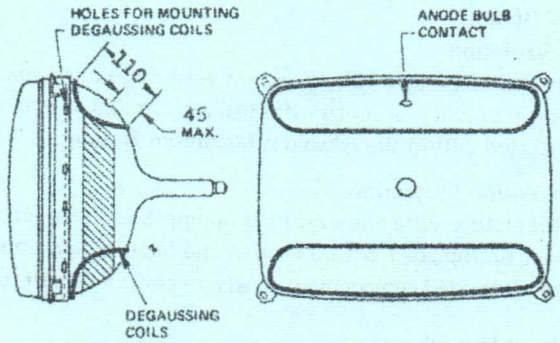


Figure 9 — Convergence Action Accomplished by Adjustment of Quadrupole Coil Current



Dimensions in mm

Figure 10 — Relative Placement of Typical Degaussing Coil

Magnetic Shield and Degaussing

The A56-610X is provided with an internal magnetic shield. In order to be effective, the shield and the shadow-mask assembly should be thoroughly degaussed in the presence of the vertical component of the earth's magnetic field. This initial degaussing should be performed with the tube mounted in the TV receiver. The treatment will correct for localized areas of misregister resulting from magnetization of the metal shield and other tube parts. The vertical component of the earth's field is essentially constant with any receiver's orientation and the degaussing will compensate for this field also.

After the initial degaussing, automatic degaussing may be accomplished by two coils mounted on the top and bottom of the funnel, as shown in Figure 10, and connected to produce a vertical, crossaxial degaussing field. For proper degaussing, an initial value of 1200 peak-to-peak ampere-turns (equivalent to an mmf of 300 ampere-turns in each coil) is required. The degaussing circuit must gradually reduce this mmf to a quiescent level not exceeding 2.0 peak-to-peak ampere-turns. For optimum performance, the degaussing coils should always be connected to a very low source impedance to the horizontal frequency. Rectangular holes are provided in the rim bands to facilitate mounting of the automatic degaussing coils.

RCA Picture Tube Division

Color Picture Tube Assembly

A56-611X

AL/1978/2
Annex CRT
- 44 -

110° Deflection - 29mm Neck - 56cm Diagonal Precision In-Line Color Picture Tube Assembly

Includes Factory Preset Yoke and Neck Components

- Self-Converging System
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type with Low Impedance — Ideal for Solid-State Deflection Circuits
- Integral Tube Components — Yoke and Other Neck Components Mounted and Preset at Factory
- Integral Mounting Lugs
- Super Arch Mask — Minimizes Thermal Expansion Effects
- Tinted Phosphor Screen — Enhanced Color and Contrast
- Line Screen — Minimizes Vertical Register Sensitivity
- Moiré Minimized for 625 TV-Line Systems
- Internal Magnetic Shield
- Quick-Heat Cathodes
- Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs

RCA A56-611X is a 110° Color Picture Tube Assembly consisting of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke system, and a permanent magnet purity and static convergence device. The picture tube incorporates selectively absorbent phosphors, an internal magnetic shield and quick-heat cathodes. The phosphor is tinted to selectively absorb room light striking it and permit only the phosphor color to be reflected. The quick-heat cathode design provides a typical warmup time of 7.5 seconds to produce 50 per cent of stabilized emission current when operated at nominal heater voltage from a source impedance of 1 ohm.

The A56-611X 110° precision in-line color picture tube assembly features a low deflection power requirement. It maintains most of the inherently self-converging features of the 90° precision in-line system. Additional convergence correction is accomplished by an integral quadrupole yoke winding excited by the vertical drive. Simple circuitry provided within the yoke housing has only two controls, preset at the factory.

The PST yoke system in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self-convergence. Simple permanent-magnet devices are used to accomplish static convergence and purity.

The yoke and other neck components are preassembled on the tube and factory preset for optimum performance. The precision in-line tube assembly can normally be installed in the receiver by the manufacturer or field serviceman without making any convergence or purity adjustments—saving installation and adjustment costs. The integral tube-component construction provides reliable and stable convergence, purity, and white uniformity performance throughout tube life.

Picture Tube Data

Electrical:

Heater		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Percent)	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Diagonal	110	deg
Horizontal	97	deg
Vertical	78	deg
Direct Interelectrode Capacitance (Approx.):		
Grid No.1 to all other electrodes	11.4	pF
Grid No.3 to all other electrodes	5.6	pF
Green cathode to all other electrodes	7.1	pF
Red or blue cathode to all other electrodes	6.5	pF
Capacitance Between Anode and External Conductive Coating	1750 max. 1350 min.	pF pF
Capacitance Between Anode and Metal Hardware	300	pF
Resistance Between Metal Hardware and External Conductive Coating	50 min.	MΩ

Optical:

Faceplate:	
Light transmission at center (Approx.)	71.5%
Surface	Polished
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green)	P22
Type	Selectively absorbent
Persistence	Medium-Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios at center (Approx.)	0.826 mm

Printed in U.S.A./3-78
A56-611X

Mechanical:

Tube Dimensions:
- Overall length ..... 358.44 ± 6.35 mm
- At mold-match line:
  - Diagonal ..... 564.2 ± 2.0 mm
  - Horizontal ..... 484.3 ± 2.0 mm
  - Vertical ..... 379.8 ± 2.0 mm

Minimum Screen Dimensions (Projected):
- Diagonal ..... 533 mm
- Horizontal ..... 447 mm
- Vertical ..... 337 mm
- Area ..... 1471 sq cm

Bulb Funnel Designation ..... JEDEC No.J561D

Bulb Panel Designation ..... JEDEC No.F564D

Anode Bulb Contact Designation ..... Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)

Base Designation[a] ..... JEDEC No.B12-260

Pin Position Alignment ..... Pin No.1 Aligns Approx. with Anode Bulb Contact

Operating Position ..... Anode Bulb Contact Up

Gun Configuration ..... Horizontal In-Line

Weight (Approx.) ..... 15.7 kg

Implosion Protection

Type ..... Rim Bands and Tension Band

Maximum and Minimum Ratings, Absolute-Maximum Values[b]

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

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d,e]	6.9	max.	V
	5.7	min.	V
Heater-Cathode Voltage:[f]			
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	200	max.	V
Peak value	300	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing electrode) Voltage ..... 16.8% to 20% of Anode voltage

Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot ..... See CUTOFF DESIGN CHART in Figure 3
- At cathode voltage of 125 V ..... 345 to 675 V
- At cathode voltage of 150 V ..... 435 to 835 V
- At cathode voltage of 175 V ..... 530 to 990 V

Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Cutoff 1.50

Heater Voltage[d,e] ..... 6.3 V

Grid-No.3 Current[g] ..... ± 15 μA

Grid-No.2 Current ..... ± 5 μA

Grid-No.1 Current ..... ± 5 μA

To Produce White Light of	6550 K + 7 M.P.C.D. (Illum. D)	9300 K + 27 M.P.C.D.	
CIE Coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:
- Horizontal ..... ± 8.0 mm
- Vertical ..... ± 8.0 mm

Deflection Yoke Data

Horizontal Section:[h]			
Inductance at 1 V rms and 1 kHz	0.27 ± 5%		mH
Resistance at 25° C	0.35 ± 7%		Ω
Typical operation with edge-to-edge scan at 25 kV:			
Peak-to-peak deflection current	12.0		A
Stored energy	5.1		mJ
Vertical Section, Including Quadrupole Coil Circuit:[i]			
Inductance at 1 V rms and 1 kHz	3.2 ± 5%		mH
Resistance at 25° C:			
At vertical current = 0 A dc	4.8 ± 10%		Ω
At vertical current = 1.55 A dc	3.9 ± 10%		Ω
Typical operation with edge-to-edge scan at 25 kV:			
Peak-to-peak deflection current	3.1		A
Typical Raster Pincushion Distortion:[k]			
East/west	9.0%		
North/south	8.5%		

Maximum Ratings, Absolute-Maximum Values:[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz For a Maximum Pulse Duration of 12.5 μs ..... 700 max. V

Peak Pulse Voltage Between Horizontal and Vertical or Quadrupole Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs ..... 700 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

a The mating socket assembly with associated circuit board and mounted components must not weigh more than one-half kilogram. 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.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry to 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply voltage be regulated at or slightly below the Typical Design Value with an adequate regulation circuit. Details of this specific circuit should be reviewed with RCA Picture Tube Division. The surge voltage across the heater must be limited to 9.5 volts rms.

e Although the tube incorporates a "quick heat" design, a faster turn-on can be accomplished with "instant on" operation. If "instant on" operation is utilized, the Absolute-Maximum heater voltage under standby conditions is 5.5 volts. The Typical Design heater voltages for "instant on" operation are: 6.0 volts under operating conditions and 5.0 volts under standby conditions. All other voltages normally applied to the tube must be removed during standby operation.

For maximum reliability, the series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm.

g A high internal impedance in the focus circuit can result in a change in the focus voltage with a change in the grid-No.3 leakage current.

h Measured between terminals 5 and 15.

j Measured between terminals 2 and 14 with terminals 1, 11, and 13 connected together. The vertical section of the yoke includes the quadrupole coil circuit with nonlinear elements. Therefore, the vertical deflection circuit should employ suitable circuit techniques such as current feedback to ensure that the small nonlinear impedance of the quadrupole coil does not distort the deflection current waveform.

k Typical measured values at a distance 5 times the picture height in accordance with IEC Recommendation — Publication 107-1960 — Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

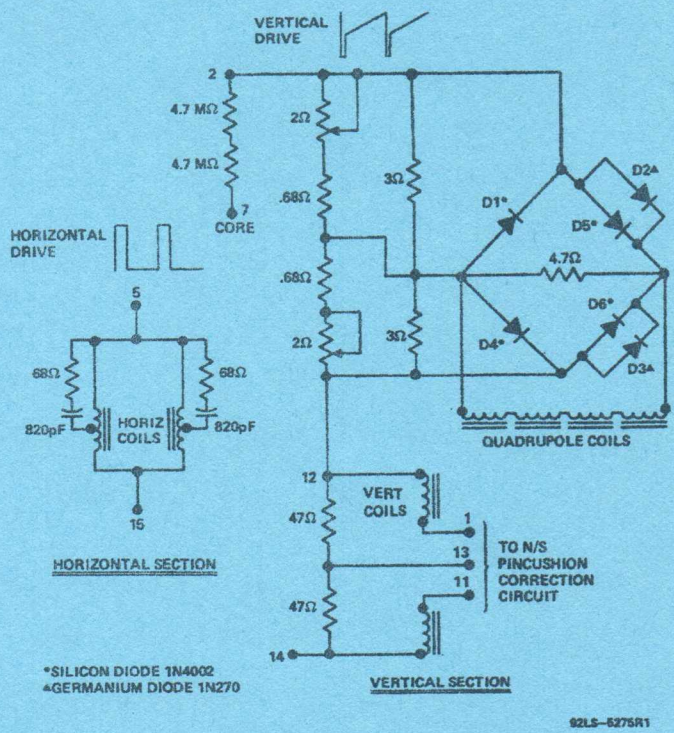


Figure 1 — Circuit of the Deflection Yoke

Basing Specification JEDEC No.13G

Pin 1: Grid No.3
Pin 3: Cathode of Blue Beam
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Beam
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Beam
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

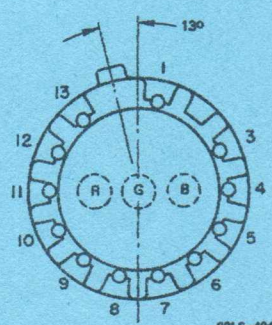


Figure 2 — Bottom View of Base

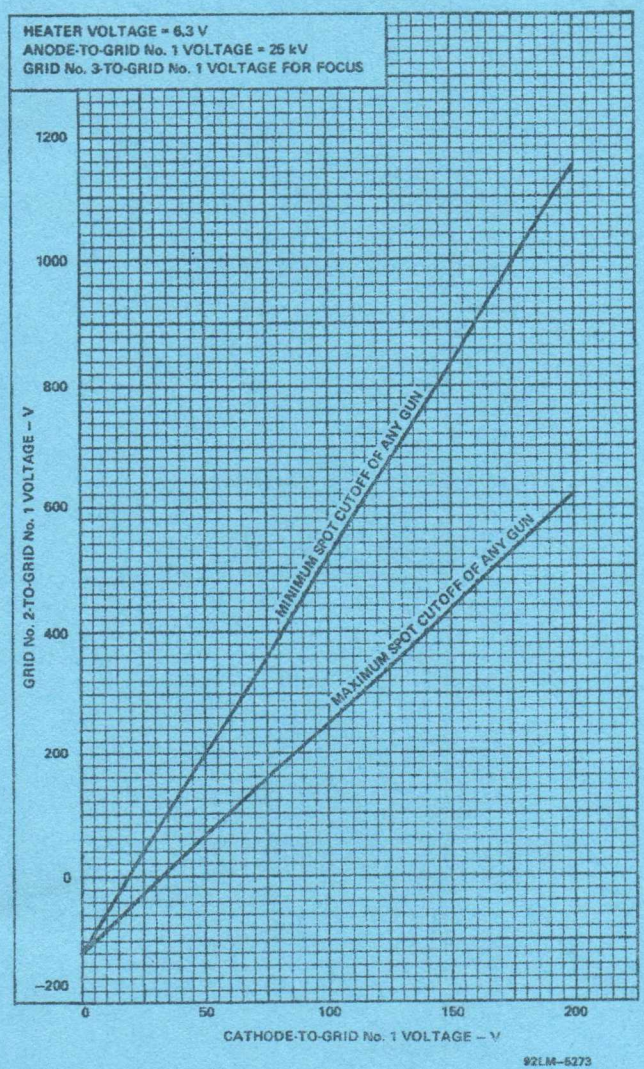


Figure 3 – Cutoff Design Chart

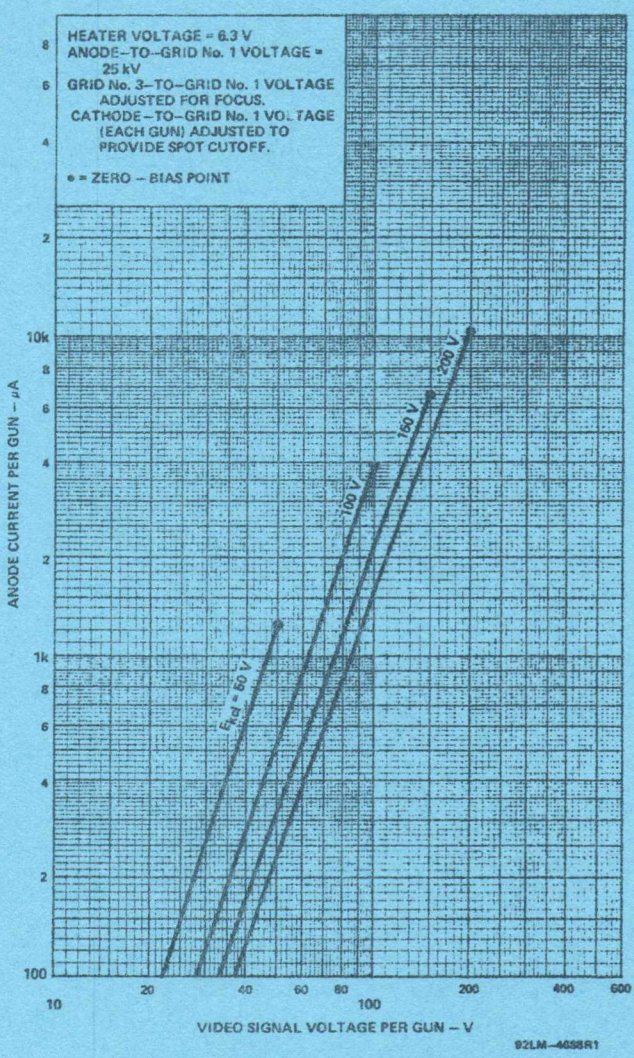


Figure 4 – Typical Drive Characteristics, Cathode-Drive Service

Notes for Dimensional Outline

Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

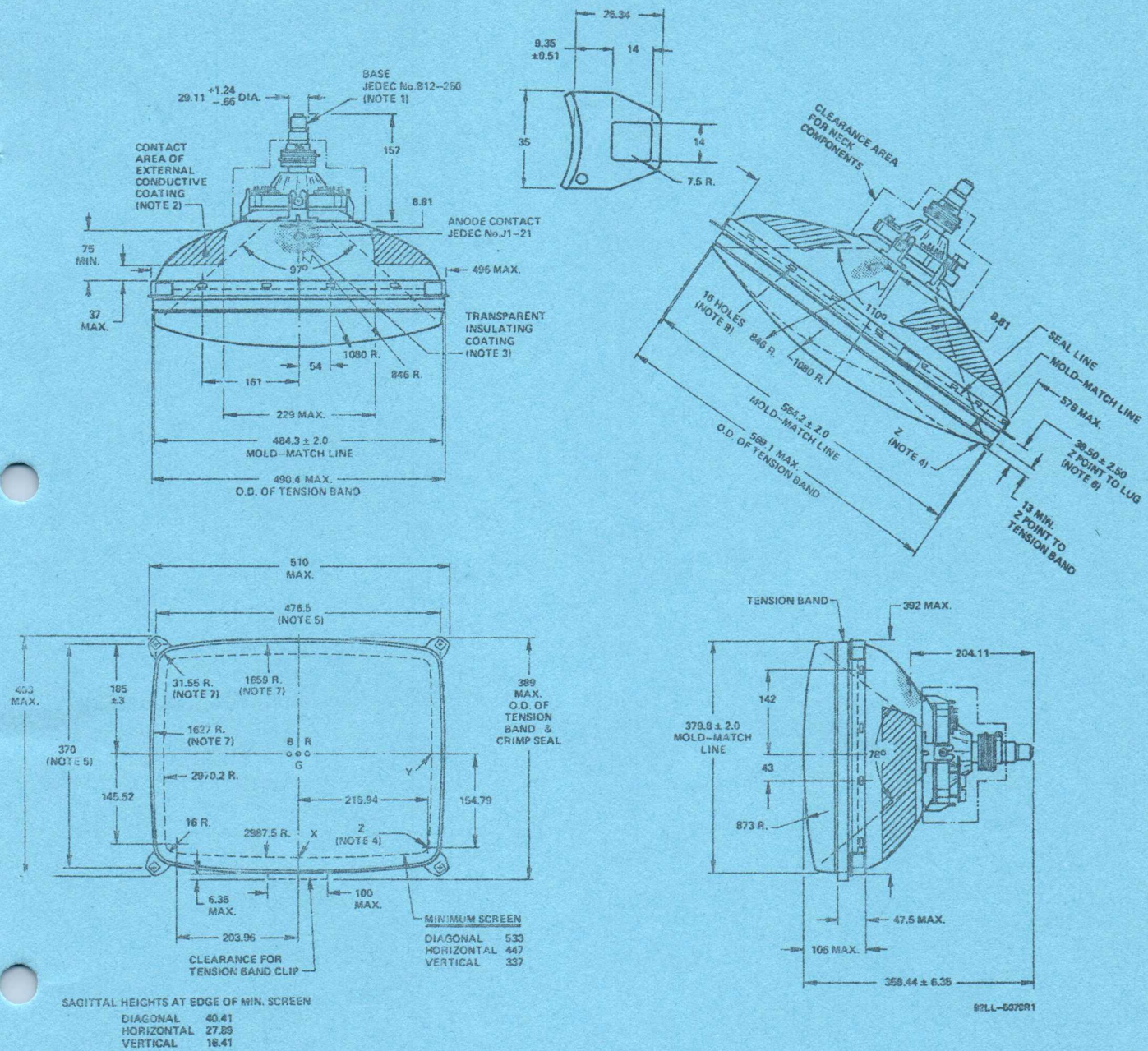
Note 4 – "X", "Y", and "Z" reference points are located on the outside surface of the faceplate at the intersection of the minimum published screen with the minor, major, and diagonal axes, respectively.

Note 5 – The tolerance of the mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when positioned on the hole centers.

Note 6 – One of four brackets may deviate 2 mm max. from the plane of the other three.

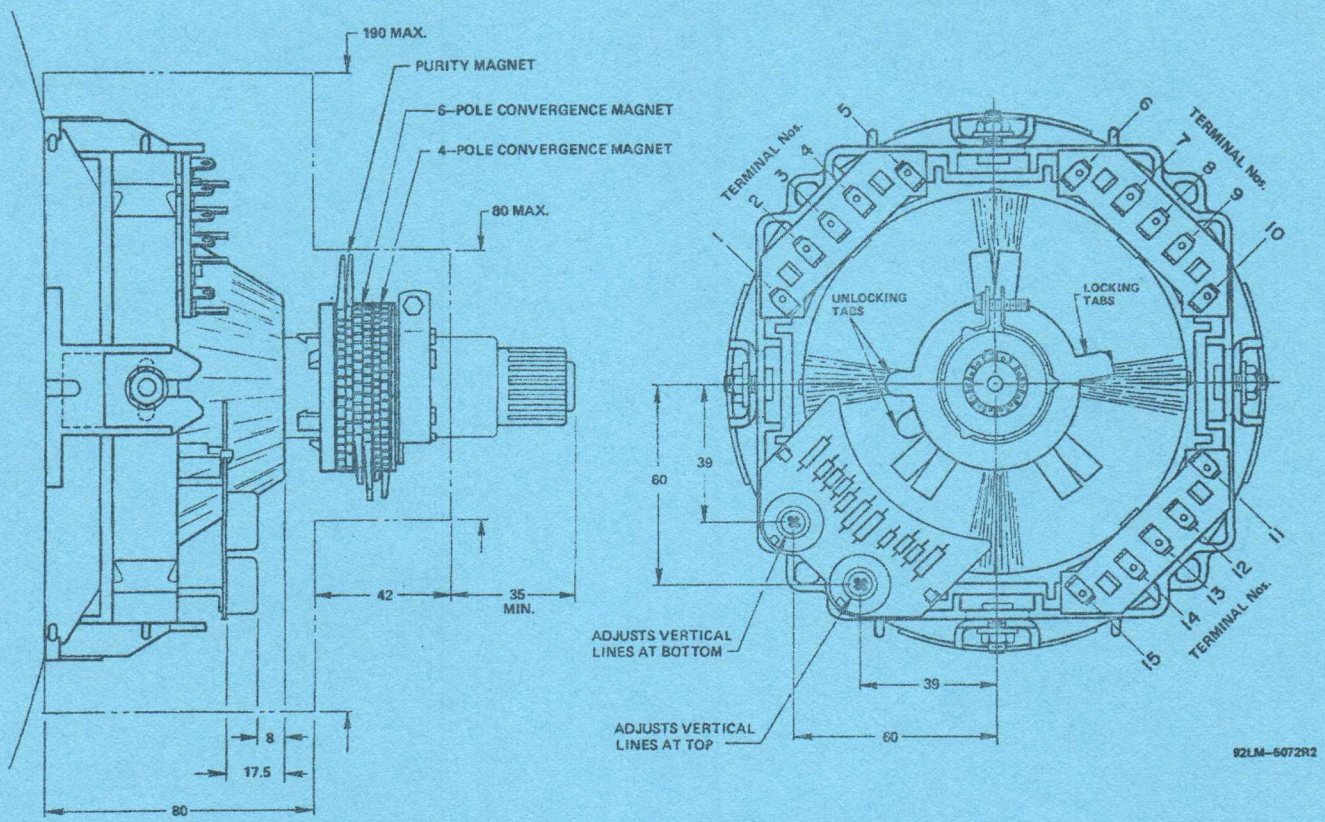
Note 7 – The radius is to the outside of the glass at the mold-match line and is intended to define the shape of the required cutout for "push-through" cabinet designs.

Note 8 – Mounting holes for degaussing coils 14.73 mm x 5.08 mm.



Dimensions in mm unless otherwise noted

Figure 5 – Dimensional Outline



Term. 1: Pin Correction
Term. 2: Vertical High
Term. 3: IC
Term. 4: IC
Term. 5: Horizontal High
Term. 6: IC
Term. 7: IC
Term. 8: IC
Term. 9: IC
Term. 10: IC
Term. 11: Pin Correction
Term. 12: IC
Term. 13: Pin Correction CT
Term. 14: Vertical Low
Term. 15: Horizontal Low

Figure 6 – Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

Convergence and Purity

The slight correction required for static convergence and color purity in the precision in-line system is supplied by three pairs of permanent magnets in one assembly which is mounted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of approximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished by varying the magnetic strength in the pair of magnets nearest the yoke to produce a vertical field. The other two pairs of magnets are used for static convergence, a four-pole magnet as shown in **Figure 7** (the pair nearest the base) to move the outside beams equally in opposite directions and a six-pole magnet as shown in **Figure 8** (the middle pair) to move the outside beams equally in the same direction. In both the four-pole and six-pole devices the field in the center is zero so the center beam is unaffected. These devices are used to converge any orientation of the outside beams to the center beam at the center of the screen with substantially no motion of the center beam and without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

Convergence of the three beams over the entire screen is accomplished by (1) positioning of the yoke with respect to the beams and (2) application of vertical-frequency correction current through a quadrupole winding on the yoke. The yoke is adjusted and secured in its optimum position in the tube factory. The quadrupole coils on the yoke are driven by a small circuit included in the vertical section of the deflection yoke. This circuit is internally connected in series with the vertical deflection coils and forms an integral part of the self-convergence system. The two controls provided are adjusted at the same time the mechanical position of the yoke is established. The convergence action of these controls is shown in **Figure 9**. One control adjusts the two outside beams in a horizontal direction to converge the vertical crosshatch lines in the upper half of the raster. The other control performs a similar function in the lower half of the raster. These controls are located in an accessible position, as shown in **Figure 6**, for readjustment in the receiver as required for optimum performance.

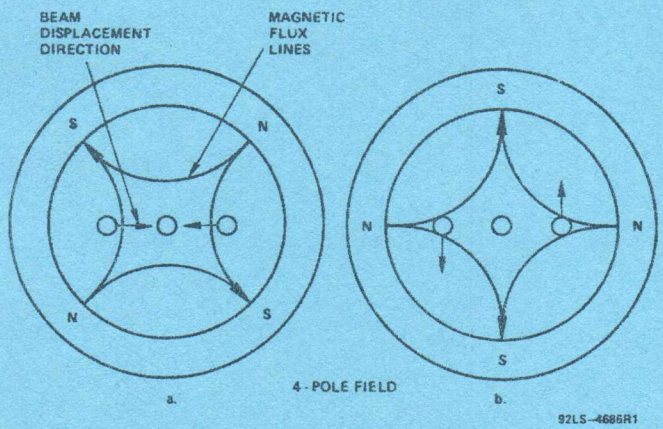


Figure 7 — Beam Motion Produced by the Four-Pole Convergence Magnet

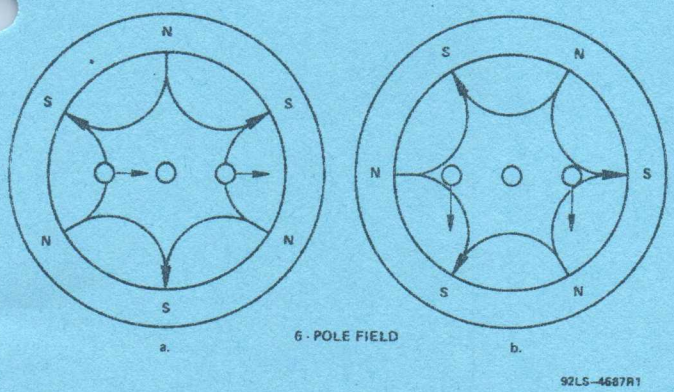


Figure 8 — Beam Motion Produced by the Six-Pole Convergence Magnet

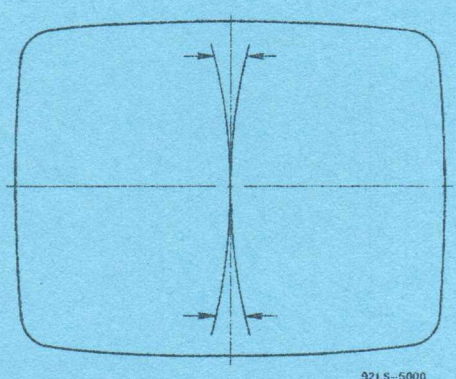
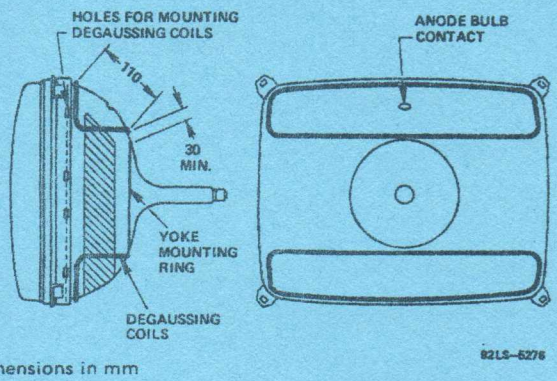


Figure 9 — Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

Magnetic Shield and Degaussing

The A56-611X tube employs an internal magnetic shield and, because of the line screen and its insensitivity to vertical beam register, allows simpler degaussing than the delta gun tubes.



Dimensions in mm

Figure 10 — Relative Placement of Typical Degaussing Coil

Degaussing Coils

The recommended degaussing system for the A56-611X utilizes two series connected coils symmetrically placed as shown in **Figure 10** with one coil on top of the funnel and one located under the funnel. Each coil consists of 200 turns of 0.5 mm wire with a circumference of 1100 to 1200 mm. These are connected to produce a vertical cross axial degaussing field. Rectangular holes are provided in the rim bands to facilitate mounting of the automatic degaussing coils.

Degaussing Circuit

A recommended degaussing circuit as shown in **Figure 11** uses a conventional dual PTC device. For proper degaussing, a minimum value of 1400 peak-to-peak ampere turns (equivalent to an MMF of 350 ampere turns in each coil) is required. It is essential that the degaussing current reduces in a gradual manner to a quiescent level not exceeding 2.0 peak-to-peak ampere turns. For optimum performance the degaussing coils should always be connected to a very low source impedance at the horizontal frequency. If the circuit used does not have an inherent low impedance at the horizontal frequency, the degaussing coil should be shunted with a suitable capacitor. If the addition of a short across the coils increases the horizontal frequency currents in the degaussing coils by more than 20%, the inherent source impedance offered by the PTC and associated circuitry is indicated to be too high to provide satisfactory performance. Therefore a capacitor should be added across the degaussing coil to satisfy this requirement.

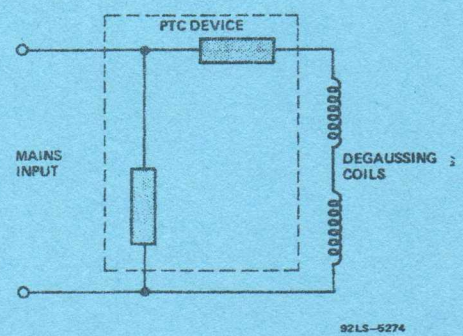


Figure 11 — Typical Degaussing Circuit

Deguassing 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. During the external degaussing, the receiver should be in an "off" condition or in an "on" condition with the vertical scan removed and the main 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 folowed by the receiver's internal degaussing in the normal manner.

WARNING

X-Radiation:

This color picture tube does not emit x-radiation above the internationally accepted isoexposure rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

Implosion Protection:

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a recommended replacement 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 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 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 A56-611X 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 of 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.

RCA Picture Tube Division

Color Picture Tube Assembly

27 JUL 1978

A56-613X

AL/1978/2
Annex CRT
- 52 -

110° Deflection - 29mm Neck - 56cm Diagonal Precision In-Line Color Picture Tube Assembly

Includes Factory Preset Yoke and Neck Components

- **Self-Converging System**
- **Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids**
- **PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type with Low Impedance — Ideal for Solid-State Deflection Circuits**
- **Integral Tube Components — Yoke and Other Neck Components Mounted and Preset at Factory for Operation in the Southern Hemisphere**
- **Integral Mounting Lugs**
- **Super Arch Mask — Minimizes Thermal Expansion Effects**
- **Tinted Phosphor Screen — Enhanced Color and Contrast**
- **Line Screen — Minimizes Vertical Register Sensitivity**
- **Moiré Minimized for 625 TV-Line Systems**
- **Internal Magnetic Shield**
- **Quick-Heat Cathodes**
- **Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs**

RCA A56-613X is a 110° Color Picture Tube Assembly designed for use in the southern hemisphere. The assembly components are factory preset for optimum performance consistent with the southern hemisphere's vertical component of the earth's magnetic field. The A56-613X consists of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke system, and a permanent magnet purity and static convergence device. The picture tube incorporates selectively absorbent phosphors, an internal magnetic shield and quick-heat cathodes. The phosphor is tinted to selectively absorb room light striking it and permit only the phosphor color to be reflected. The quick-heat cathode design provides a typical warmup time of 7.5 seconds to produce 50 per cent of stabilized emission current when operated at nominal heater voltage from a source impedance of 1 ohm.

The A56-613X 110° precision in-line color picture tube assembly features a low deflection power requirement. It maintains most of the inherently self-converging features of the 90° precision in-line system. Additional convergence correction is accomplished by an integral quadrupole yoke winding excited by the vertical drive. Simple circuitry provided within the yoke housing has only two controls, preset at the factory.

The PST yoke system in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self-convergence. Simple permanent-magnet devices are used to accomplish static convergence and purity.

The yoke and other neck components are preassembled on the tube, factory preset for optimum performance in the southern hemisphere with the anode contact button up. The precision in-line tube assembly can normally be installed in the receiver by the manufacturer or field serviceman without making any convergence or purity adjustments—saving installation and adjustment costs. The integral tube-component construction provides reliable and stable convergence, purity, and white uniformity performance throughout tube life.

Picture Tube Data

Electrical:

Heater		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Preset)	
Deflection Method	Magnetic	
Deflection Angles (Approx.)		
Diagonal	110	deg
Horizontal	97	deg
Vertical	78	deg
Direct Interelectrode Capacitance (Approx.):		
Grid No.1 to all other electrodes	11.4	pF
Grid No.3 to all other electrodes	5.6	pF
Green cathode to all other electrodes	7.1	pF
Red or blue cathode to all other electrodes	6.5	pF
Capacitance Between Anode and External Conductive Coating	1750 max. 1350 min.	pF pF
Capacitance Between Anode and Metal Hardware	300	pF
Resistance Between Metal Hardware and External Conductive Coating	50 min.	MΩ

Optical:

Faceplate:	
Light transmission at center (Approx.)	71.5%
Surface	Polished
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green)	P22
Type	Selectively absorbent
Persistence	Medium-Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios at center (Approx.)	0.826 mm

Printed in U.S.A./5-78
A56-613X

Mechanical:

Tube Dimensions:
- Overall length ..... 358.44 ± 6.35 mm
- At mold-match line:
  - Diagonal ..... 564.2 ± 2.0 mm
  - Horizontal ..... 484.3 ± 2.0 mm
  - Vertical ..... 379.8 ± 2.0 mm

Minimum Screen Dimensions (Projected):
- Diagonal ..... 533 mm
- Horizontal ..... 447 mm
- Vertical ..... 337 mm
- Area ..... 1471 sq cm

Bulb Funnel Designation ..... JEDEC No.J561D

Bulb Panel Designation ..... JEDEC No.F564D

Anode Bulb Contact Designation ..... Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)

Base Designation[a] ..... JEDEC No.B12-260

Pin Position Alignment ..... Pin No.1 Aligns Approx. with Anode Bulb Contact

Operating Position ..... Anode Bulb Contact Up

Gun Configuration ..... Horizontal In-Line

Weight (Approx.) ..... 15.7 kg

Implosion Protection

Type ..... Rim Bands and Tension Band

Maximum and Minimum Ratings, Absolute-Maximum Values[b]

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

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d,e]	6.9	max.	V
	5.7	min.	V
Heater-Cathode Voltage:[f]			
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	200	max.	V
Peak value	300	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing electrode) Voltage ..... 16.8% to 20% of Anode voltage

Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot ..... See CUTOFF DESIGN CHART in Figure 3

- At cathode voltage of 125 V ..... 345 to 675 V
- At cathode voltage of 150 V ..... 435 to 835 V
- At cathode voltage of 175 V ..... 530 to 990 V

Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Cutoff 1.50

Heater Voltage[d,e] ..... 6.3 V

Grid-No.3 Current[g] ..... ± 15 μA

Grid-No.2 Current ..... ± 5 μA

Grid-No.1 Current ..... ± 5 μA

To Produce White Light of	6550 K + 7 M.P.C.D. (Illum. D)	9300 K + 27 M.P.C.D.	
CIE Coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:
- Horizontal ..... ± 8.0 mm
- Vertical ..... ± 8.0 mm

Deflection Yoke Data

Horizontal Section:[h]
- Inductance at 1 V rms and 1 kHz ..... 0.27 ± 5% mH
- Resistance at 25° C ..... 0.35 ± 7% Ω
- Typical operation with edge-to-edge scan at 25 kV:
  - Peak-to-peak deflection current ..... 12.0 A
  - Stored energy ..... 5.1 mJ

Vertical Section, Including Quadrupole Coil Circuit:[i]
- Inductance at 1 V rms and 1 kHz ..... 3.2 ± 5% mH
- Resistance at 25° C:
  - At vertical current = 0 A dc ..... 4.8 ± 10% Ω
  - At vertical current = 1.55 A dc ..... 3.9 ± 10% Ω
- Typical operation with edge-to-edge scan at 25 kV:
  - Peak-to-peak deflection current ..... 3.1 A

Typical Raster Pincushion Distortion:[k]
- East/west 9.0%
- North/south 8.5%

Maximum Ratings, Absolute-Maximum Values:[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz For a Maximum Pulse Duration of 12.5 μs ..... 700 max. V

Peak Pulse Voltage Between Horizontal and Vertical or Quadrupole Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs ..... 700 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

a The mating socket assembly with associated circuit board and mounted components must not weigh more than one-half kilogram. 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.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry to 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply voltage be regulated at or slightly below the Typical Design Value with an adequate regulation circuit. Details of this specific circuit should be reviewed with RCA Picture Tube Division. The surge voltage across the heater must be limited to 9.5 volts rms.

e Although the tube incorporates a "quick heat" design, a faster turn-on can be accomplished with "instant on" operation. If "instant on" operation is utilized, the Absolute-Maximum heater voltage under standby conditions is 5.5 volts. The Typical Design heater voltages for "instant on" operation are: 6.0 volts under operating conditions and 5.0 volts under standby conditions. All other voltages normally applied to the tube must be removed during standby operation.

For maximum reliability, the series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm.

g A high internal impedance in the focus circuit can result in a change in the focus voltage with a change in the grid-No.3 leakage current.

h Measured between terminals 5 and 15.

j Measured between terminals 2 and 14 with terminals 1, 11, and 13 connected together. The vertical section of the yoke includes the quadrupole coil circuit with nonlinear elements. Therefore, the vertical deflection circuit should employ suitable circuit techniques such as current feedback to ensure that the small nonlinear impedance of the quadrupole coil does not distort the deflection current waveform.

k Typical measured values at a distance 5 times the picture height in accordance with IEC Recommendation -- Publication 107-1960 -- Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

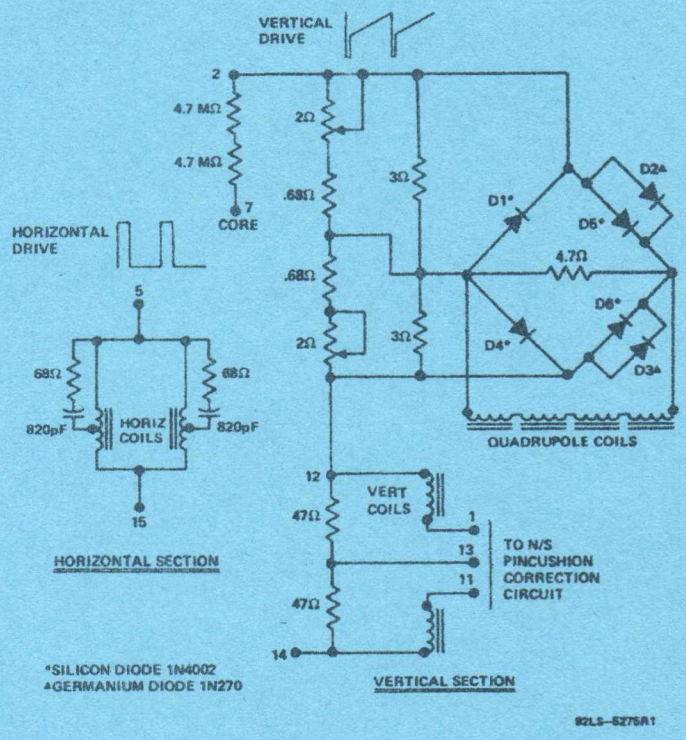


Figure 1 — Circuit of the Deflection Yoke

Basing Specification JEDEC No.13G

Pin 1: Grid No.3
Pin 3: Cathode of Blue Beam
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Beam
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Beam
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

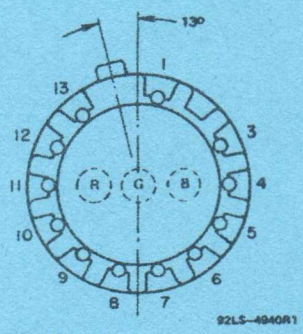


Figure 2 — Bottom View of Base

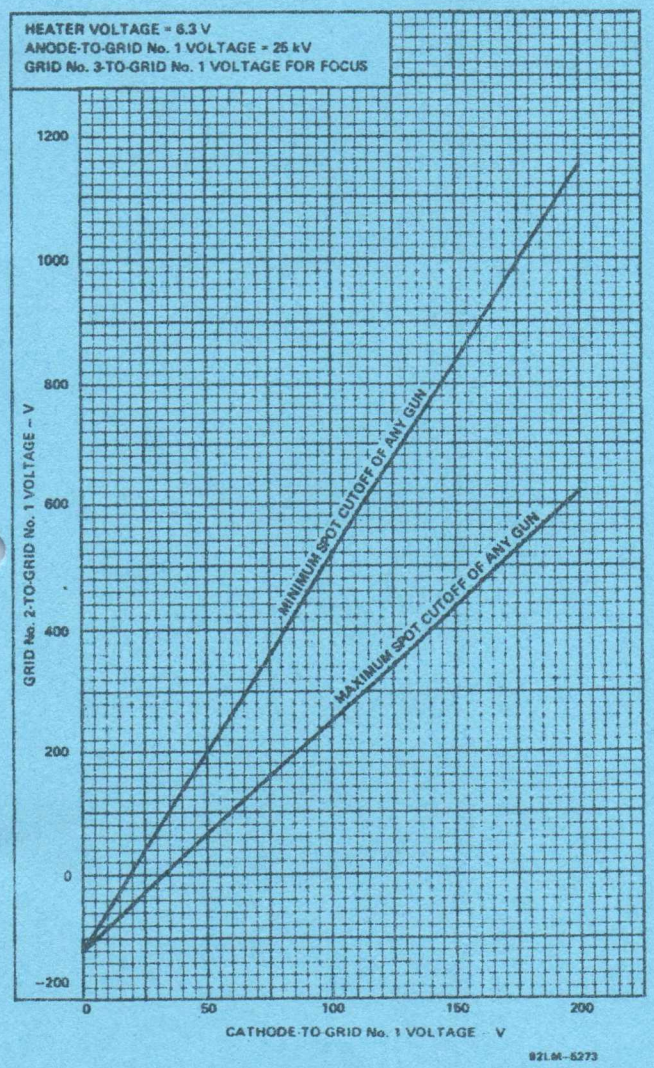


Figure 3 – Cutoff Design Chart

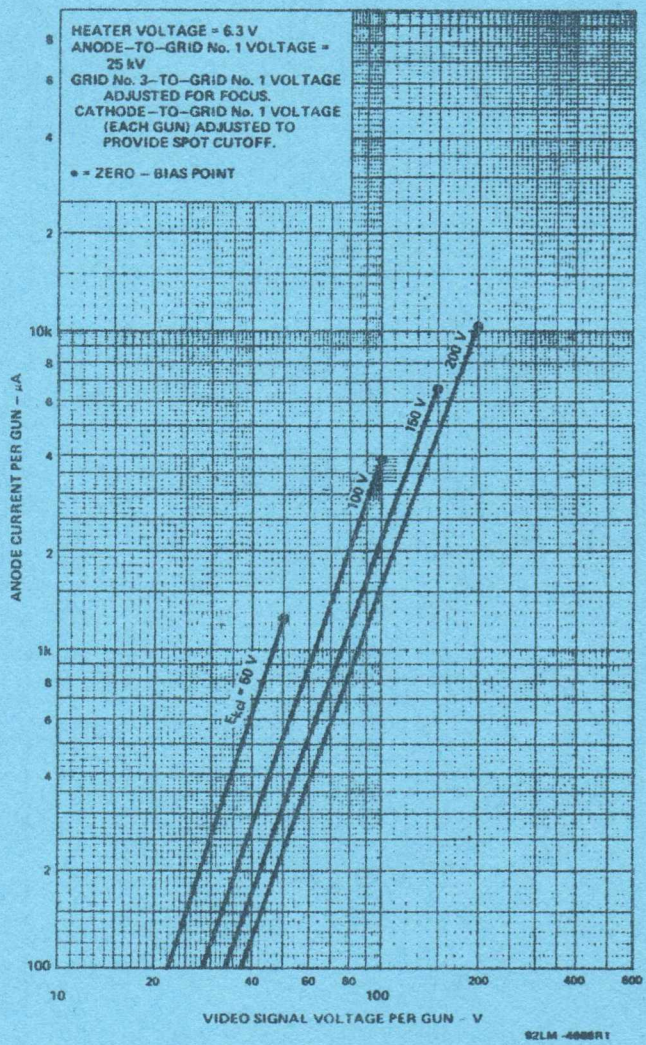


Figure 4 – Typical Drive Characteristics, Cathode-Drive Service

Notes for Dimensional Outline

Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

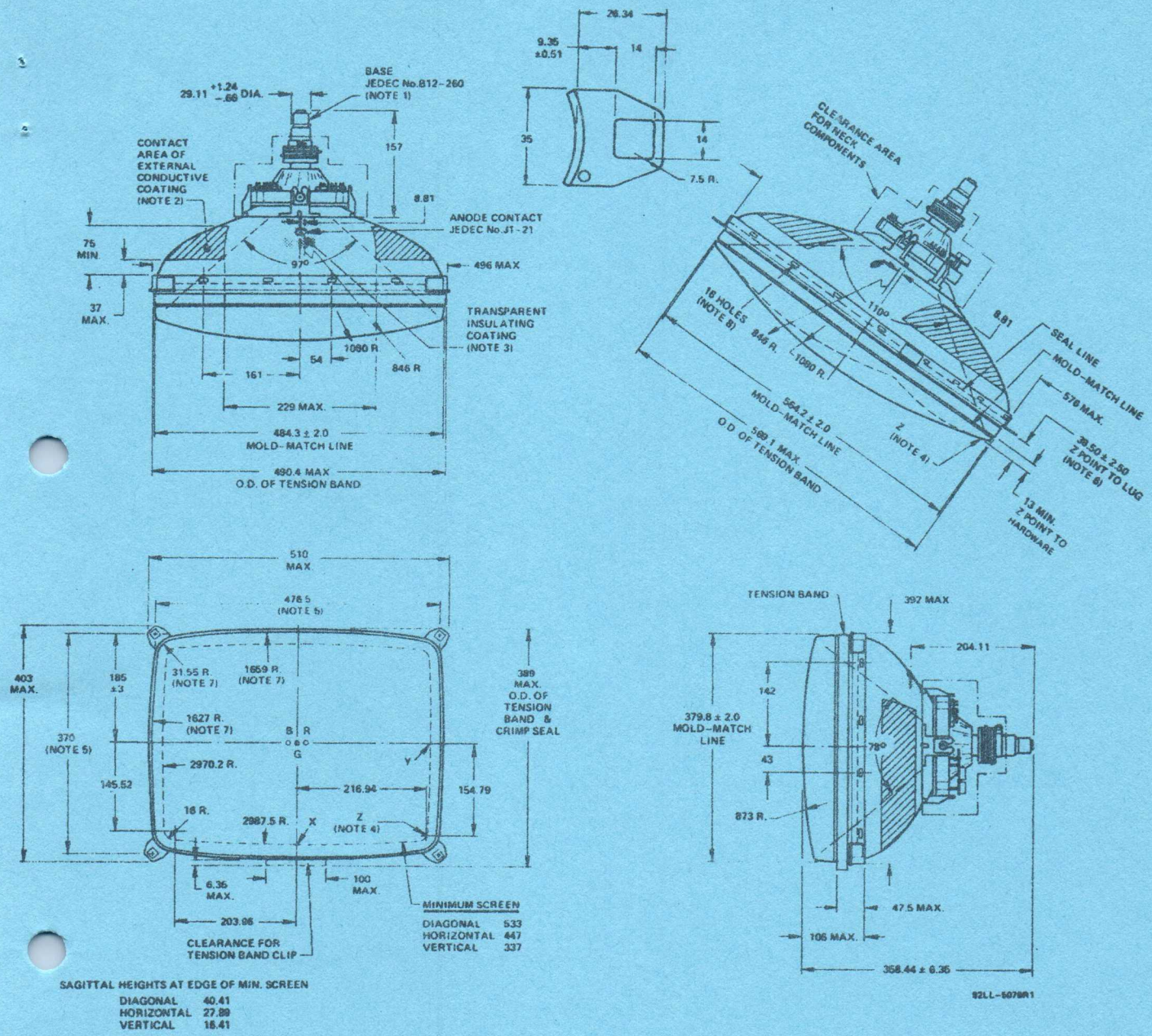
Note 4 – "X", "Y", and "Z" reference points are located on the outside surface of the faceplate at the intersection of the minimum published screen with the minor, major, and diagonal axes, respectively.

Note 5 – The tolerance of the mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when positioned on the hole centers.

Note 6 – One of four brackets may deviate 2 mm max. from the plane of the other three.

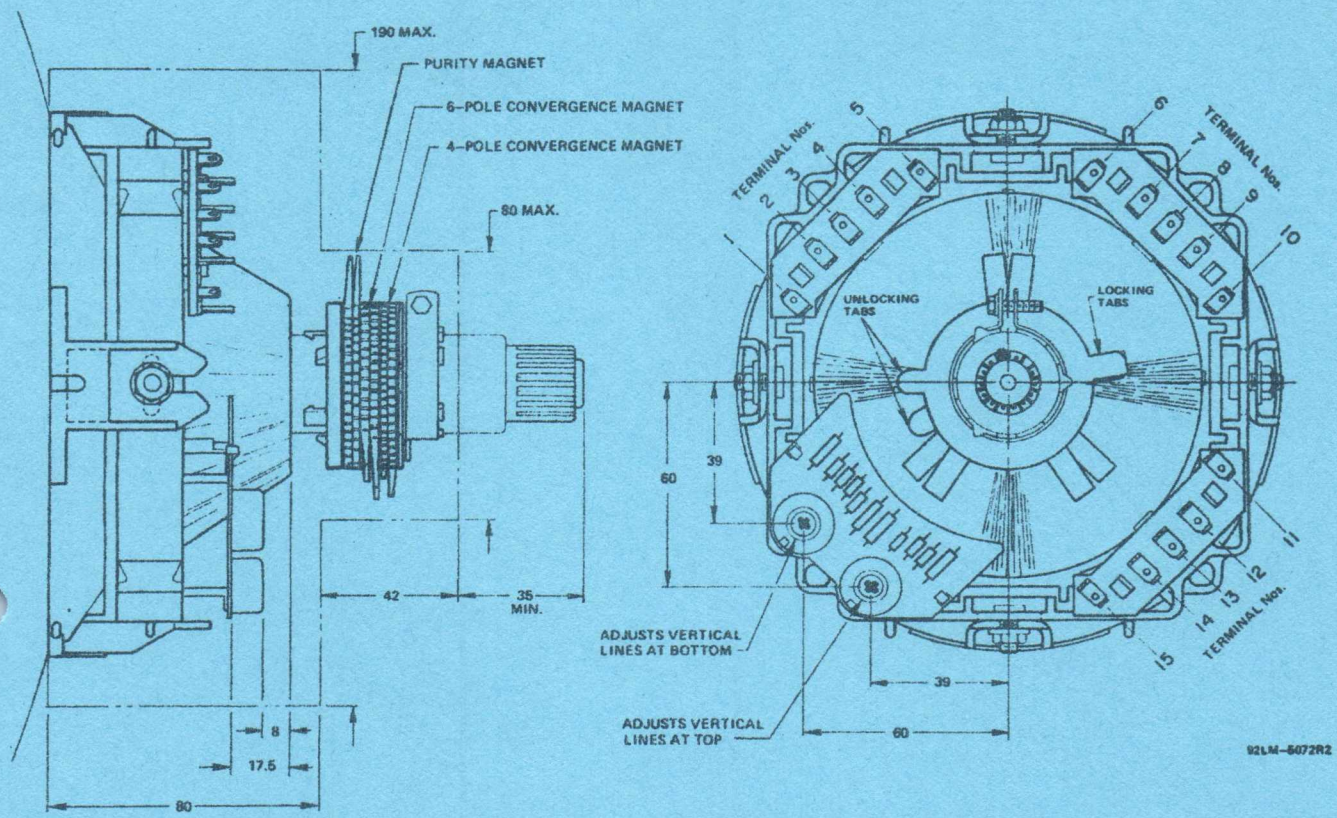
Note 7 – The radius is to the outside of the glass at the mold-match line and is intended to define the shape of the required cutout for "push-through" cabinet designs.

Note 8 – Mounting holes for degaussing coils 14.73 mm x 5.08 mm.



Dimensions in mm unless otherwise noted

Figure 5 — Dimensional Outline



Term. 1: Pin Correction	Term. 6: IC	Term. 11: Pin Correction
Term. 2: Vertical High	Term. 7: IC	Term. 12: IC
Term. 3: IC	Term. 8: IC	Term. 13: Pin Correction CT
Term. 4: IC	Term. 9: IC	Term. 14: Vertical Low
Term. 5: Horizontal High	Term. 10: IC	Term. 15: Horizontal Low

Figure 6 – Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

Convergence and Purity

The slight correction required for static convergence and color purity in the precision in-line system is supplied by three pairs of permanent magnets in one assembly which is mounted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of approximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished by varying the magnetic strength in the pair of magnets nearest the yoke to produce a vertical field. The other two pairs of magnets are used for static convergence, a four-pole magnet as shown in **Figure 7** (the pair nearest the base) to move the outside beams equally in opposite directions and a six-pole magnet as shown in **Figure 8** (the middle pair) to move the outside beams equally in the same direction. In both the four-pole and six-pole devices the field in the center is zero so the center beam is unaffected. These devices are used to converge any orientation of the outside beams to the center beam at the center of the screen with substantially no motion of the center beam and without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

Convergence of the three beams over the entire screen is accomplished by (1) positioning of the yoke with respect to the beams and (2) application of vertical-frequency correction current through a quadrupole winding on the yoke. The yoke is adjusted and secured in its optimum position in the tube factory. The quadrupole coils on the yoke are driven by a small circuit included in the vertical section of the deflection yoke. This circuit is internally connected in series with the vertical deflection coils and forms an integral part of the self-convergence system. The two controls provided are adjusted at the same time the mechanical position of the yoke is established. The convergence action of these controls is shown in **Figure 9**. One control adjusts the two outside beams in a horizontal direction to converge the vertical crosshatch lines in the upper half of the raster. The other control performs a similar function in the lower half of the raster. These controls are located in an accessible position, as shown in **Figure 6**, for readjustment in the receiver as required for optimum performance.

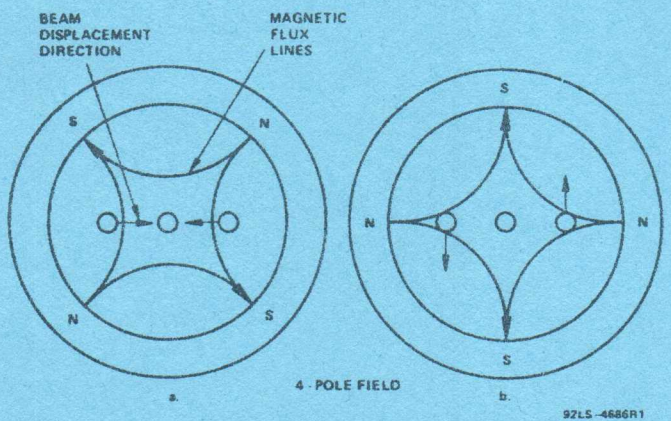


Figure 7 — Beam Motion Produced by the Four-Pole Convergence Magnet

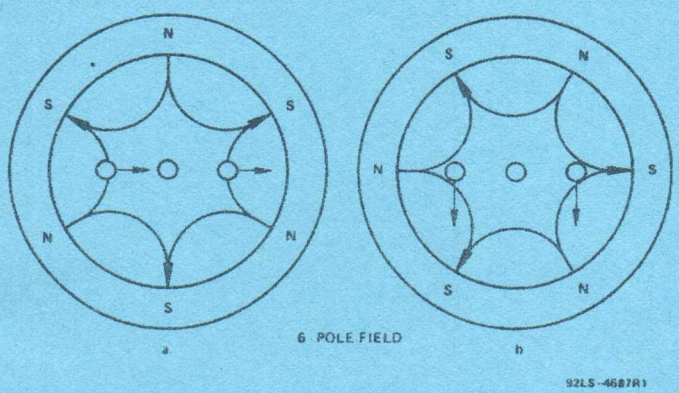


Figure 8 — Beam Motion Produced by the Six-Pole Convergence Magnet

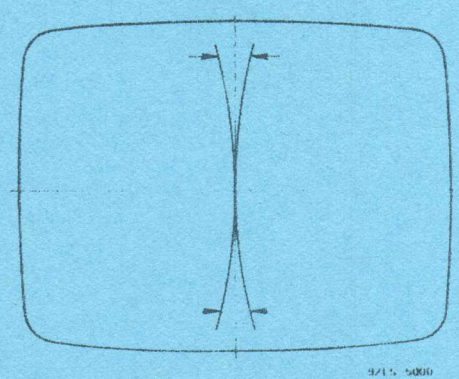


Figure 9 — Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

Magnetic Shield and Degaussing

The A56-613X tube employs an internal magnetic shield and, because of the line screen and its insensitivity to vertical beam register, allows simpler degaussing than the delta gun tubes.

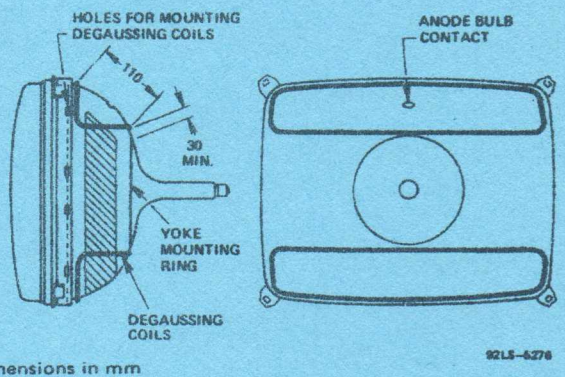


Figure 10 — Relative Placement of Typical Degaussing Coil

Degaussing Coils

The recommended degaussing system for the A56-613X utilizes two series connected coils symmetrically placed as shown in **Figure 10** with one coil on top of the funnel and one located under the funnel. Each coil consists of 200 turns of 0.5 mm wire with a circumference of 1100 to 1200 mm. These are connected to produce a vertical cross axial degaussing field. Rectangular holes are provided in the rim bands to facilitate mounting of the automatic degaussing coils.

Degaussing Circuit

A recommended degaussing circuit as shown in **Figure 11** uses a conventional dual PTC device. For proper degaussing, a minimum value of 1400 peak-to-peak ampere turns (equivalent to an MMF of 350 ampere turns in each coil) is required. It is essential that the degaussing current reduces in a gradual manner to a quiescent level not exceeding 2.0 peak-to-peak ampere turns. For optimum performance the degaussing coils should always be connected to a very low source impedance at the horizontal frequency. If the circuit used does not have an inherent low impedance at the horizontal frequency, the degaussing coil should be shunted with a suitable capacitor. If the addition of a short across the coils increases the horizontal frequency currents in the degaussing coils by more than 20%, the inherent source impedance offered by the PTC and associated circuitry is indicated to be too high to provide satisfactory performance. Therefore a capacitor should be added across the degaussing coil to satisfy this requirement.

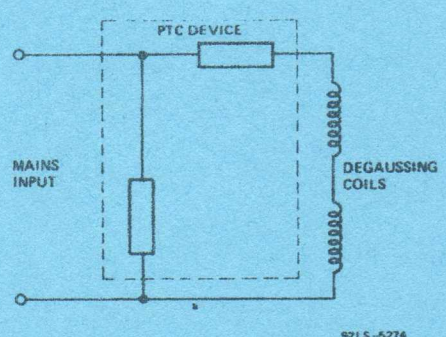


Figure 11 — Typical Degaussing Circuit

Deguassing 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. 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 folowed by the receiver's internal degaussing in the normal manner.

WARNING

X-Radiation:

This color picture tube does not emit x-radiation above the internationally accepted isoexposure rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

Implosion Protection:

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a recommended replacement 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 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 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 A56-613X 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 of 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.

Color Picture Tube

A67-127X

MATRIX Screen

- MATRIX Screen with a Tinted Phosphor — Increased picture brightness Enhanced Color & Contrast
- 90° ULTRA-RECTANGULAR— 4 x 3 Aspect Ratio
- 527.7 x 395.8 mm Screen
- High-Resolution Bipotential Gun Sharper Pictures — Greater detail
- Moiré Minimized in 625 TV-Line Systems
- Rare-Earth (Red) Phosphor
- PERMA-CHROME — Temperature Compensated Shadow-Mask Assembly
- Banded-Type Implosion Protection — For "Push-Through" cabinet designs
- Integral Mounting Lugs

RCA-A67-127X is a 90° MATRIX color picture tube with a selectively absorbent phosphor screen. The phosphor is tinted to selectively absorb room light striking it and permit only the phosphor color to be reflected. Contrast ratio improvement is approximately 25 per cent over standard phosphors.

MATRIX is a color-screen system employing a black opaque matrix around the phosphor dots. The matrix absorbs the ambient light which is normally reflected by the screen of a standard color picture tube, without reducing the light output from the phosphor-dot screen. This feature permits the use of a high-transmission filterglass faceplate which, in combination with a high-efficiency screen assembly, provides pictures with increased brightness. This increased brightness is obtained without sacrifice of picture contrast even under high ambient-light conditions.

The high transmission filterglass in combination with the black matrix and the white color of the phosphor produces a light neutral screen appearance when the TV set is turned off. Improved phosphors are incorporated in the screen consisting of a red-emitting, yttrium-oxysulfide, rare-earth phosphor; a new green-emitting sulfide phosphor; and a blue-emitting sulfide phosphor.

Other features of the A67-127X are: PERMA-CHROME, and integral implosion protection provided by rim bands which are attached to the periphery of the tube panel with epoxy resin and a tension band. The rim bands do not extend in front of the mold-match line making this tube suitable for "push-through" cabinet designs. Four mounting lugs have been incorporated in the system to facilitate mounting the A67-127X in the color TV cabinet.

Formerly RCA Developmental Type C76380

General Data

Electrical:

Electron Guns, Three with Axes Titled Toward Tube Axis	Red, Blue, Green	
Heater:		
Voltage	6.3	V
Current	900	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	90	deg
Horizontal	78	deg
Vertical	60	deg
Direct Interelectrode Capacitance (Approx.):		
Grid No.1 of any gun to all other electrodes	7.5	pF
Grid No.3 to all other electrodes	6.5	pF
All cathodes to all other electrodes	15	pF
Capacitance Between Anode and External Conductive Coating	2500 max. 2000 min.	pF pF
Capacitance Between Anode and Rim Band		pF
Resistance Between Metal Hardware and External Conductive Coating	50	MΩ

Printed in U.S.A./1-77
A67-127X

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	84.5%
Surface	Polished
Screen	Aluminized
Matrix	Black opaque material
Type	Negative guard band
Phosphor, rare-earth (Red) sulfide (Blue & green)	P22
Type	Selectively absorbent
Persistence	Medium-Short
Array	564,000 Dot trios
Spacing between centers of adjacent dot trios (Approx.)	0.66 mm

Mechanical:

Tube Dimensions:

Overall length	549.40 +4.45 −6.35 mm
Neck length	175.08 ± 4.78 mm
At mold-match line:	
Diagonal	666.67 ± 2.36 mm
Horizontal	571.78 ± 2.36 mm
Vertical	442.47 ± 2.36 mm
Minimum Screen Dimensions (Projected):	
Diagonal	626.31 mm
Horizontal	527.71 mm
Vertical	395.78 mm
Area	2032 sq cm
Bulb Funnel Designation	JEDEC No.J663A
Bulb Panel Designation	JEDEC No.F667A
Anode Bulb Contact Designation	Recessed Small Cavity Cap (JEDEC No.J1-21)
Base Designation[a]	Small-Button Diheptar 12-Pin (JEDEC No.B12-244)
Basing Designation	JEDEC No.14BE
Pin Position Alignment	Pin No.12 Aligns Approx. with Anode Bulb Contact
Operating Position, Preferred	Anode Bulb Contact on Top
Gun Configuration	Delta
Weight (Approx.)	22.7 kg

Implosion Protection

Type	Rim Bands and Tension Band

Maximum and Minimum Ratings, Absolute-Maximum Values[b]

Unless otherwise specified, values are for each gun and voltage values are positive with respect to cathode.

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage, Including Video Signal Voltage	1000	max.	V
Grid-No.1 Voltage:			
Negative bias value	400	max.	V
Negative operating cutoff value	200	max.	V
Positive bias value	0	max.	V
Positive peak value	2	max.	V
Heater Voltage (ac or dc):[d]			
Under operating conditions	6.9	max.	V
	5.7	min.	V
Under standby conditions[e]	5.5	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	275	max.	V
Peak value	330	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

Unless otherwise specified, values are for each gun and voltage values are positive with respect to cathode.

For anode voltages of 25 kV

Grid-No.3 (Focusing electrode) Voltage	16.8% to 20% of Anode voltage
Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot	See CUTOFF DESIGN CHART in **Figure 1**
At grid-No.1 voltage of −75 V	95 to 295 V
At grid-No.1 voltage of −125 V	205 to 535 V
At grid-No.1 voltage of −175 V	315 to 780 V
Maximum Ratio of Grid-No.2 Voltage, Highest Gun to Lowest Gun in Any Tube (At grid-No.1 spot cutoff voltage of −100 V)	1.86
Heater Voltage:[d]	
Under operating conditions:	
When standby operation is not utilized	6.3 V
When 5.0-V standby operation is utilized[e]	6.0 V
Under standby conditions[e]	5.0 V
Grid-No.3 Current (Total)	± 15 μA
Grid-No.2 Current	± 5 μA
Grid-No.1 Current	± 5 μA

To Produce White Light of	Illum. D 6550° K + 7 M.P.C.D.	Color 9300° K + 27 M.P.C.D.	
CIE Coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Displacements, Measured at Center of Screen:		
Raster centering displacement:		
Horizontal	±11.4	mm
Vertical	±11.4	mm
Lateral distance between the blue beam and the converged red and green beams	±6.4	mm
Radial convergence displacement excluding effects of dynamic convergence (each beam)	±9.4	mm
Maximum Required Correction for Register[f] (Including effect of earth's magnetic field when using recommended components) as Measured at the Center of the Screen in any Direction	130 max.	μm

Limiting Circuit Values

High-Voltage Circuits:
Grid-No.3 circuit resistance ..... 7.5 max. MΩ

Low-Voltage Circuits:
Effective grid-No.1-to-cathode-circuit resistance (each gun) ..... 0.75 max. MΩ

---

a The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one-half kilogram.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry of 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

e All other voltages normally applied to the tube must be removed during standby operation.

f Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios.

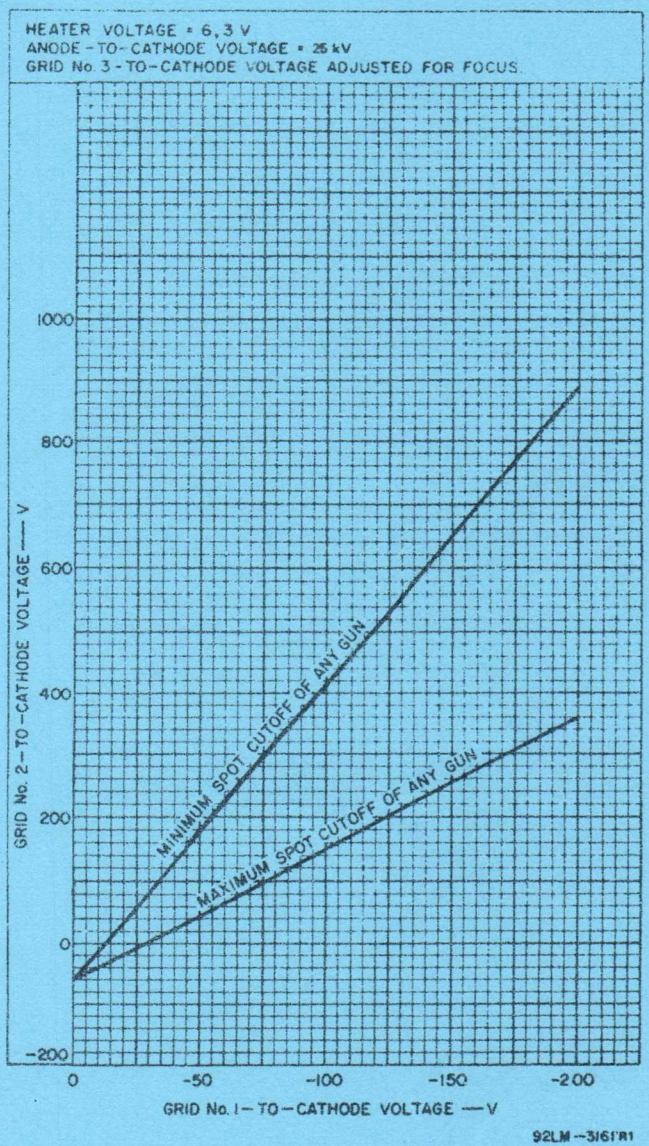


Figure 1 — Cutoff Design Chart

WARNING

X-Radiation:

This color picture tube does not emit x-radiation above the internationally accepted dosage rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

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.

This color picture tube incorporates integral x-radiation shielding and must be replaced with a tube of the same type number or an RCA recommended replacement to assure continued safety.

Implosion Protection:

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or an RCA recommended replacement to assure continued safety.

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.

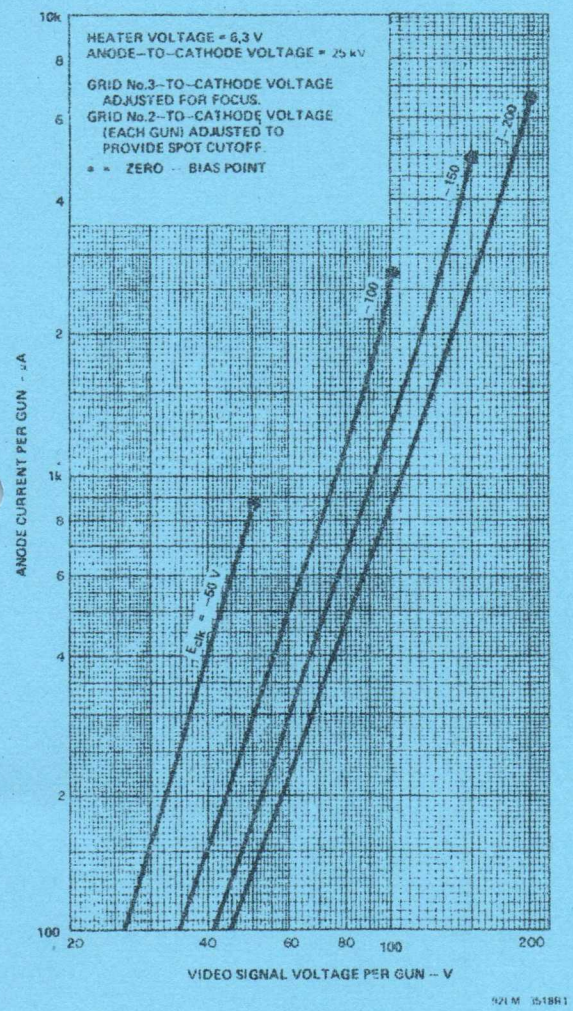


Figure 2 — Typical Drive Characteristics, Grid-Drive Service

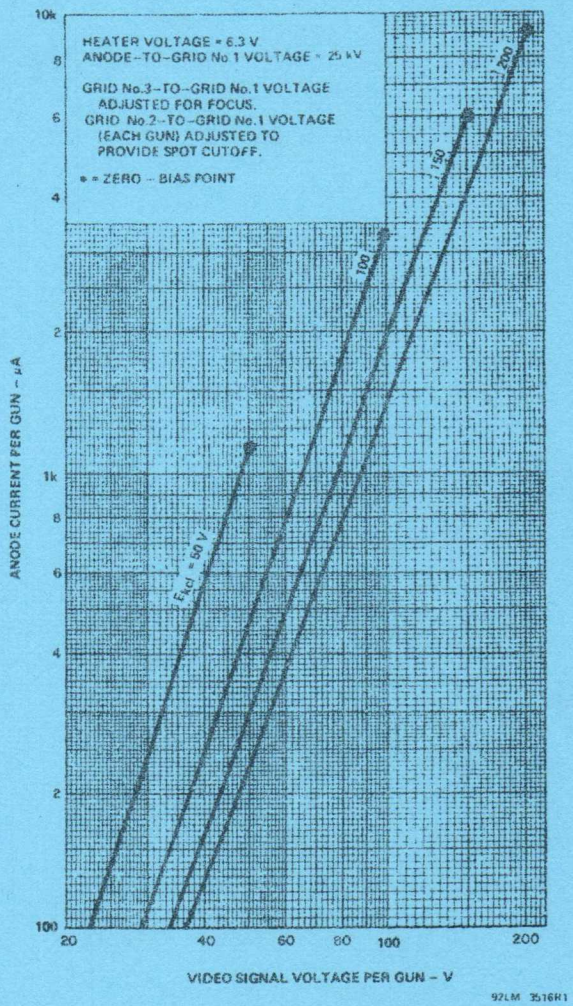


Figure 3 — Typical Drive Characteristics, Cathode-Drive Service

Mounting

Integral mounting lugs are provided to facilitate mounting the A67-155X 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 (1 MΩ).

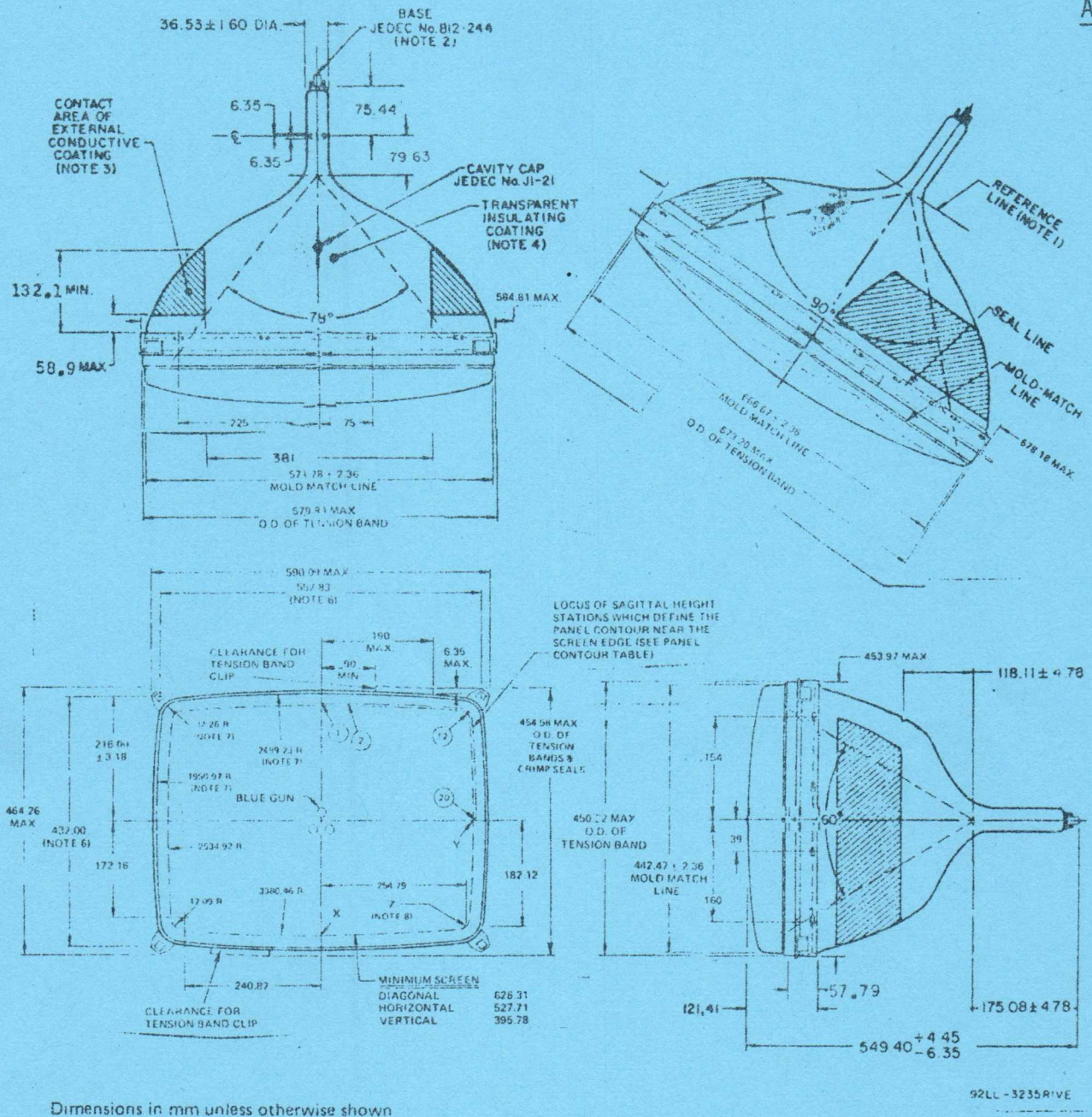
The color receiver mounting system should incorporate sufficient cushioning so that under normal conditions of shipment or handling an impact force of more than 35 g is never applied to the picture tube.

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.

Panel Contour

Sagittal heights with reference to centerface at points 3.18 beyond edge of min. screen.

Station No.	Coordinates Y Axis	Coordinates X Axis	Sagittal Height
1 (Minor)	0	201.07	17.91
2	25.40	200.96	18.21
3	50.80	200.69	19.18
4	76.20	200.20	20.73
5	101.60	199.54	22.91
6	127.00	198.68	25.70
7	152.40	197.64	29.11
8	177.80	196.39	33.12
9	203.20	194.87	37.74
10	228.60	193.34	43.00
11	242.32	192.38	46.10
12 (Diagonal)	257.35	183.95	48.34
13	261.09	173.53	47.40
14	262.46	152.40	44.32
15	263.86	127.00	41.15
16	265.00	101.60	38.53
17	265.89	76.20	36.50
18	266.52	50.80	35.05
19	266.90	25.40	34.16
20 (Major)	267.03	0	33.86



92LL-3235RIVE

Dimensions in mm unless otherwise shown

Note 1 – With tube neck inserted through flared end of reference line and neck funnel contour gauge (JEDEC No.G162) and with tube seated in gauge, the reference line is determined by the intersection of the plane C-C' of the gauge with the glass funnel.

Note 2 – Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. Bottom circumference of base will fall within a 51-mm circle concentric with bulb axis.

Note 3 – 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 4 – To clean this area, wipe only with soft, dry, lintless cloth.

Note 5 – One of the four brackets may deviate 2 mm max. from the plane of the other three.

Note 6 – The tolerance of the mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when positioned on the hole centers.

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 – "X", "Y", and "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 9 – Mounting holes for degaussing coils.

Figure 4 – Dimensional Outline

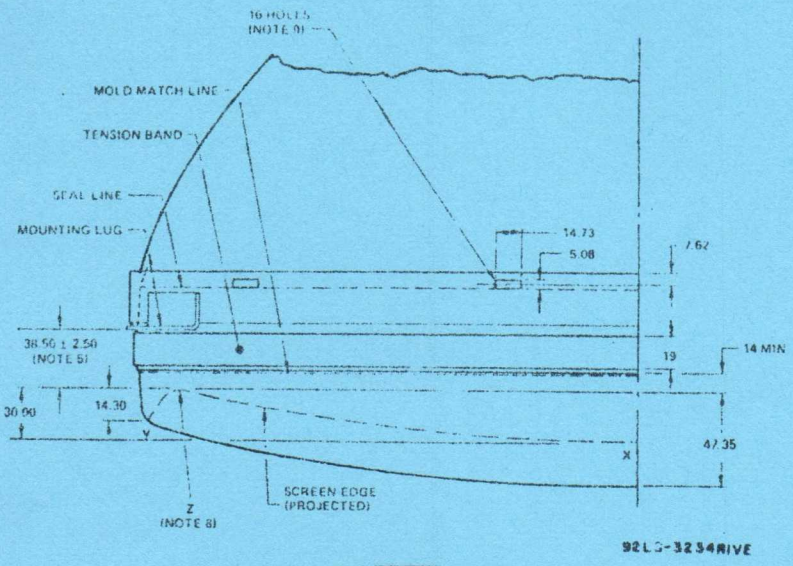


Figure 5 -- Detail of Panel

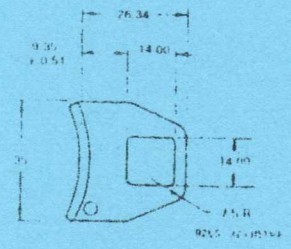


Figure 6 -- Detail of Mounting Lug

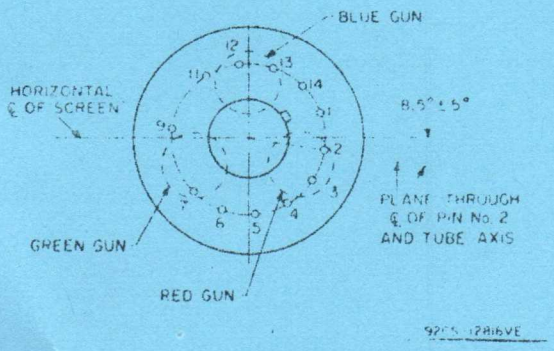


Figure 7 -- Bottom View of Base

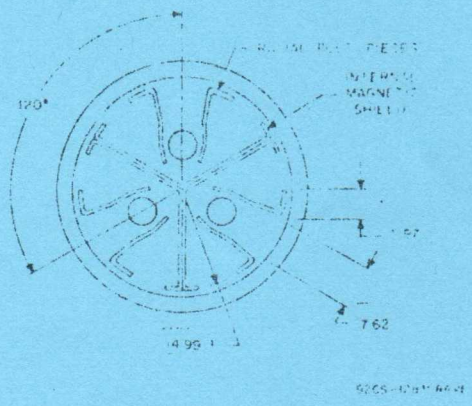


Figure 8 -- Location of Radial-Converging Pole Pieces Viewed from Screen End of Guns

Base Specification -- JEDEC No.14BE

Pin 1:	Heater
Pin 2:	Cathode of Red Gun
Pin 3:	Grid No.1 of Red Gun
Pin 4:	Grid No.2 of Red Gun
Pin 5:	Grid No.2 of Green Gun
Pin 6:	Cathode of Green Gun
Pin 7:	Grid No.1 of Green Gun
Pin 9:	Grid No.3
Pin 11:	Cathode of Blue Gun
Pin 12:	Grid No.1 of Blue Gun
Pin 13:	Grid No.2 of Blue Gun
Pin 14:	Heater
Cap:	Anode (Grid No.4, Screen, Collector)
C:	External Conductive Coating

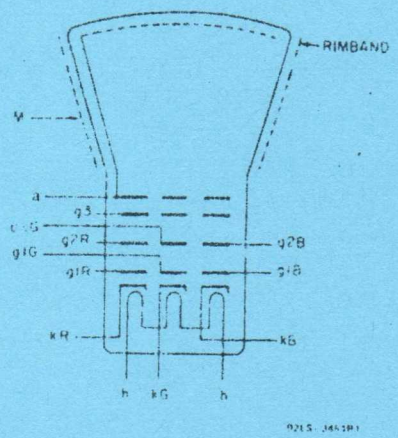


Figure 9 -- Tube Symbol

110° Deflection-29mm Neck-67 cm Diagonal

- Wide Angle Deflection – 110°
- Shorter Overall Length – 432 mm
- Narrow Neck Diameter – 29 mm
- Internal Magnetic Shield
- Ultra-Rectangular – 4 x 3 Aspect Ratio
- 527.7 x 395.8 mm Screen
- HI-LITE MATRIX Screen – Increased picture brightness without sacrifice of contrast
- New High-Resolution Bipotential Gun Sharper Pictures – Greater detail
- Moiré Minimized in 625 TV-Line Systems
- Improved Wide-Angle Temperature-Compensated Shadow-Mask System
- Banded-Type Implosion Protection – For "Push-Through" cabinet designs
- Integral Mounting Lugs

RCA-A67-155X is a 110°, 67 cm ultra-rectangular HI-LITE MATRIX color picture tube. The wider deflection angle results in a tube over 112 mm shorter than 67 cm, 90° delta types. This shorter throw distance improves the focus performance of the tube, and the smaller neck diameter minimizes the increase in power required for the wider deflection angle.

The A67-155X incorporates a close-spaced, triple-beam delta electron-gun assembly which, in conjunction with a Precision Static Toroid (PST) deflection yoke, allows good beam convergence, accurate beam landing, and maintains sharp focus over the entire screen area. The system results in performance superior to that of 90° delta types while maintaining its simplicity.

HI-LITE MATRIX is a color-screen system employing a black opaque matrix around the phosphor dots. The matrix absorbs the ambient light which is normally reflected by the screen of a standard color picture tube, without reducing the light output from the phosphor-dot screen. This feature permits the use of a high-transmission filterglass faceplate which, in combination with a high-efficiency screen assembly, provides pictures with increased brightness. This increased brightness is obtained without sacrifice of picture contrast even under high ambient-light conditions.

The high transmission filterglass in combination with the black matrix and the white color of the phosphor produces a light neutral screen appearance when the TV set is turned off. Improved phosphors are incorporated in the screen consisting of a red-emitting, yttrium-oxysulfide, rare-earth phosphor; a new green-emitting sulfide phosphor; and a blue-emitting sulfide phosphor.

Other features of the A67-155X are: an improved wide angle temperature-compensated shadow-mask system, an internal magnetic shield, and integral implosion protection provided by rim bands which are attached to the tube panel periphery with epoxy resin and tension bands. The rim bands do not extend in front of the panel mold-match line making this tube suitable for "push-through" cabinet designs. Four mounting lugs have been incorporated in the system to facilitate mounting the A67-155X in the color TV cabinet.

Formerly RCA Developmental Type C76284.

General Data

Electrical:

Electron Guns, Three with Axes Tilted Toward Tube Axis	Red, Blue, Green	
Heater:		
Voltage	6.3	V
Current	900	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	110	deg
Horizontal	97	deg
Vertical	77	deg
Direct Interelectrode Capacitance (Approx.):		
Grid No.1 of any gun to all other electrodes	3.8	pF
Grid No.3 to all other electrodes	2.6	pF
All cathodes to all other electrodes	19	pF
Capacitance Between Anode and External Conductive Coating	2500 max. 2000 min.	pF pF
Capacitance Between Anode and Rim Band	450	pF
Resistance Between Metal Hardware and External Conductive Coating	50	MΩ

Optical:

Faceplate	Filterglass
Light transmission at center (Approx.)	84.5%
Surface	Polished
Screen	Aluminized
Matrix	Black opaque material
Type	Negative guard band
Phosphor, rare-earth (Red) sulfide (Blue & green)	P22
Persistence	Medium-Short
Array	564,000 Dot trios
Spacing between centers of adjacent dot trios (Approx.)	0.66 mm

Printed in U.S.A./4-75
A67-155X

General Data (cont'd)

Mechanical:

Tube Dimensions:		
Overall length	432.03 ± 9.53	mm
Reference line to center of face	280.44	mm
Neck length	151.59 ± 4.78	mm
At mold-match line:		
Diagonal	666.67 ± 2.36	mm
Horizontal	571.78 ± 2.36	mm
Vertical	442.47 ± 2.36	mm
Minimum Screen Dimensions (Projected):		
Diagonal	626.31	mm
Horizontal	527.71	mm
Vertical	395.78	mm
Area	2032	sq cm
Bulb Funnel Designation	JEDEC No.J663C	
Bulb Panel Designation	JEDEC No.F667A	
Anode Bulb Contact Designation	Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)	
Base Designation[a]	JEDEC No.B12-260	
[illegible]g Designation	JEDEC No.13C	
Pin Position Alignment	Pin No.4 Aligns Approx. with Anode Bulb Contact	
Deflection Yoke	RCA-XD4422-J12 or equivalent	
Operating Position, Preferred	Anode Bulb Contact on Top	
Gun Configuration	Delta	
Weight (Approx.)	20.0 kg	

Implosion Protection:

Type	Rim Bands and Tension Bands

Maximum and Minimum Ratings, Absolute-Maximum Values[b]

Unless otherwise specified, values are for each gun and voltage values are positive with respect to cathode.

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage, Including Video Signal Voltage	1000	max.	V
[illegible]No.1 Voltage:			
[illegible]egative bias value	400	max.	V
Negative operating cutoff value	200	max.	V
Positive bias value	0	max.	V
Positive peak value	2	max.	V
Heater Voltage (ac or dc):[d]			
Under operating conditions	6.9	max.	V
	5.7	min.	V
Under standby conditions[e]	5.5	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	275	max.	V
Peak value	330	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Equipment Design Ranges

Unless otherwise specified, values are for each gun and voltage values are positive with respect to cathode.

For anode voltages of 25 kV

Grid-No.3 (Focusing electrode) Voltage	16.8% to 20% of Anode voltage
Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot	See CUTOFF DESIGN CHART in Figure 1
At grid-No.1 voltage of −75 V	95 to 295 V
At grid-No.1 voltage of −125 V	205 to 535 V
At grid-No.1 voltage of −175 V	320 to 780 V
Maximum Ratio of Grid-No.2 Voltage, Highest Gun to Lowest Gun in Any Tube (At grid-No.1 spot cutoff voltage of −100 V)	1.86
Heater Voltage:[d]	
Under operating conditions:	
When standby operation is not utilized	6.3 V
When 5.0-V standby operation is utilized[e]	6.0 V
Under standby conditions[e]	5.0 V
Grid-No.3 Current (Total)	± 15 μA
Grid-No.2 Current	± 5 μA
Grid-No.1 Current	± 5 μA

To Produce White Light of	Illum. D 6550° K + 7 M.P.C.D.	Color 9300° K + 27 M.P.C.D.	
CIE Coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Displacements, Measured at Center of Screen:			
Raster centering displacement:			
Horizontal	± 12		mm
Vertical	± 12		mm
Lateral distance between the blue beam and the converged red and green beams	± 5.3		mm
Radial convergence displacement excluding effects of dynamic convergence (each beam)	± 8		mm
Maximum Required Correction for Register[f] (including effect of earth's magnetic field when using recommended components) as Measured at the Center of the Screen in any Direction	130	max.	μm
Automatic Degaussing Field (See Magnetic Shield under General Considerations):			
Initial peak-to-peak value	1500	min.	At
Quiescent peak-to-peak value	2.0	max.	At

Limiting Circuit Values

High-Voltage Circuits:			
Grid-No.3 circuit resistance	7.5	max.	MΩ
Low-Voltage Circuits:			
Effective grid-No.1-to-cathode-circuit resistance (each gun)	0.75	max.	MΩ

---

[a] The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one-half kilogram.

[b] The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry to 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

e All other voltages normally applied to the tube must be removed during standby operation.

f Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios.

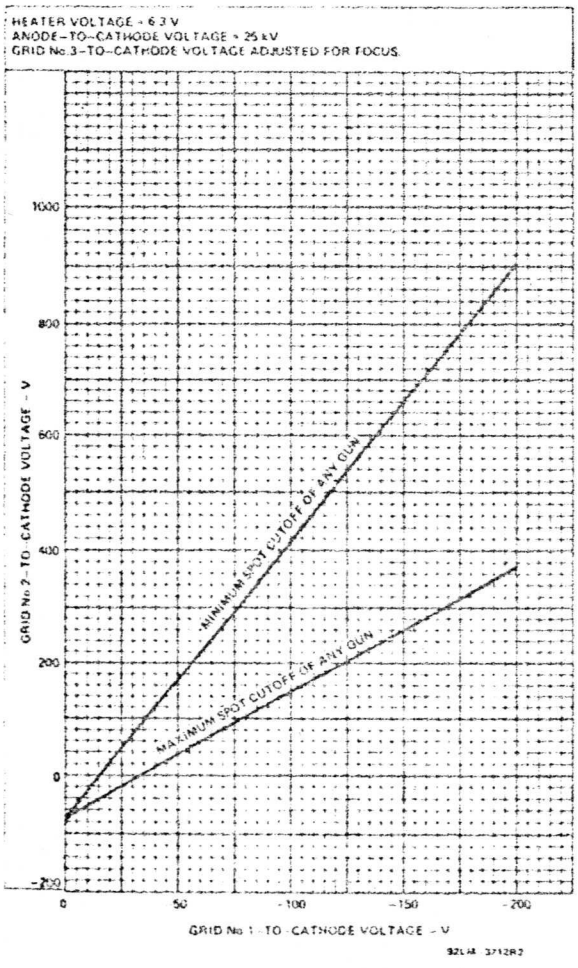


Figure 1 – Cutoff Design Chart

WARNING

X-Radiation:

This color picture tube does not emit x-radiation above the internationally accepted dosage rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

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.

This color picture tube incorporates integral x-radiation shielding and must be replaced with a tube of the same type number or an RCA recommended replacement to assure continued safety.

Implosion Protection:

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or an RCA recommended replacement to assure continued safety.

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.

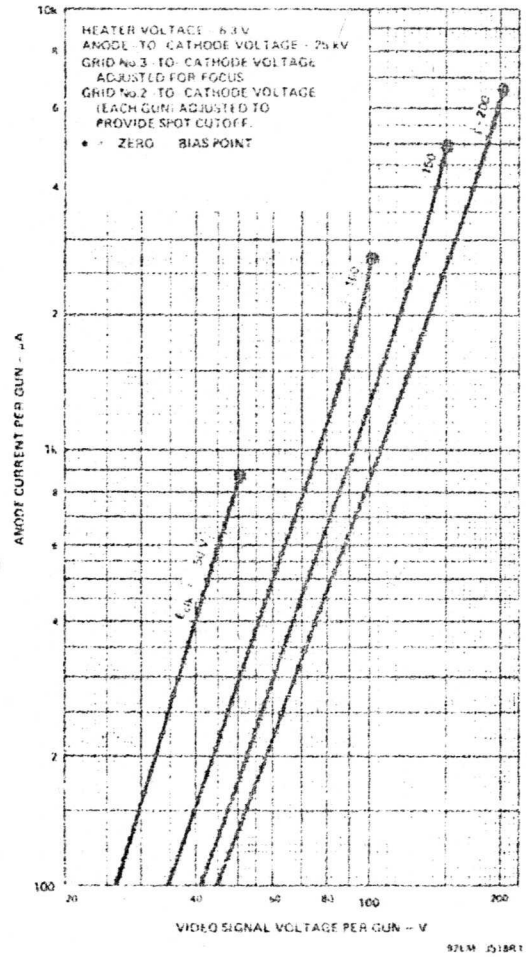


Figure 2 — Typical Drive Characteristics, Grid-Drive Service

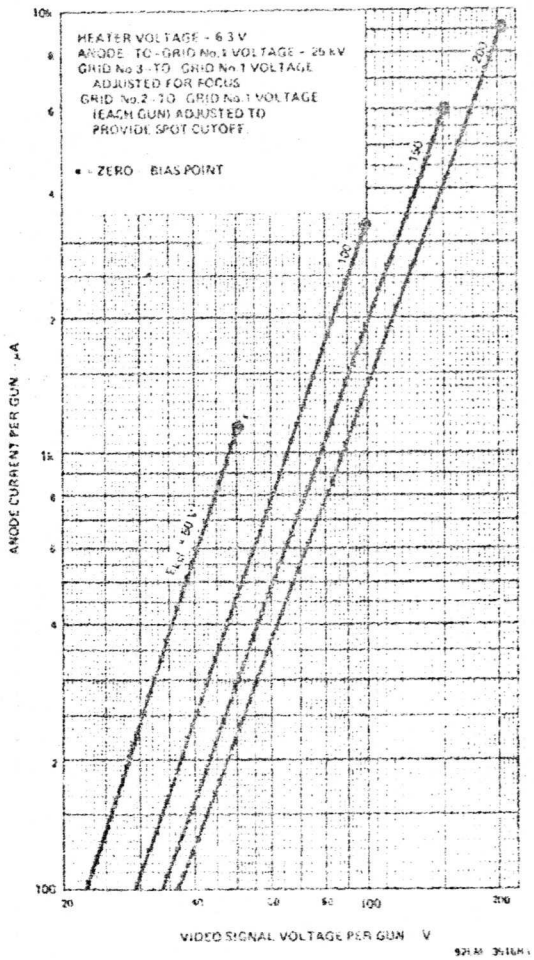
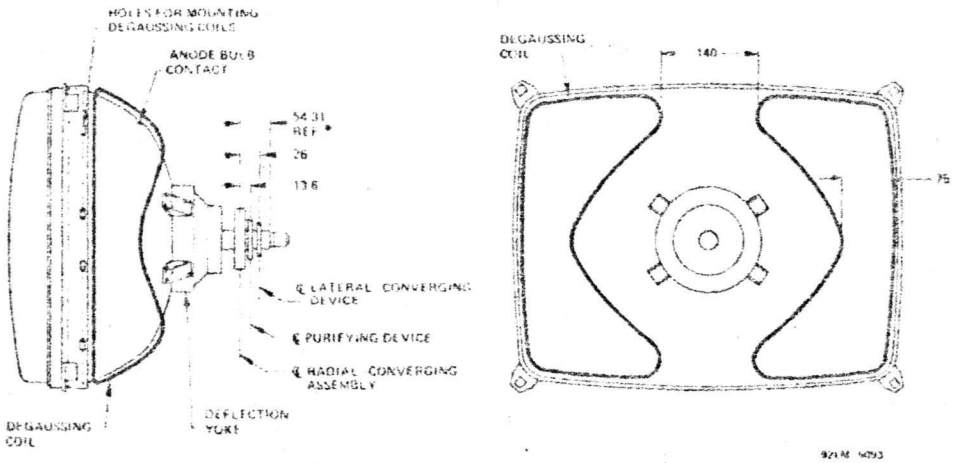


Figure 3 — Typical Drive Characteristics, Cathode-Drive Service



*Center line of Radial Converging Assembly Core directly over center line of internal pole pieces.

Dimensions in mm unless otherwise noted.

Figure 4 — Relative Placement of Typical Components

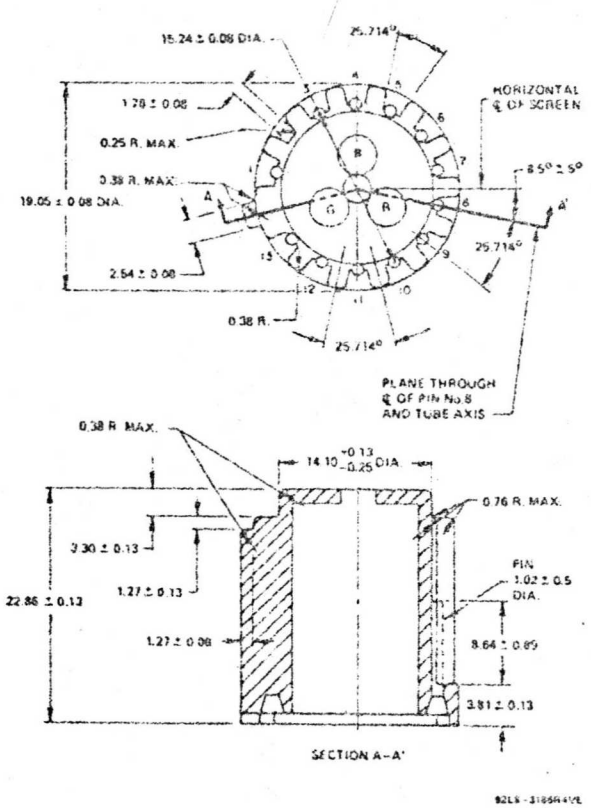


Figure 5 – Base

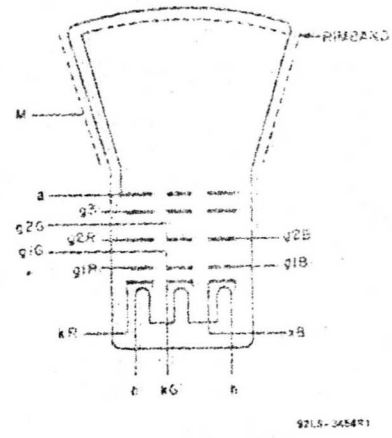
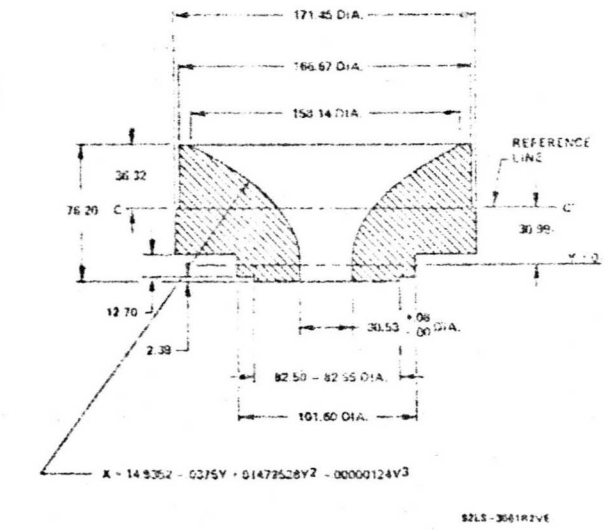


Figure 6 – Tube Symbol

Basing Specification JEDEC No.13C

Pin 1: Grid No.3
Pin 3: Cathode of Blue Gun
Pin 4: Grid No.1 of Blue Gun
Pin 5: Grid No.2 of Blue Gun
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Gun
Pin 9: Grid No.1 of Red Gun
Pin 10: Grid No.2 of Red Gun
Pin 11: Grid No.2 of Green Gun
Pin 12: Cathode of Green Gun
Pin 13: Grid No.1 of Green Gun
Bulb Contact: Anode (Grid No.4, screen, collector)
M: External Conductive Coating



Reference Line is determined by plane C-C' when gauge is seated.

Figure 7 – Reference-Line and Neck-Funnel Contour Gauge (JEDEC No.G-172)

Dimensions in mm unless otherwise noted.

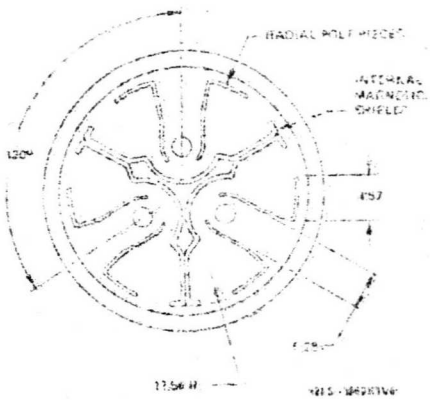
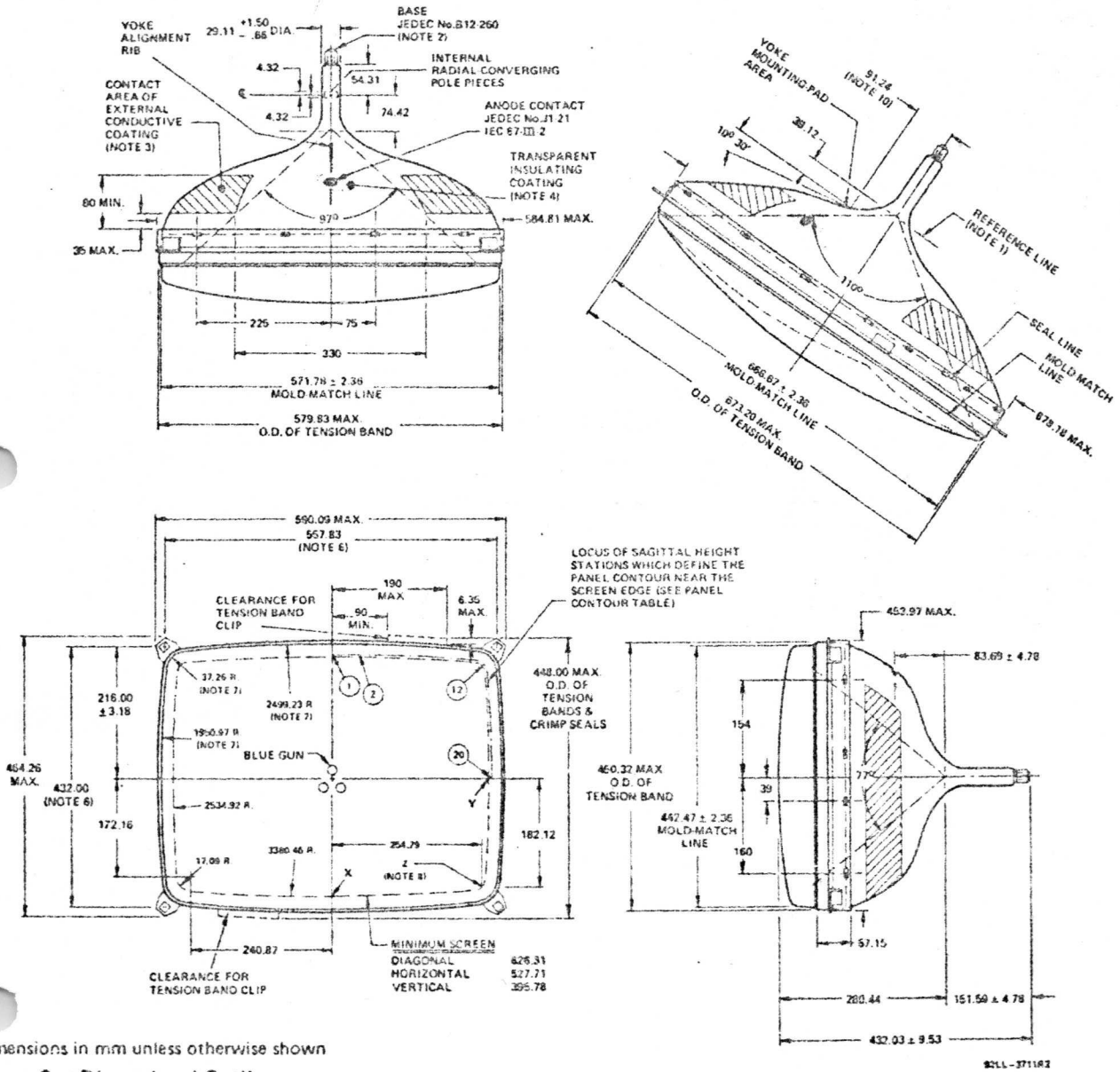


Figure 8 – Location of Radial-Converging Pole Pieces Viewed from Screen End of Guns



Dimensions in mm unless otherwise shown

Figure 9 – Dimensional Outline

Note 1 – With tube neck inserted through flared end of reference line and neck funnel contour gauge (JEDEC No.G172) and with tube seated in gauge, the reference line is determined by the intersection of the plane C-C' of the gauge with the glass funnel.

Note 2 – Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely.

Note 3 – 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 4 – To clean this area, wipe only with soft, dry, lintless cloth.

Note 5 – One of the four brackets may deviate 2 mm max. from the plane of the other three.

Note 6 – The tolerance of the mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when positioned on the hole centers.

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 – "X", "Y", and "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.

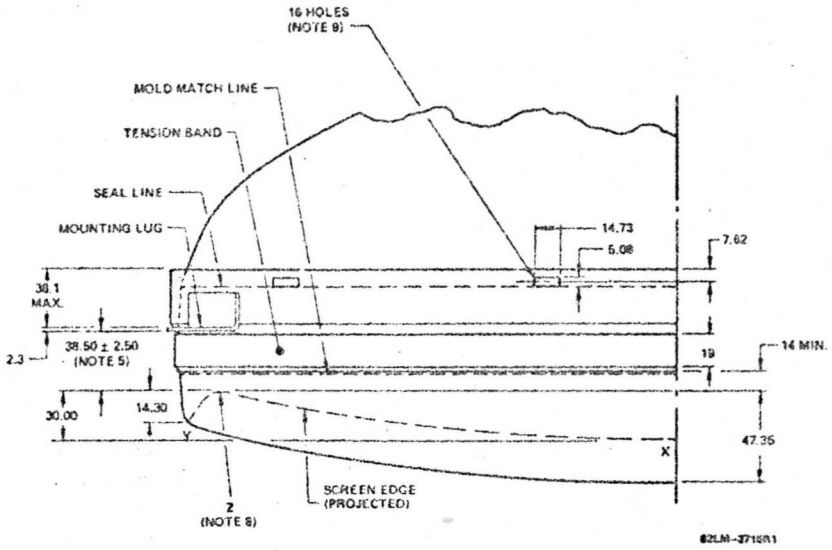
Note 9 – Mounting holes for degaussing coils.

Note 10 – These dimensions locate the center of four, 19 mm square pad areas which may be used for the yoke mounting assembly supports. They are located on the diagonal axes of the funnel (see station 17 in Figure 12).

Panel Contour

Sagittal heights with reference to centerface at points 3.18 beyond edge of min. screen.

Station No.	Coordinates Y Axis	X Axis	Sagittal Height
1 (Minor)	0	201.07	17.91
2	25.40	200.96	18.21
3	50.80	200.69	19.18
4	76.20	200.20	20.73
5	101.60	199.54	22.91
6	127.00	198.68	25.70
7	152.40	197.64	29.11
8	177.80	196.39	33.12
9	203.20	194.87	37.74
10	228.60	193.34	43.00
11	242.32	192.38	46.10
12 (Diagonal)	257.35	183.95	48.34
13	261.09	173.53	47.40
14	262.46	152.40	44.32
15	263.86	127.00	41.15
16	265.00	101.60	38.53
17	265.89	76.20	36.50
18	266.52	50.80	35.05
19	266.90	25.40	34.16
20 (Major)	267.03	0	33.86



Dimensions in mm unless otherwise noted.

Figure 11 – Detail of Panel

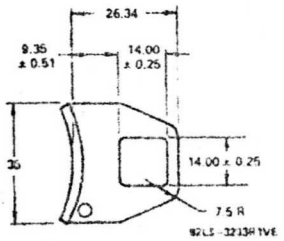


Figure 10 – Detail of Mounting Lug

General Considerations

Magnetic Shield

The A67-155X is provided with an internal magnetic shield. In order to be effective, the shield and the shadow-mask assembly should be thoroughly degaussed in the presence of the vertical component of the earth's magnetic field. This initial degaussing should be performed with the tube mounted in the TV receiver. The treatment will correct for localized areas of misregister resulting from magnetization of the metal shield and other tube parts. The vertical component of the earth's field is essentially constant with any receiver's orientation and the degaussing will compensate for this field also.

After the initial deguassing, automatic degaussing may be accomplished by two coils mounted on the sides of the funnel and wired to produce a horizontal, cross-axial degaussing field. For proper degaussing, an initial value of 1500 peak-to-peak ampere-turns (equivalent to an mmf of 375 ampere-turns in each coil) is required. After reducing to 40 peak-to-peak ampere-turns (an mmf of 10 ampere-turns) or less the degaussing current may be turned off. Under no circumstance should quiescent ac field from the degaussing coils exceed 2.0 peak-to-peak ampere-turns. Rectangular holes are provided in the rim band to facilitate mounting of the automatic degaussing coils.

Base:

The A67-155X utilizes a base in which the wire leads lie in grooves in the base with ridges between each lead. These ridges provide protection for the leads and give longer leakage paths. Contact to the leads should be made with a socket having leaf-spring contacts which touch only the outside surface of the leads.

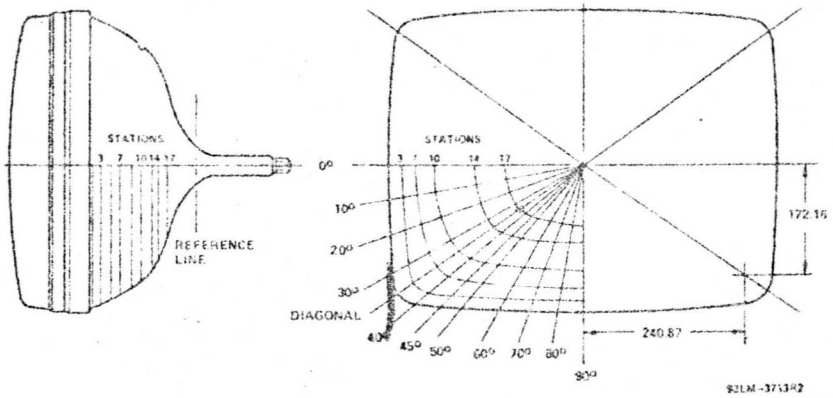
Mounting

Integral mounting lugs are provided to facilitate mounting the A67-155X 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 (1 MΩ).

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.

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.

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.



Station	Height Above Ref. Line	Major Axis 0°	10°	20°	30°	Diag. Axis 35°33'17"	40°	45°	50°	60°	70°	80°	Minor Axis 90°
Seal Edge	170.08	283.36	287.15	298.96	320.29	331.52	322.22	297.46	277.57	249.02	231.34	221.64	218.54
Mold Match	167.79	283.69	287.48	299.29	320.62	331.85	322.55	297.79	277.90	249.35	231.67	221.97	218.87
B[illegible] Line	166.42	283.62	287.40	299.21	320.55	331.77	322.45	297.69	277.83	249.28	231.60	221.89	218.80
1	158.75	279.55	283.26	294.82	315.72	326.75	317.50	292.96	273.25	244.96	227.41	217.81	214.73
2	151.02	275.49	279.07	290.20	310.31	320.93	311.84	287.68	268.27	240.41	223.14	213.69	210.67
3	143.41	271.42	274.75	285.12	303.83	313.69	304.85	281.38	262.56	235.51	218.72	209.52	206.60
4	135.74	267.36	270.21	279.10	295.17	303.63	295.30	273.15	255.35	229.82	214.00	205.31	202.54
5	128.37	263.30	265.56	272.64	285.45	292.18	284.45	263.91	247.42	223.75	209.09	201.04	198.48
6	120.42	258.67	260.38	265.71	275.31	280.39	273.25	254.25	239.01	217.12	203.56	196.11	193.75
7	112.80	252.10	253.37	257.33	264.49	268.25	261.67	244.20	230.17	210.01	197.51	190.68	188.49
8	105.18	244.14	245.06	247.93	253.11	255.83	249.73	233.53	220.52	201.85	190.27	183.95	181.91
9	97.56	234.44	235.13	237.24	241.07	243.08	237.39	222.28	210.13	192.74	181.91	176.00	174.12
10	89.94	222.89	223.39	225.02	227.97	229.51	224.21	210.06	198.73	182.45	172.34	166.80	165.05
11	82.32	209.65	210.06	211.33	213.61	214.81	209.91	196.85	186.39	171.35	162.03	156.92	155.30
12	74.70	194.56	194.87	195.86	197.66	198.60	194.11	182.14	172.54	158.75	150.19	145.52	144.02
13	67.08	178.56	178.79	179.53	180.85	181.56	177.47	166.62	157.94	145.44	137.69	133.43	132.08
14	59.46	161.19	161.37	161.90	162.86	163.37	159.74	150.11	142.39	131.32	124.43	120.65	119.46
15	51.84	142.29	142.39	142.75	143.41	143.74	140.67	132.51	125.93	116.54	110.69	107.49	106.48
16	44.22	116.94	116.94	116.94	116.94	116.94	114.96	109.70	105.49	99.42	95.66	93.60	92.94
17*	39.12					91.24							
Round	36.32	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07

*See footnote 10 on page 6.

F[illegible]e 12 – Bogie Bulb Contour Dimensions

Color Purity and Convergence Adjustments

The setup procedure for the A67-155X with the XD4422-J12 yoke is similar to that used for 90° types. After degaussing the tube, the convergence at the center of the screen should be adjusted by means of the static radial-convergence controls and by adjustment of the lateral-converging device. With the red beam on and the yoke pulled back as far as possible, the purifying magnet should be adjusted until the red area is centered on the screen. Slide the deflecting yoke axially on its supports to produce the most uniform red field. The blue field and the green field should now be checked separately for color purity. A compromise in adjustment settings may be necessary to give the best red, blue, and green field purity. Center convergence should be checked before and after each purity adjustment.

The dynamic convergence is then adjusted to give convergence on the horizontal and vertical axis. With this RCA tube-yoke combination, no additional adjustment is required for corner convergence.

Color Picture Tube Assembly A67-610X

25 JUIN 1975

110° Deflection-29mm Neck-67 cm Diagonal Precision In-Line Color Picture Tube Assembly-

Includes Factory Preset Yoke and Neck Components

- Self-Converging System
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type Yoke with Low Impedance — Ideal for Solid-State Deflection Circuits
- Integral Tube Components — Yoke and Other Neck Components Mounted and Preset at Factory
- Quick-Heat Cathodes
- Internal Magnetic Shield
- Line Screen — Minimizes Vertical Register Sensitivity
- Moiré Minimized for 625 TV-Line Systems
- Short Overall Length — 401 mm Allows Improved Cabinet Styling
- Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs
- Integral Mounting Lugs

Videocolor A67-610X is a 110° Color Picture Tube Assembly consisting of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke system, and a permanent magnet purity and static convergence device. The picture tube incorporates an internal magnetic shield and quick-heat cathodes. The quick-heat cathode design provides a typical warmup time of 7.5 seconds to produce 50 per cent of stabilized emission current when operated at nominal heater voltage from a source impedance of 1 ohm.

The A67-610X 110° precision in-line color picture tube assembly features a lower deflection power requirement than any commercial 110° color picture tube system of the same size. It maintains most of the inherently self-converging features of the 90° precision in-line system. Additional convergence correction is accomplished by an integral quadrupole yoke winding excited by the vertical drive. Simple circuitry provided within the yoke housing has only two controls, preset at the factory.

The PST yoke system in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self-convergence. Simple permanent-magnet devices are used to accomplish static convergence and purity.

The yoke and other neck components are preassembled on the tube and factory preset for optimum performance. The precision in-line tube assembly can normally be installed in the receiver by the manufacturer or field serviceman without making any convergence or purity adjustments—saving installation and adjustment costs. The integral tube-component construction provides reliable and stable convergence, purity, and white uniformity performance throughout tube life.

Picture Tube Data

Electrical:		
Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method		Electrostatic
Focus Lens		Bipotential
Convergence Method		Magnetic (Preset)
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal	110	deg
Horizontal	97	deg
Vertical	77	deg

Picture Tube Data (Cont'd)

Direct Interelectrode Capacitance (Approx.):		
Grid No.1 to all other electrodes	11.4	pF
Grid No.3 to all other electrodes	5.6	pF
Green cathode to all other electrodes	6.7	pF
Red or blue cathode to all other electrodes	5.5	pF
Capacitance Between Anode and External Conductive Coating	2500 max. 2000 min.	pF pF
Resistance Between Metal Hardware and External Conductive Coating	50	MΩ

Optical:

Faceplate:	
Light transmission at center (Approx.)	51%
Surface	Polished
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green)	P22
Persistence	Medium-Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios (Approx.)	0.826 mm

Mechanical:

Tube Dimensions:	
Overall length	400.84 ± 6.35 mm
At mold-match line:	
Diagonal	666.67 ± 2.36 mm
Horizontal	571.78 ± 2.36 mm
Vertical	442.47 ± 2.36 mm
Minimum Screen Dimensions (Projected):	
Diagonal	626.31 mm
Horizontal	527.71 mm
Vertical	395.78 mm
Area	2032 sq cm
Bulb Funnel Designation	JEDEC No.J663C
Bulb Panel Designation	JEDEC No.F667A
Anode Bulb Contact Designation	Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)
Base Designation[a]	JEDEC No.B12-260
Pin Position Alignment	Pin No.1 Aligns Approx. with Anode Bulb Contact
Operating Position, Preferred	Anode Bulb Contact on Top
Gun Configuration	Horizontal In-Line
Weight (Approx.)	20.5 kg

Implosion Protection:

Type	Rim Bands and Tension Bands

Maximum and Minimum Ratings, Absolute-Maximum Values:[b]

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

Anode Voltage	27.5 20	max. min.	kV kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d,e]	6.9 5.7	max. min.	V 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	200	max.	V
Peak value	200	max.	V
In service mode	300	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values:

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

For anode voltage of 25 kV	
Grid-No.3 (Focusing electrode) Voltage	16.8% to 20% of Anode voltage
Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot	See CUTOFF DESIGN CHART in Figure 2
At cathode voltage of 125 V	335 to 670 V
At cathode voltage of 150 V	425 to 820 V
At cathode voltage of 175 V	510 to 975 V
Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun with Cathode Voltage Adjusted for Spot Cutoff	1.50
Heater Voltage[d,e]	6.3 V
Grid-No.3 Current	±15 μA
Grid-No.2 Current	±5 μA
Grid-No.1 Current	±5 μA

	Illum. D 6550° K + 7 M.P.C.D.	Color 9300° K + 27 M.P.C.D.	
To Produce White Light of			
CIE Coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:	
Horizontal	±8.0 mm
Vertical	±8.0 mm

Limiting Circuit Values:

High-Voltage Circuits:	
Grid-No.3 circuit resistance	7.5 max. MΩ
Low-Voltage Circuits:	
Effective grid-No.1-to-cathode-circuit resistance	0.75 max. MΩ

Deflection Yoke Data

Horizontal Section:[f]		
Inductance at 1 V rms and 1 kHz	0.28 ± 5%	mH
Resistance at 25° C	0.36 ± 7%	Ω
Typical operation with edge-to edge scan at 25 kV:		
Peak-to-peak deflection current	12.0	A
Stored energy	5.1	mJ
Vertical Section, Including Quadrupole Coil Circuit:[g]		
Inductance at 1 V rms and 1 kHz	3.2 ± 5%	mH
Resistance at 25° C:		
At vertical current = 0 A dc	4.8 ± 10%	Ω
At vertical current = 1.55 A dc	3.9 ± 10%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	3.1	A
Raster Pincushion Distortion:[h]		
East/West	9.0%	
North/South	8.5%	

Maximum Ratings, Absolute-Maximum Values:[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs	700 max. V
Peak Pulse Voltage Between Horizontal and Vertical or Quadrupole Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs	700 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

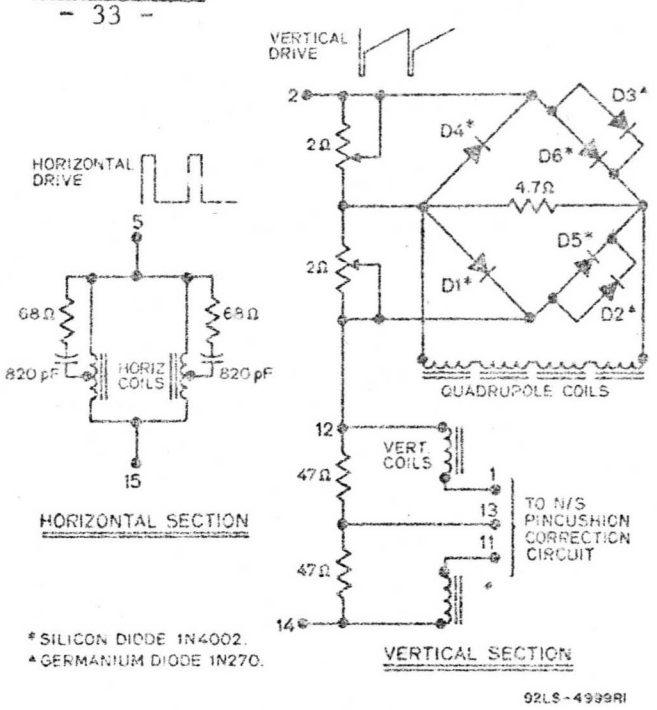


Figure 1 — Circuit of the Deflection Yoke

[a] The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one-half kilogram.

[b] The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

[c] The short-term average anode current should be limited by circuitry of 1500 microamperes.

[d] For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

[e] Although the tube incorporates a "quick heat" design, a faster turn-on can be accomplished with "instant on" operation. If "instant on" operation is utilized, the Absolute-Maximum heater voltage under standby conditions is 5.5 volts. The Typical Design heater voltages for "instant on" operation are: 6.0 volts under operating conditions and 5.0 volts under standby conditions. All other voltages normally applied to the tube must be removed during standby operation.

[f] Measured between terminals 5 and 15.

[g] Measured between terminals 2 and 14 with terminals 1, 11, and 13 connected together. The vertical section of the yoke includes the quadrupole coil circuit with nonlinear elements. Therefore, the vertical deflection circuit should employ suitable circuit techniques such as current feedback to ensure that the small nonlinear impedance of the quadrupole coil does not distort the deflection current waveform.

[h] Measured in accordance with IEC Recommendation — Publication 107-1960 — Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

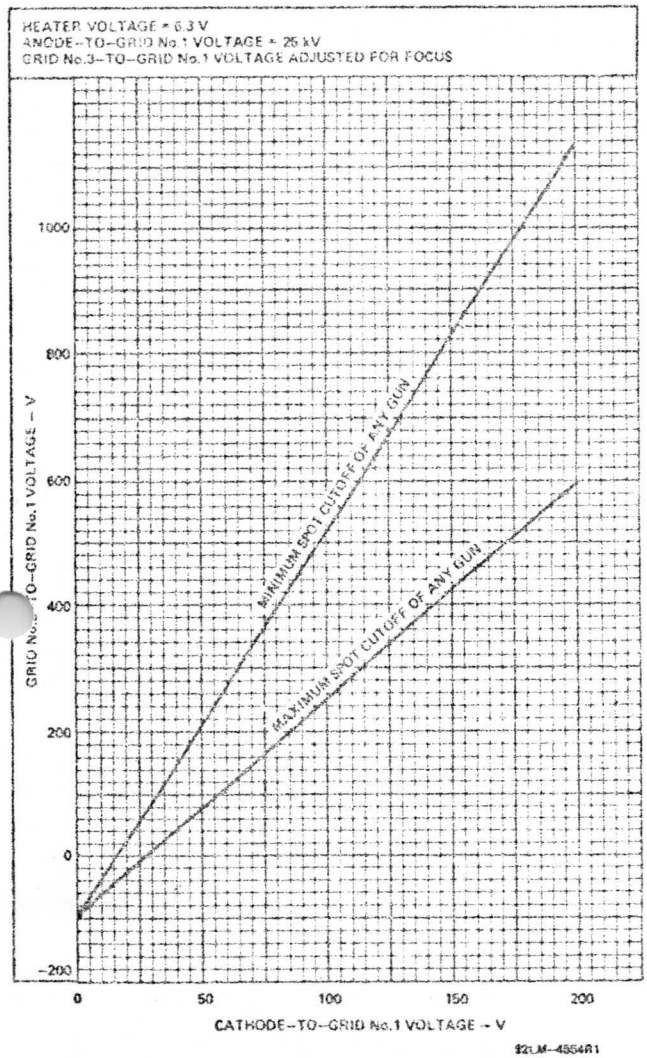


Figure 2 — Cutoff Design Chart

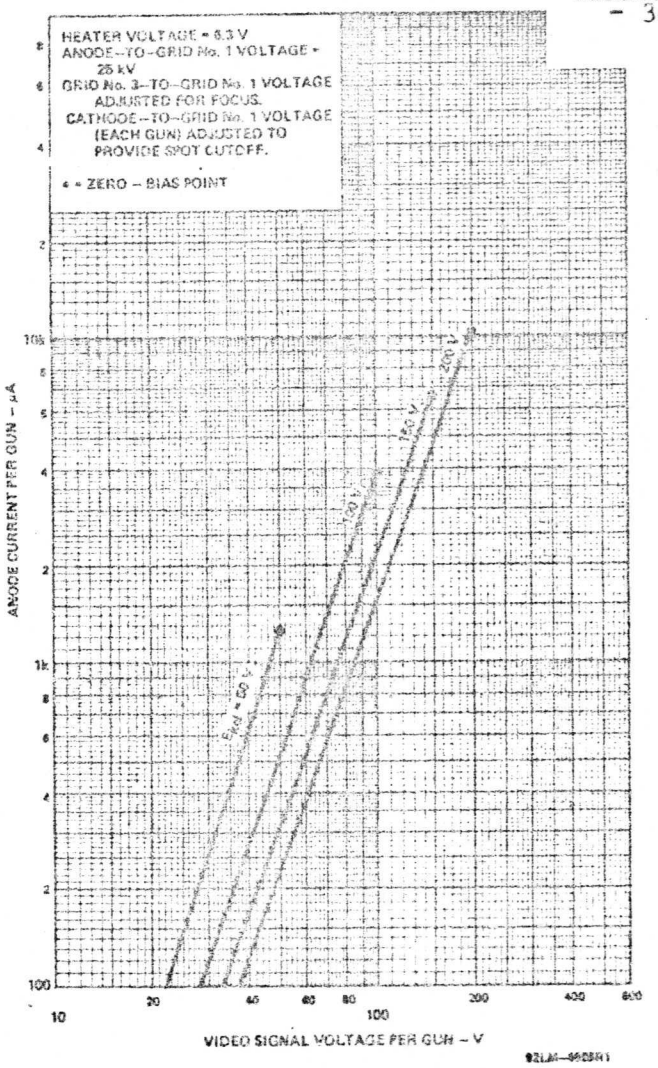


Figure 3 — Typical Drive Characteristics, Cathode-Drive Service

Notes for Dimensional Outline

Note 1 — Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

Note 4 — "X", "Y", and "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 9.5 mm in diameter when positioned on the hole centers.

Note 6 — One of four brackets may deviate 2 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 14.73 mm x 5.05 mm.

Basing Specification JEDEC No.13D

Pin 1: Grid No.3
Pin 3: Cathode of Blue Gun
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Gun
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Gun
Pin 13: NC
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

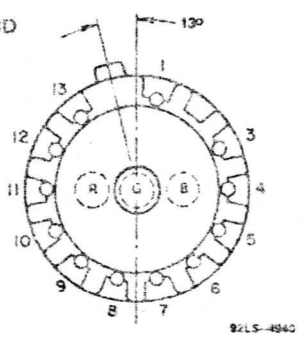
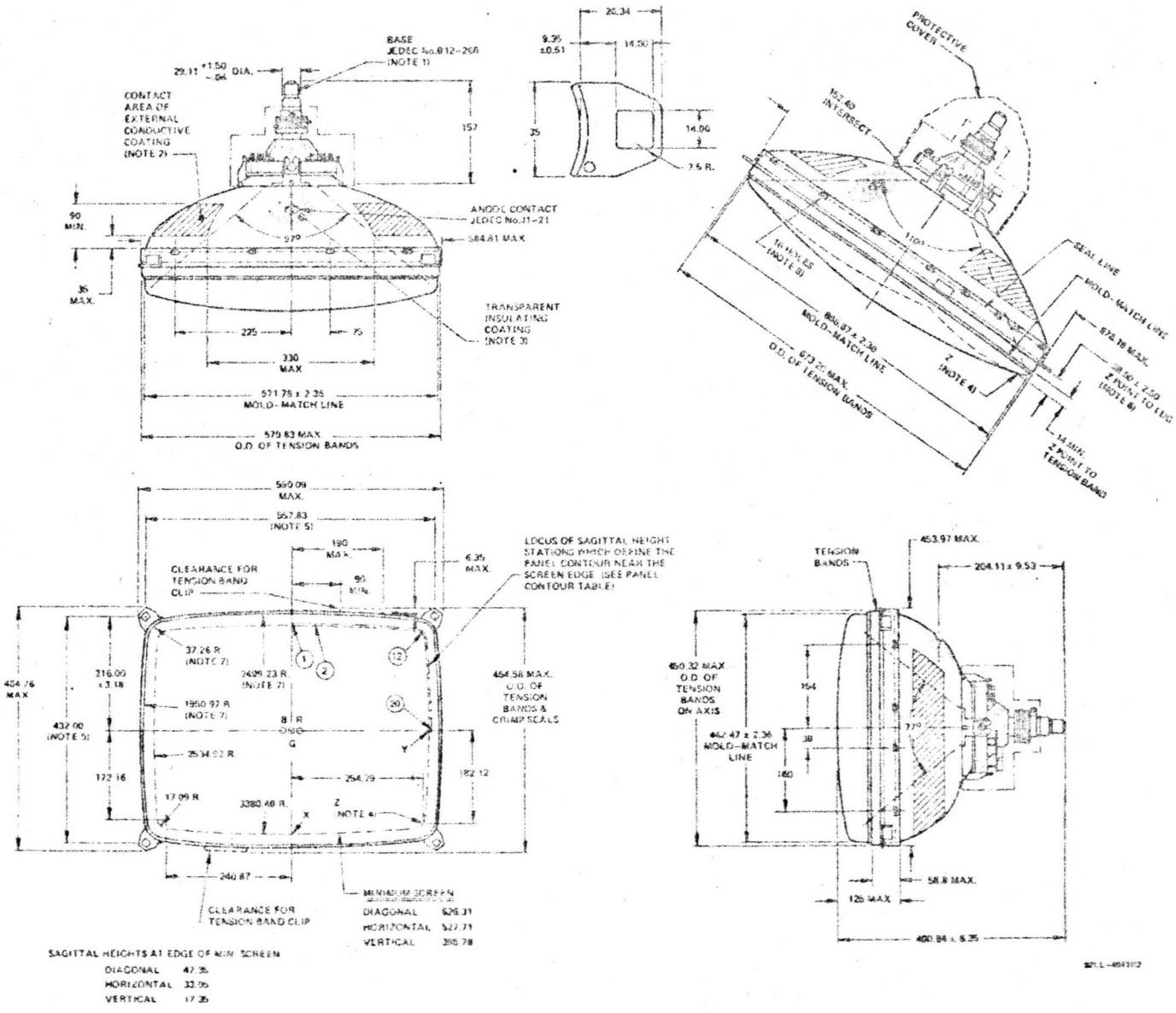


Figure 4 — Bottom View of Base



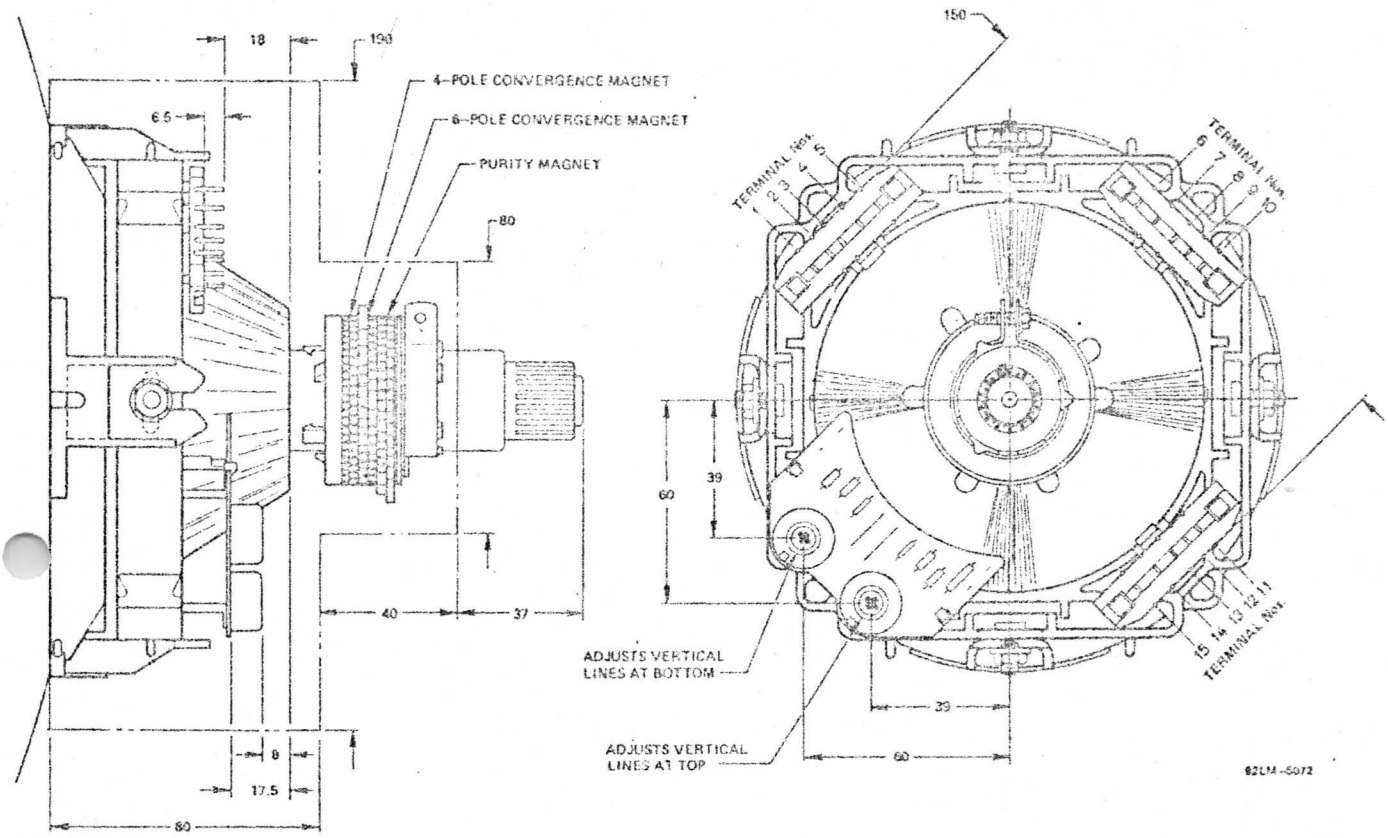
Panel Contour

Sagittal Heights with reference to centerface at Points 3.18 Beyond Edge of Min. Screen

Station No.	Coordinates Y Axis	Coordinates X Axis	Sagittal Height	Station No.	Coordinates Y Axis	Coordinates X Axis	Sagittal Height
1 (Minor)	0	201.07	17.91	11	242.32	192.38	46.10
2	25.40	200.96	18.21	12 (Diagonal)	257.35	183.95	48.34
3	50.80	200.69	19.18	13	261.09	173.53	47.40
4	76.20	200.20	20.73	14	262.46	152.40	44.32
5	101.60	199.54	22.91	15	263.86	127.00	41.15
6	127.00	198.68	25.70	16	265.00	101.60	38.53
7	152.40	197.64	29.11	17	265.89	76.20	36.50
8	177.80	196.39	33.12	18	266.52	50.80	35.05
9	203.20	194.87	37.74	19	266.90	25.40	34.16
10	228.60	193.34	43.00	20 (Major)	267.03	0	33.86

Dimensions in mm unless otherwise noted

Figure 5 -- Dimensional Outline



Term. 1: Pin Correction	Term. 6: IC	Term. 11: Pin Correction
Term. 2: Vertical High	Term. 7: NC	Term. 12: IC
Term. 3: IC	Term. 8: IC	Term. 13: Pin Correction CT
Term. 4: IC	Term. 9: IC	Term. 14: Vertical Low
Term. 5: Horizontal High	Term. 10: IC	Term. 15: Horizontal Low

Figure 6 — Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

Convergence and Purity

The slight correction required for static convergence and color purity in the precision in-line system is supplied by three pairs of permanent magnets in one assembly which is mounted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of aporoximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished by varying the magnetic strength in the pair of magnets nearest the base to produce a vertical field. The other two pairs of magnets are used for static convergence, a four-pole magnet as shown in Figure 7 (the pair nearest the yoke) to move the outside beams equally in opposite directions and a six-pole magnet as shown in Figure 8 (the middle pair) to move the outside beams equally in the same direction. In both the four-pole and six-pole devices the field in the center is zero so the center beam is unaffected. These devices are used to converge any orientation of the outside beams to the center beam at the center of the screen with substantially no motion of the center beam and without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

Convergence of the three beams over the entire screen is accomplished by (1) positioning of the yoke with respect to the beams and (2) application of vertical-frequency correction current through a quadrupole winding on the yoke. The yoke is adjusted and secured in its optimum position in the tube factory. The quadrupole coils on the yoke are driven by a small circuit included in the vertical section of the deflection yoke. This circuit is internally connected in series with the vertical deflection coils and forms an integral part of the self-convergence system. The two controls provided are adjusted at the same time the mechanical position of the yoke is established. The convergence action of these controls is shown in Figure 9. One control adjusts the two outside beams in a horizontal direction to converge the vertical crosshatch lines in the upper half of the raster. The other control performs a similar function in the lower half of the raster. These controls are located in an accessible position, as shown in Figure 6, for readjustment in the receiver as required for optimum performance.

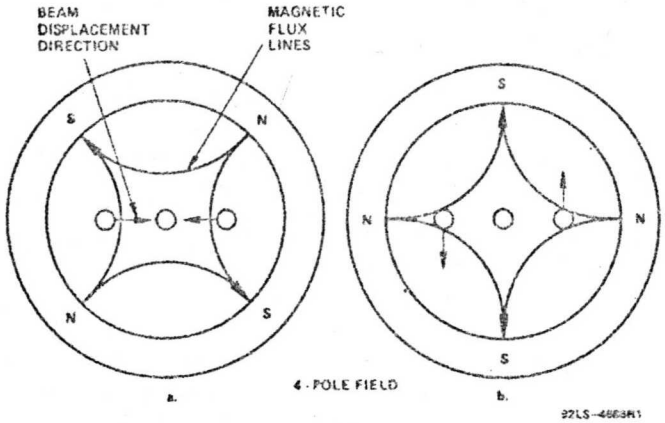


Figure 7 — Beam Motion Produced by the Four-Pole Convergence Magnet

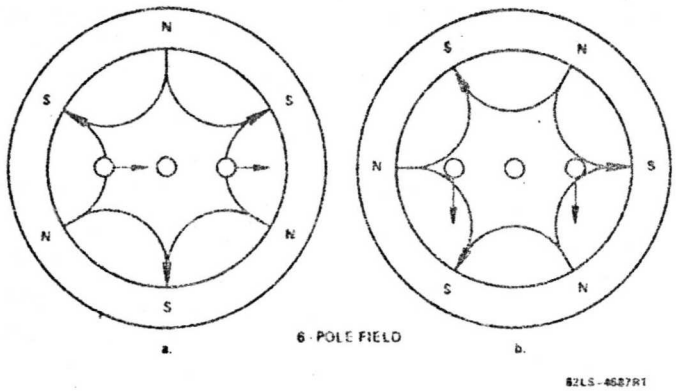


Figure 8 — Beam Motion Produced by the Six-Pole Convergence Magnet

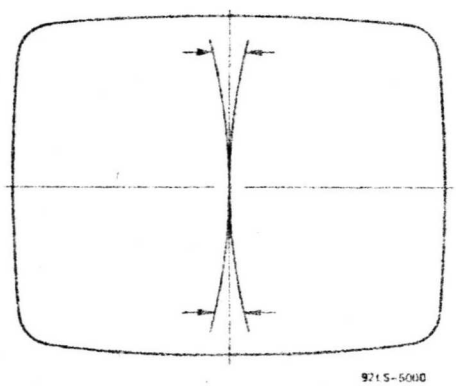
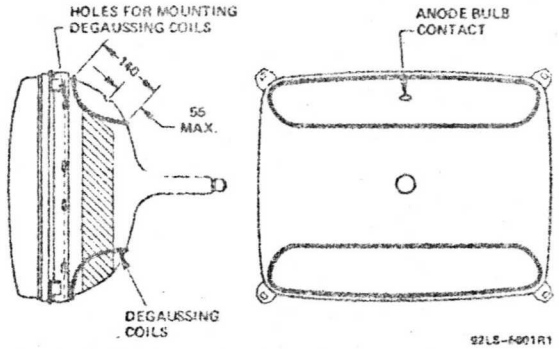


Figure 9 — Convergence Action Accomplished by Adjustment of Quadrupole Coil Current



Dimensions in mm

Figure 10 — Relative Placement of Typical Degaussing Coil

Magnetic Shield and Degaussing

The A67-610X is provided with an internal magnetic shield. In order to be effective, the shield and the shadow-mask assembly should be thoroughly degaussed in the presence of the vertical component of the earth's magnetic field. This initial degaussing should be performed with the tube mounted in the TV receiver. The treatment will correct for localized areas of misregister resulting from magnetization of the metal shield and other tube parts. The vertical component of the earth's field is essentially constant with any receiver's orientation and the degaussing will compensate for this field also.

After the initial degaussing, automatic degaussing may be accomplished by two coils mounted on the top and bottom of the funnel, as shown in **Figure 10**, and connected to produce a vertical, crossaxial degaussing field. For proper degaussing, an initial value of 1200 peak-to-peak ampere-turns (equivalent to an mmf of 300 ampere-turns in each coil) is required. The degaussing circuit must gradually reduce this mmf to a quiescent level not exceeding 2.0 peak-to-peak ampere-turns. For optimum performance, the degaussing coils should always be connected to a very low source impedance to the horizontal frequency. Rectangular holes are provided in the rim bands to facilitate mounting of the automatic degaussing coils.

WARNING

X-Radiation:

This color picture tube does not emit x-radiation above the internationally accepted dosage rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

Implosion Protection:

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a recommended replacement 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 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 control brackets may produce a shock hazard.

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. To maintain the preset adjustments of the neck components, the assembly is shipped with a protective cover over these components. The cover should be left on the assembly until it is mounted in the receiver. The picture tube assembly should never be handled by the neck, yoke or other components. The mounting lugs or mounting holes in the implosion protection hardware may be used to aid in the installation of the tube assembly in the cabinet.

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

Printed in U.S.A./3-75

RCA Picture Tube Division

Color Picture Tube Assembly

A67-611X

AL/1978/2
Annex CRT
- 60 -

110° Deflection - 29mm Neck - 67 cm Diagonal Precision In-Line Color Picture Tube Assembly

Includes Factory Preset Yoke and Neck Components

- Self-Converging System
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type with Low Impedance — Ideal for Solid-State Deflection Circuits
- Integral Tube Components — Yoke and Other Neck Components Mounted and Preset at Factory
- Increased Light Output Resulting from:
  - 71% Faceplate Glass Transmission
  - Close-Tolerance Screen/Mask Assembly
- Tinted Phosphor Screen — Enhanced Color and Contrast
- Super Arch Mask — Minimizes Thermal Expansion Effects
- Other Features —
  - Line Screen — Minimizes Vertical Register Sensitivity
  - Moiré Minimized for 625 TV-Line Systems
  - Internal Magnetic Shield
  - Quick-Heat Cathodes
  - Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs
  - Integral Mounting Lugs

RCA A67-611X is a 110° Color Picture Tube Assembly consisting of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke system, and a permanent magnet purity and static convergence device. The picture tube incorporates selectively absorbent phosphors, an internal magnetic shield and quick-heat cathodes. The phosphor is tinted to selectively absorb room light striking it and permit only the phosphor color to be reflected. Therefore it was possible to increase the faceplate glass transmission to 71 per cent without adversely affecting the contrast. The increase in the glass transmission in combination with a close-tolerance screen/mask assembly results in an increase in light output of the A67-611X over the A67-610X.

The A67-611X 110° precision in-line color picture tube assembly features a low deflection power requirement. It maintains most of the inherently self-converging features of the 90° precision in-line system. Additional convergence correction is accomplished by an integral quadrupole yoke winding excited by the vertical drive. Simple circuitry provided within the yoke housing has only two controls, preset at the factory.

The PST yoke system in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self-convergence. Simple permanent-magnet devices are used to accomplish static convergence and purity.

The yoke and other neck components are preassembled on the tube and factory preset for optimum performance. The precision in-line tube assembly can normally be installed in the receiver by the manufacturer or field serviceman without making any convergence or purity adjustments—saving installation and adjustment costs. The integral tube-component construction provides reliable and stable convergence, purity, and white uniformity performance throughout tube life.

Picture Tube Data

Electrical:

Heater:			
Voltage	6.3		V
Current	700		mA
Focusing Method	Electrostatic		
Focus Lens	Bipotential		
Convergence Method	Magnetic (Preset)		
Deflection Method	Magnetic		
Deflection Angles (Approx.):			
Diagonal	110		deg
Horizontal	97		deg
Vertical	78		deg
Direct Interelectrode Capacitance (Approx.):			
Grid No.1 to all other electrodes	11.4		pF
Grid No.3 to all other electrodes	5.6		pF
Green cathode to all other electrodes	7.1		pF
Red or blue cathode to all other electrodes	6.5		pF
Capacitance Between Anode and External Conductive Coating	2500	max.	pF
	2000	min.	pF
Capacitance Between Anode and Metal Hardware	400		pF
Resistance Between Metal Hardware and External Conductive Coating	50	min.	MΩ

Optical:

Faceplate:	
Light transmission at center (approx.)	71%
Surface	Polished
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green)	P22
Type	Selectively absorbent
Persistence	Medium-Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios at center (approx.)	0.826 mm

Printed in U.S.A./4-78
A67-611X

Mechanical:

Tube Dimensions:
- Overall length ..... 400.84 ± 6.35 mm
- At mold-match line:
  - Diagonal ..... 666.67 ± 2.00 mm
  - Horizontal ..... 571.78 ± 2.00 mm
  - Vertical ..... 442.47 ± 2.00 mm

Minimum Screen Dimensions (Projected):
- Diagonal ..... 626.31 mm
- Horizontal ..... 527.71 mm
- Vertical ..... 395.78 mm
- Area ..... 2032 sq cm

Bulb Funnel Designation ..... JEDEC No.J663C

Bulb Panel Designation ..... JEDEC No.F667A

Anode Bulb Contact Designation ..... Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)

Base Designation[a] ..... JEDEC No.B12-260

Pin Position Alignment ..... Pin No.1 Aligns Approx. with Anode Bulb Contact

Operating Position, ... Anode Bulb Contact Up

Gun Configuration ..... Horizontal In-Line

Weight (Approx.) ..... 20.5 kg

Implosion Protection

Type ..... Rim Bands and Tension Bands

Maximum and Minimum Ratings, Absolute-Maximum Values[b]

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

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d]	6.9	max.	V
	5.7	min.	V
Heater-Cathode Voltage:[e]			
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	200	max.	V
Peak value	300	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing electrode) Voltage ..... 16.8% to 20% of Anode voltage

Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot ..... See CUTOFF DESIGN CHART in **Figure 3**
- At cathode voltage of 125 V ..... 345 to 675 V
- At cathode voltage of 150 V ..... 435 to 835 V
- At cathode voltage of 175 V ..... 530 to 990 V

Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Cutoff 1.50

Heater Voltage[d] ..... 6.3 V

Grid-No.3 Current[f] ..... ± 15 μA

Grid-No.2 Current ..... ± 5 μA

Grid-No.1 Current ..... ± 5 μA

To Produce White Light of	6550 K + 7 M.P.C.D. (Illum. D)	9300 K + 27 M.P.C.D.	
CIE Coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:
- Horizontal ..... ± 8.0 mm
- Vertical ..... ± 8.0 mm

Deflection Yoke Data

Horizontal Section:[g]		
Inductance at 1 V rms and 1 kHz	0.28 ± 5%	mH
Resistance at 25° C	0.36 ± 7%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	12.0	A
Stored energy	5.1	mJ
Vertical Section, Including Quadrupole Coil Circuit:[h]		
Inductance at 1 V rms and 1 kHz	3.2 ± 5%	mH
Resistance at 25° C:		
At vertical current = 0 A dc	4.8 ± 10%	Ω
At vertical current = 1.55 A dc	3.9 ± 10%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	3.1	A
Typical Raster Pincushion Distortion:[i]		
East/west	9.0%	
North/south	8.5%	

Maximum Ratings, Absolute-Maximum Values:[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz For a Maximum Pulse Duration of 12.5 μs ..... 700 max. V

Peak Pulse Voltage Between Horizontal and Vertical or Quadrupole Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs ..... 700 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

a The mating socket assembly with associated circuit board and mounted components must not weigh more than one-half kilogram. 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.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry to 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply voltage be regulated at or slightly below the Typical Design Value with an adequate regulation circuit. Details of this specific circuit should be reviewed with RCA Picture Tube Division. The surge voltage across the heater must be limited to 9.5 volts rms.

e For maximum reliability, the series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm.

f A high internal impedance in the focus circuit can result in a change in the focus voltage with a change in the grid-No.3 leakage current.

g Measured between terminals 5 and 15.

h Measured between terminals 2 and 14 with terminals 1, 11, and 13 connected together. The vertical section of the yoke includes the quadrupole coil circuit with nonlinear elements. Therefore, the vertical deflection circuit should employ suitable circuit techniques such as current feedback to ensure that the small non-linear impedance of the quadrupole coil does not distort the deflection current waveform.

j Typical measured values at a distance 5 times the picture height in accordance with IEC Recommendation – Publication 107-1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

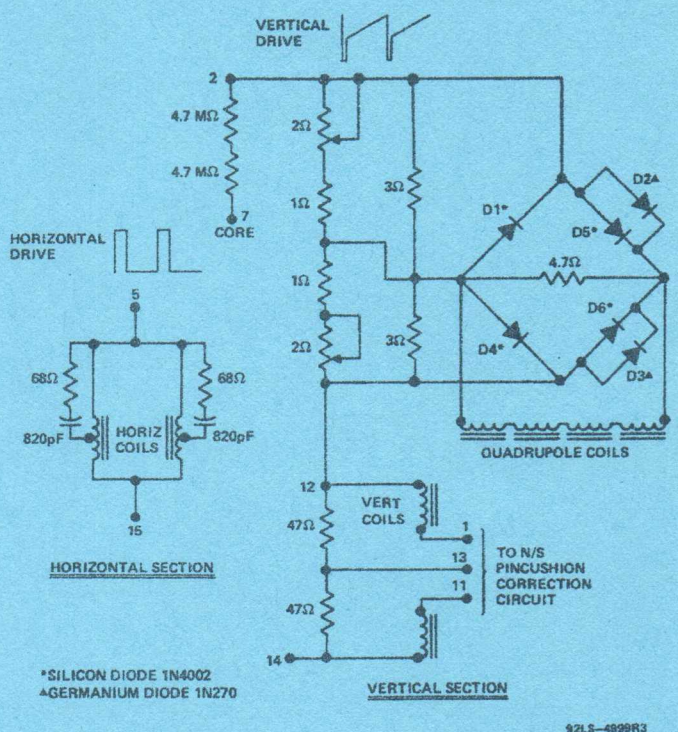


Figure 1 – Circuit of the Deflection Yoke

Basing Specification JEDEC No.13G

Pin 1: Grid No.3
Pin 3: Cathode of Blue Beam
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Beam
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Beam
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

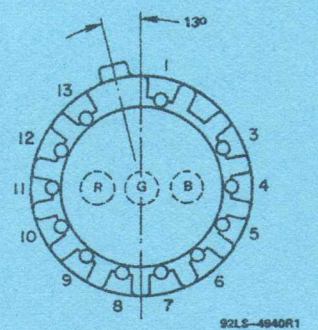


Figure 2 – Bottom View of Base

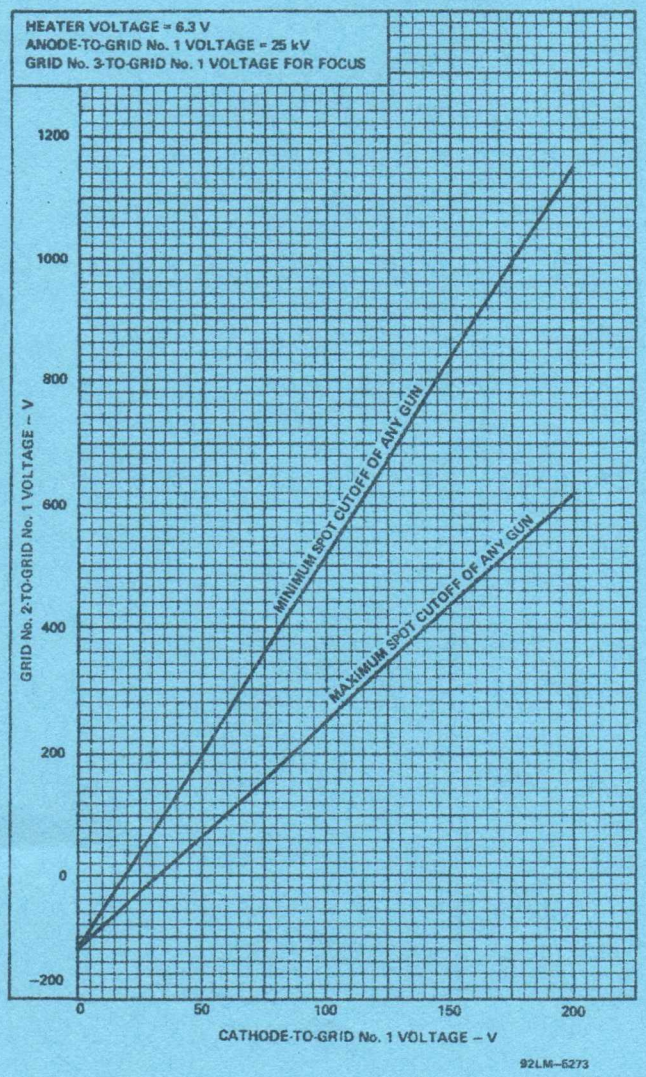


Figure 3 — Cutoff Design Chart

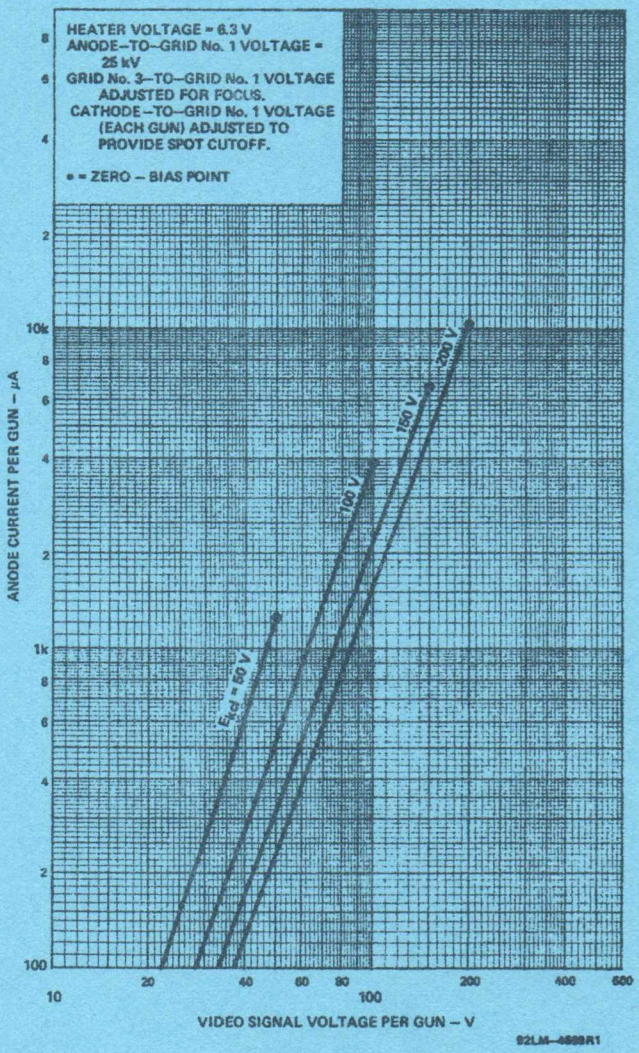


Figure 4 — Typical Drive Characteristics, Cathode-Drive Service

Notes for Dimensional Outline

Note 1 — Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

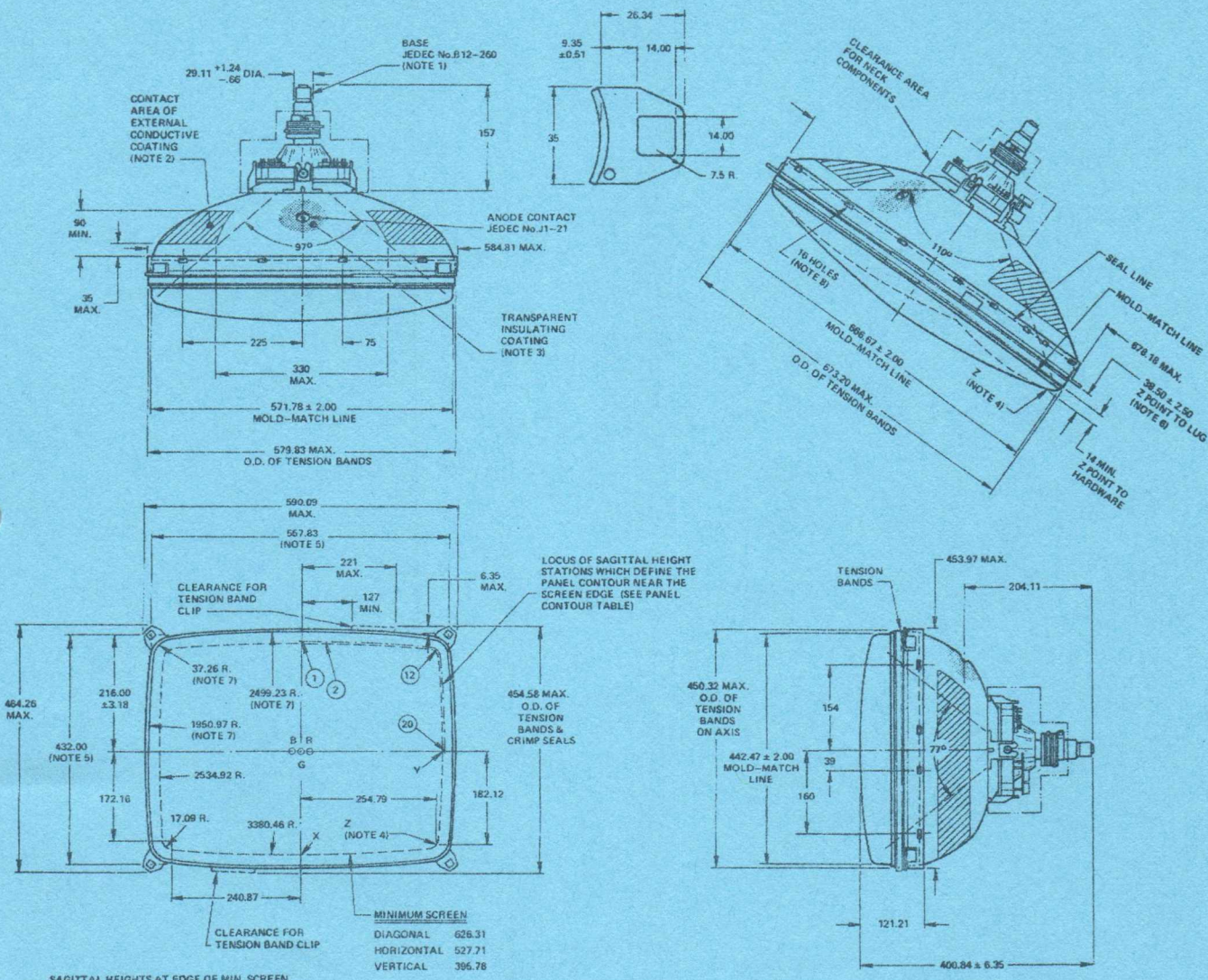
Note 4 — "X", "Y", and "Z" reference points are located on the outside surface of the faceplate at the intersection of the minimum published screen with the minor, major, and diagonal axes, respectively.

Note 5 — The tolerance of the mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when positioned on the hole centers.

Note 6 — One of four brackets may deviate 2 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 14.73 mm x 5.08 mm.



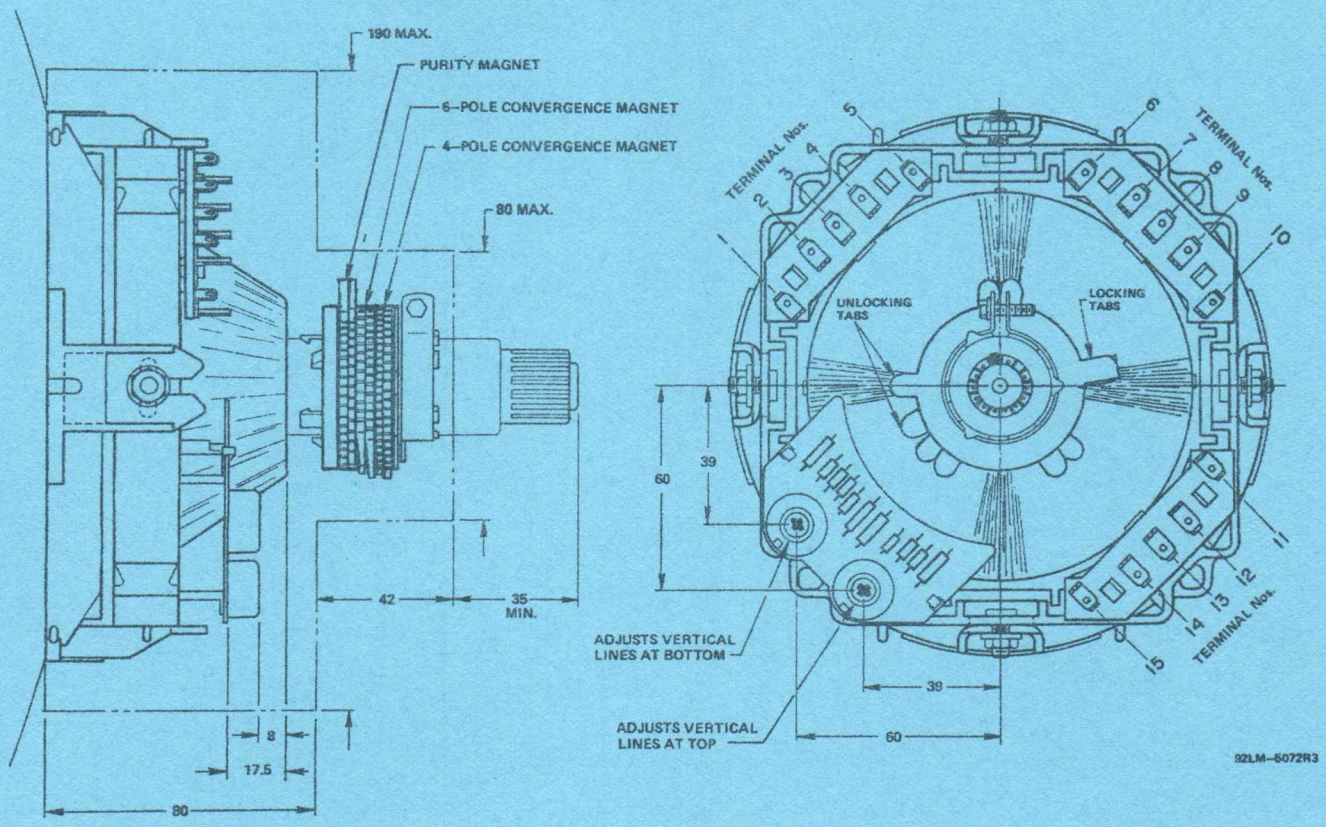
Panel Contour

Sagittal Heights with reference to centerface at Points 3.18 beyond edge of min. screen.

Station No.	Coordinates Y Axis	Coordinates X Axis	Sagittal Height	Station No.	Coordinates Y Axis	Coordinates X Axis	Sagittal Height
1 (Minor)	0	201.07	17.91	11	242.32	192.38	46.10
2	25.40	200.96	18.21	12 (Diagonal)	257.35	183.95	48.34
3	50.80	200.69	19.18	13	261.09	173.53	47.40
4	76.20	200.20	20.73	14	262.46	152.40	44.32
5	101.60	199.54	22.91	15	263.86	127.00	41.15
6	127.00	198.68	25.70	16	265.00	101.60	38.53
7	152.40	197.64	29.11	17	265.89	76.20	36.50
8	177.80	196.39	33.12	18	266.52	50.80	35.05
9	203.20	194.97	37.74	19	266.90	25.40	34.16
10	228.60	193.34	43.00	20 (Major)	267.03	0	33.86

Dimensions in mm unless otherwise noted.

Figure 5 — Dimensional Outline



Term. 1: Pin Correction	Term. 6: IC	Term. 11: Pin Correction
Term. 2: Vertical High	Term. 7: IC	Term. 12: IC
Term. 3: IC	Term. 8: IC	Term. 13: Pin Correction CT
Term. 4: IC	Term. 9: IC	Term. 14: Vertical Low
Term. 5: Horizontal High	Term. 10: IC	Term. 15: Horizontal Low

Figure 6 – Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

Convergence and Purity

The slight correction required for static convergence and color purity in the precision in-line system is supplied by three pairs of permanent magnets in one assembly which is mounted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of approximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished by varying the magnetic strength in the pair of magnets nearest the base to produce a vertical field. The other two pairs of magnets are used for static convergence, a four-pole magnet as shown in **Figure 7** (the pair nearest the base) to move the outside beams equally in opposite directions and a six-pole magnet as shown in **Figure 8** (the middle pair) to move the outside beams equally in the same direction. In both the four-pole and six-pole devices the field in the center is zero so the center beam is unaffected. These devices are used to converge any orientation of the outside beams to the center beam at the center of the screen with substantially no motion of the center beam and without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

Convergence of the three beams over the entire screen is accomplished by (1) positioning of the yoke with respect to the beams and (2) application of vertical-frequency correction current through a quadrupole winding on the yoke. The yoke is adjusted and secured in its optimum position in the tube factory. The quadrupole coils on the yoke are driven by a small circuit included in the vertical section of the deflection yoke. This circuit is internally connected in series with the vertical deflection coils and forms an integral part of the self-convergence system. The two controls provided are adjusted at the same time the mechanical position of the yoke is established. The convergence action of these controls is shown in **Figure 9**. One control adjusts the two outside beams in a horizontal direction to converge the vertical crosshatch lines in the upper half of the raster. The other control performs a similar function in the lower half of the raster. These controls are located in an accessible position, as shown in **Figure 6**, for readjustment in the receiver as required for optimum performance.

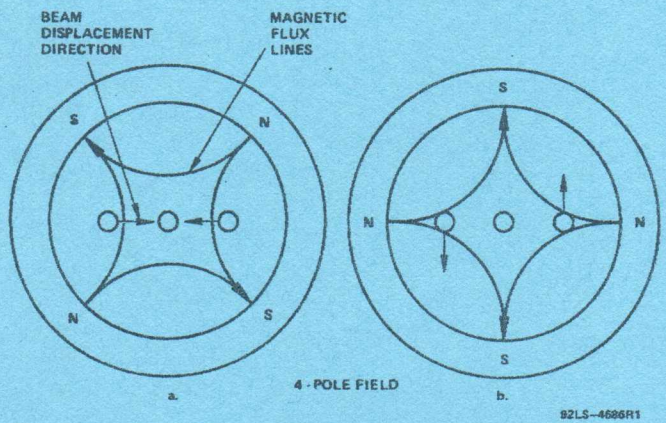


Figure 7 — Beam Motion Produced by the Four-Pole Convergence Magnet

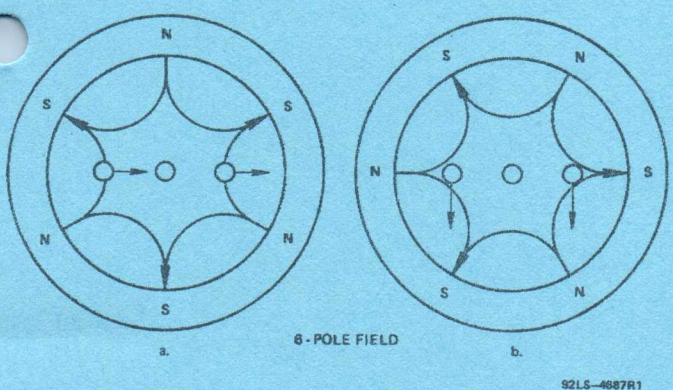


Figure 8 — Beam Motion Produced by the Six-Pole Convergence Magnet

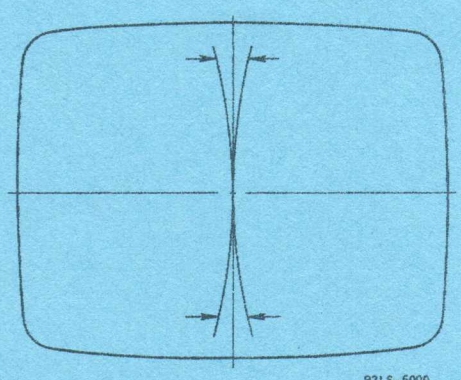


Figure 9 — Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

Magnetic Shield and Degaussing

The A67-611X tube employs an internal magnetic shield and, because of the line screen and its insensitivity to vertical beam register, allows simpler degaussing than the delta gun tubes.

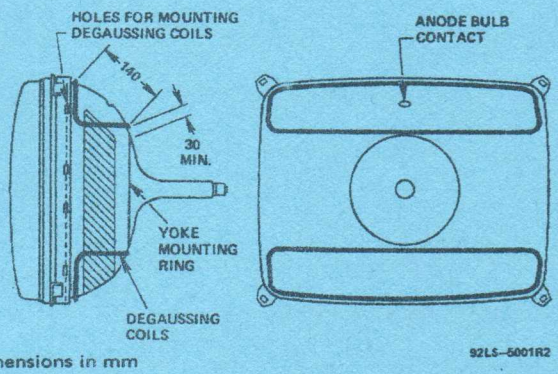


Figure 10 — Relative Placement of Typical Degaussing Coil

Degaussing Coils

The recommended degaussing system for the A67-611X utilizes two series connected coils symmetrically placed as shown in **Figure 10** with one coil on top of the funnel and one located under the funnel. Each coil consists of 200 turns of 0.5 mm wire with a circumference of 1100 to 1200 mm. These are connected to produce a vertical cross axial degaussing field. Rectangular holes are provided in the rim bands to facilitate mounting of the automatic degaussing coils.

Degaussing Circuit

A recommended degaussing circuit as shown in **Figure 11** uses a conventional dual PTC device. For proper degaussing, a minimum value of 1400 peak-to-peak ampere turns (equivalent to an MMF of 350 ampere turns in each coil) is required. It is essential that the degaussing current reduces in a gradual manner to a quiescent level not exceeding 2.0 peak-to-peak ampere turns. For optimum performance the degaussing coils should always be connected to a very low source impedance at the horizontal frequency. If the circuit used does not have an inherent low impedance at the horizontal frequency, the degaussing coil should be shunted with a suitable capacitor. If the addition of a short across the coils increases the horizontal frequency currents in the degaussing coils by more than 20%, the inherent source impedance offered by the PTC and associated circuitry is indicated to be too high to provide satisfactory performance. Therefore a capacitor should be added across the degaussing coil to satisfy this requirement.

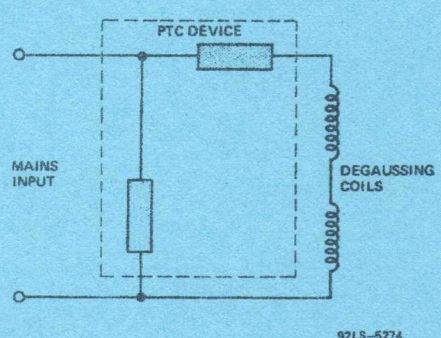


Figure 11 — Typical Degaussing Circuit

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. 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.

WARNING

X-Radiation:

This color picture tube does not emit x-radiation above the internationally accepted isoexposure rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

Implosion Protection:

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a recommended replacement 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 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 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 A67-611X 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 (1 MΩ).

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 of 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.

RCA Picture Tube Division

Color Picture Tube Assembly

27 JUIL 1978

A67-613X

AL/1978/2
Annex CRT
- 68 -

110° Deflection - 29mm Neck - 67 cm Diagonal Precision In-Line Color Picture Tube Assembly

Includes Factory Preset Yoke and Neck Components

- Self-Converging System
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type with Low Impedance — Ideal for Solid-State Deflection Circuits
- Integral Tube Components — Yoke and Other Neck Components Mounted and Preset at Factory for Operation in the Southern Hemisphere
- Increased Light Output Resulting from:
  71% Faceplate Glass Transmission
  Close-Tolerance Screen/Mask Assembly
- Tinted Phosphor Screen — Enhanced Color and Contrast
- Super Arch Mask — Minimizes Thermal Expansion Effects
- Other Features —
  Line Screen — Minimizes Vertical Register Sensitivity
  Moiré Minimized for 625 TV-Line Systems
  Internal Magnetic Shield
  Quick-Heat Cathodes
  Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs
  Integral Mounting Lugs

RCA A67-613X is a 110° Color Picture Tube Assembly designed for use in the southern hemisphere. The assembly components are factory preset for optimum performance consistent with the southern hemisphere's vertical component of the earth's magnetic field. The A67-613X consists of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke system, and a permanent magnet purity and static convergence device. The picture tube incorporates selectively absorbent phosphors, an internal magnetic shield and quick-heat cathodes. The phosphor is tinted to selectively absorb room light striking it and permit only the phosphor color to be reflected. Therefore it was possible to increase the faceplate glass transmission to 71 per cent without adversely affecting the contrast. The increase in the glass transmission in combination with a close-tolerance screen/mask assembly results in an increase in light output of the A67-613X over the A67-612X.

The A67-613X 110° precision in-line color picture tube assembly features a low deflection power requirement. It maintains most of the inherently self-converging features of the 90° precision in-line system. Additional convergence correction is accomplished by an integral quadrupole yoke winding excited by the vertical drive. Simple circuitry provided within the yoke housing has only two controls preset at the factory.

The PST yoke system in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self-convergence. Simple permanent-magnet devices are used to accomplish static convergence and purity.

The yoke and other neck components are preassembled on the tube and factory preset for optimum performance in the southern hemisphere with the anode contact button down. The precision in-line tube assembly can normally be installed in the receiver by the manufacturer or field serviceman without making any convergence or purity adjustments—saving installation and adjustment costs. The integral tube-component construction provides reliable and stable convergence, purity, and white uniformity performance throughout tube life.

Picture Tube Data

Electrical:

Heater:			
Voltage	6.3		V
Current	700		mA
Focusing Method	Electrostatic		
Focus Lens	Bipotential		
Convergence Method	Magnetic (Preset)		
Deflection Method	Magnetic		
Deflection Angles (Approx.):			
Diagonal	110		deg
Horizontal	97		deg
Vertical	78		deg
Direct Interelectrode Capacitance (Approx.):			
Grid No.1 to all other electrodes	11.4		pF
Grid No.3 to all other electrodes	5.6		pF
Green cathode to all other electrodes	7.1		pF
Red or blue cathode to all other electrodes	6.5		pF
Capacitance Between Anode and External Conductive Coating	2500	max.	pF
	2000	min.	pF
Capacitance Between Anode and Metal Hardware	400		pF
Resistance Between Metal Hardware and External Conductive Coating	50	min.	MΩ

Optical:

Faceplate:	
Light transmission at center (approx.)	71%
Surface	Polished
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green)	P22
Type	Selectively absorbent
Persistence	Medium-Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios at center (approx.)	0.826 mm

Printed in U.S.A./5-78
A67-613X

Mechanical:

Tube Dimensions:	
Overall length	400.84 ± 6.35 mm
At mold-match line:	
Diagonal	666.67 ± 2.00 mm
Horizontal	571.78 ± 2.00 mm
Vertical	442.47 ± 2.00 mm
Minimum Screen Dimensions (Projected):	
Diagonal	626.31 mm
Horizontal	527.71 mm
Vertical	395.78 mm
Area	2032 sq cm
Bulb Funnel Designation	JEDEC No.J663C
Bulb Panel Designation	JEDEC No.F667A
Anode Bulb Contact Designation	Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)
Base Designation[a]	JEDEC No.B12-260
Pin Position Alignment	Pin No.1 Aligns Approx. with Anode Bulb Contact
Operating Position,	Anode Bulb Contact Down
Gun Configuration	Horizontal In-Line
Weight (Approx.)	20.5 kg

Implosion Protection

Type ..... Rim Bands and Tension Bands

Maximum and Minimum Ratings, Absolute-Maximum Values[b]

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

Anode Voltage	27.5 20	max. min.	kV kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d]	6.9 5.7	max. min.	V V
Heater-Cathode Voltage:[e]			
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	200	max.	V
Peak value	300	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing electrode) Voltage	16.8% to 20% of Anode voltage
Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot	See CUTOFF DESIGN CHART in Figure 3
At cathode voltage of 125 V	345 to 675 V
At cathode voltage of 150 V	435 to 835 V
At cathode voltage of 175 V	530 to 990 V

Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Cutoff	1.50	
Heater Voltage[d]	6.3 V	
Grid-No.3 Current[f]	± 15 μA	
Grid-No.2 Current	± 5 μA	
Grid-No.1 Current	± 5 μA	
To Produce White Light of	6550 K + 7 M.P.C.D. (Illum. D)	9300 K + 27 M.P.C.D.
CIE Coordinates:		
X	0.313	0.281
Y	0.329	0.311
Percentage of total anode current supplied by each beam (average):		
Red	34	23 %
Blue	28	35 %
Green	38	42 %
Ratio of cathode currents:		
Red/blue:		
Minimum	1.05	0.50
Typical	1.22	0.67
Maximum	1.55	0.90
Red/green:		
Minimum	0.75	0.40
Typical	0.88	0.56
Maximum	1.05	0.70
Blue/green:		
Minimum	0.50	0.60
Typical	0.72	0.83
Maximum	0.90	1.00
Raster Centering Displacement, Measured at Center of Screen:		
Horizontal	± 8.0 mm	
Vertical	± 8.0 mm	

Deflection Yoke Data

Horizontal Section:[g]		
Inductance at 1 V rms and 1 kHz	0.28 ± 5%	mH
Resistance at 25° C	0.36 ± 7%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	12.0	A
Stored energy	5.1	mJ
Vertical Section, Including Quadrupole Coil Circuit:[h]		
Inductance at 1 V rms and 1 kHz	3.2 ± 5%	mH
Resistance at 25° C:		
At vertical current = 0 A dc	4.8 ± 10%	Ω
At vertical current = 1.55 A dc	3.9 ± 10%	Ω
Typical operation with edge-to-edge scan at 25 kV:		
Peak-to-peak deflection current	3.1	A
Typical Raster Pincushion Distortion:[i]		
East/west	9.0%	
North/south	8.5%	

Maximum Ratings, Absolute-Maximum Values:[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz For a Maximum Pulse Duration of 12.5 μs	700 max. V
Peak Pulse Voltage Between Horizontal and Vertical or Quadrupole Coils at 15,625 Hz for a Maximum Pulse Duration of 12.5 μs	700 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

a The mating socket assembly with associated circuit board and mounted components must not weigh more than one-half kilogram. 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.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry to 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply voltage be regulated at or slightly below the Typical Design Value with an adequate regulation circuit. Details of this specific circuit should be reviewed with RCA Picture Tube Division. The surge voltage across the heater must be limited to 9.5 volts rms.

e For maximum reliability, the series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm.

f A high internal impedance in the focus circuit can result in a change in the focus voltage with a change in the grid-No.3 leakage current.

g Measured between terminals 5 and 15.

h Measured between terminals 2 and 14 with terminals 1, 11, and 13 connected together. The vertical section of the yoke includes the quadrupole coil circuit with nonlinear elements. Therefore, the vertical deflection circuit should employ suitable circuit techniques such as current feedback to ensure that the small non-linear impedance of the quadrupole coil does not distort the deflection current waveform.

j Typical measured values at a distance 5 times the picture height in accordance with IEC Recommendation — Publication 107-1960 — Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

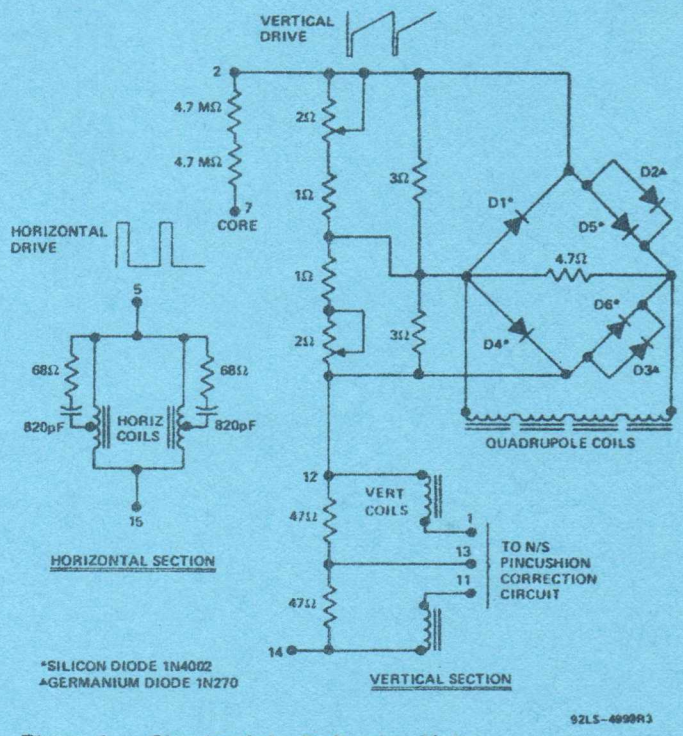


Figure 1 — Circuit of the Deflection Yoke

Basing Specification JEDEC No.13G

Pin 1: Grid No.3
Pin 3: Cathode of Blue Beam
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Beam
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Beam
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

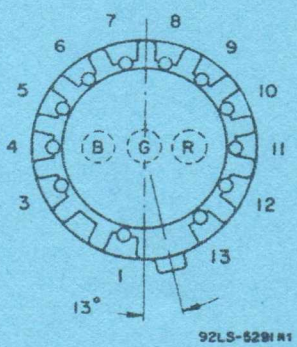


Figure 2 — Bottom View of Base

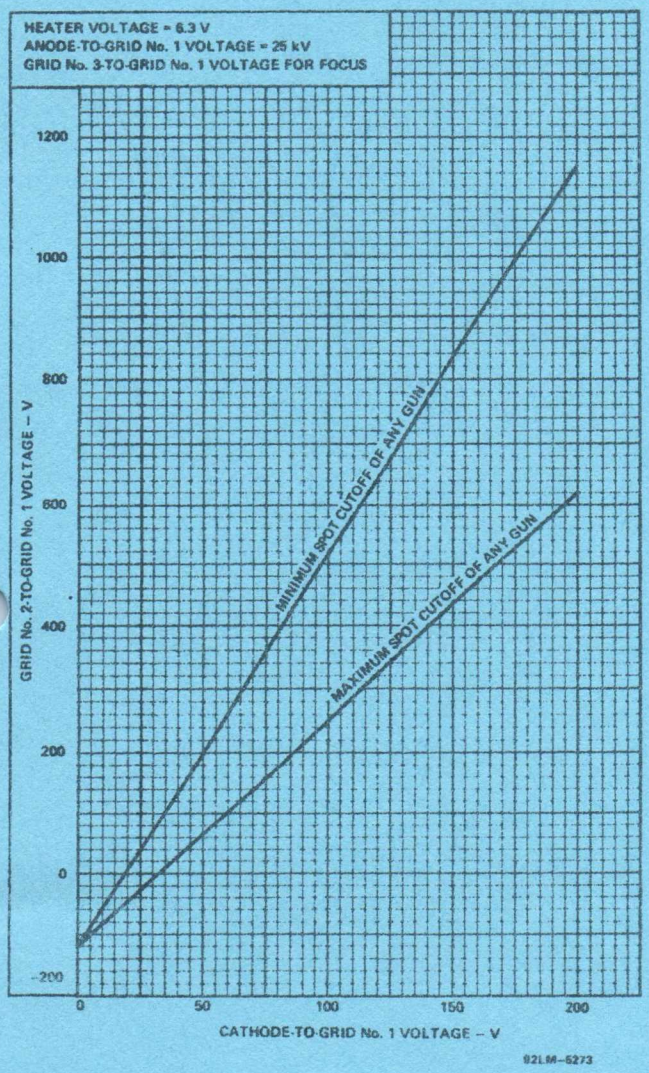


Figure 3 – Cutoff Design Chart

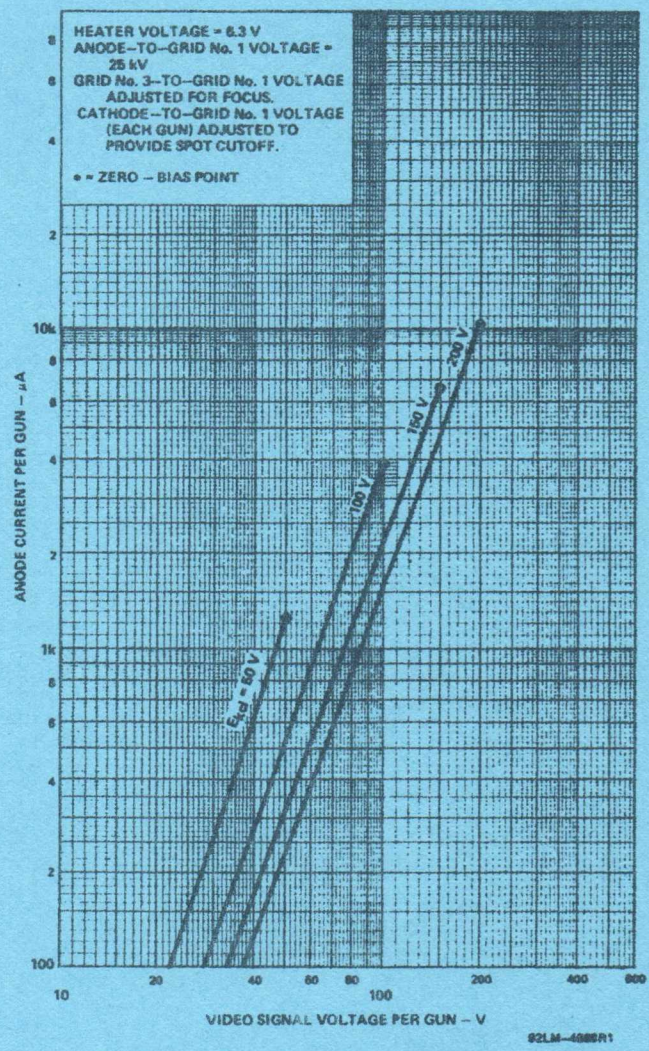


Figure 4 – Typical Drive Characteristics, Cathode-Drive Service

Notes for Dimensional Outline

Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

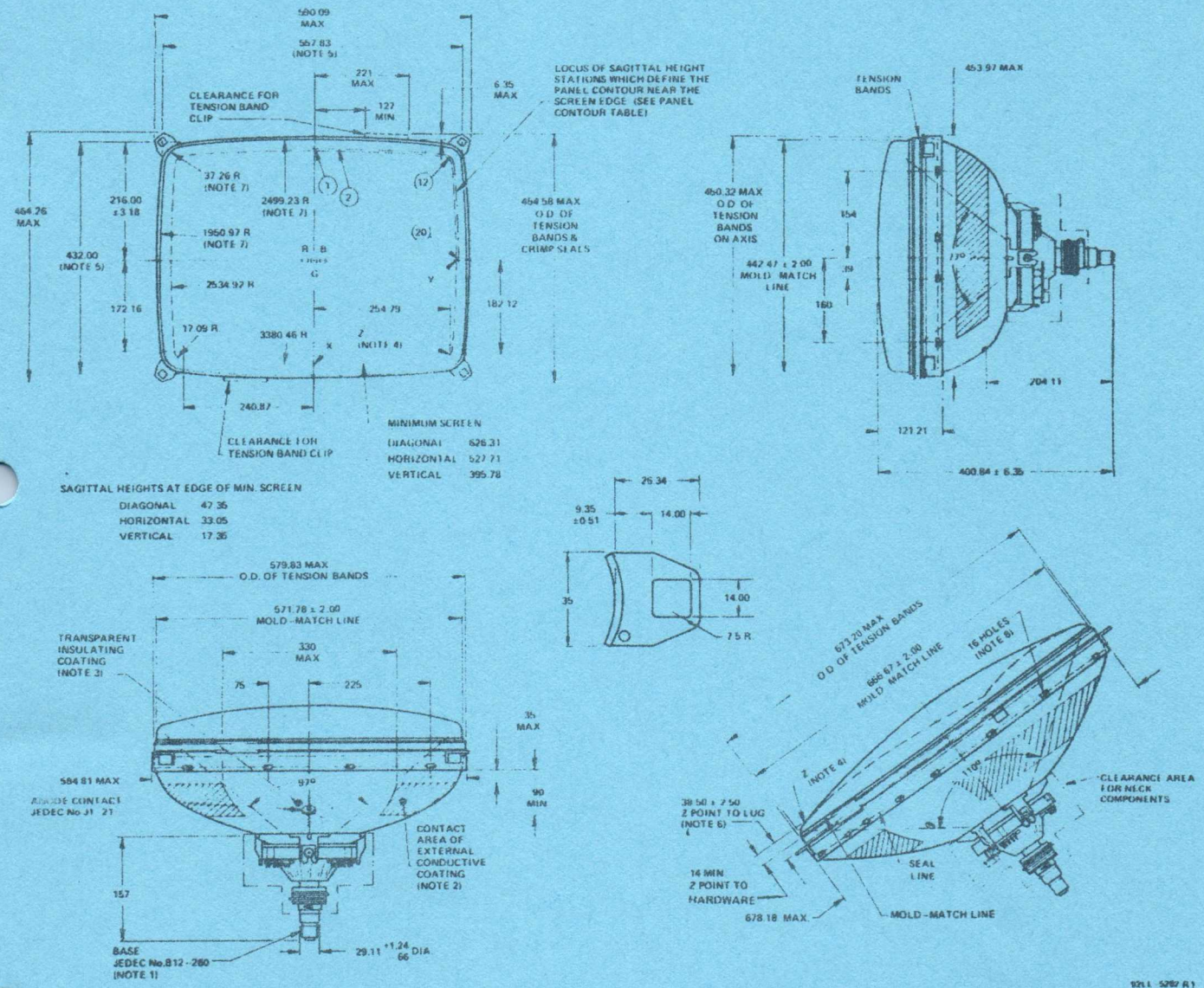
Note 4 – "X", "Y", and "Z" reference points are located on the outside surface of the faceplate at the intersection of the minimum published screen with the minor, major, and diagonal axes, respectively.

Note 5 – The tolerance of the mounting lug holes will accommodate mounting screws up to 9.5 mm in diameter when positioned on the hole centers.

Note 6 – One of four brackets may deviate 2 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 14.73 mm x 5.08 mm.



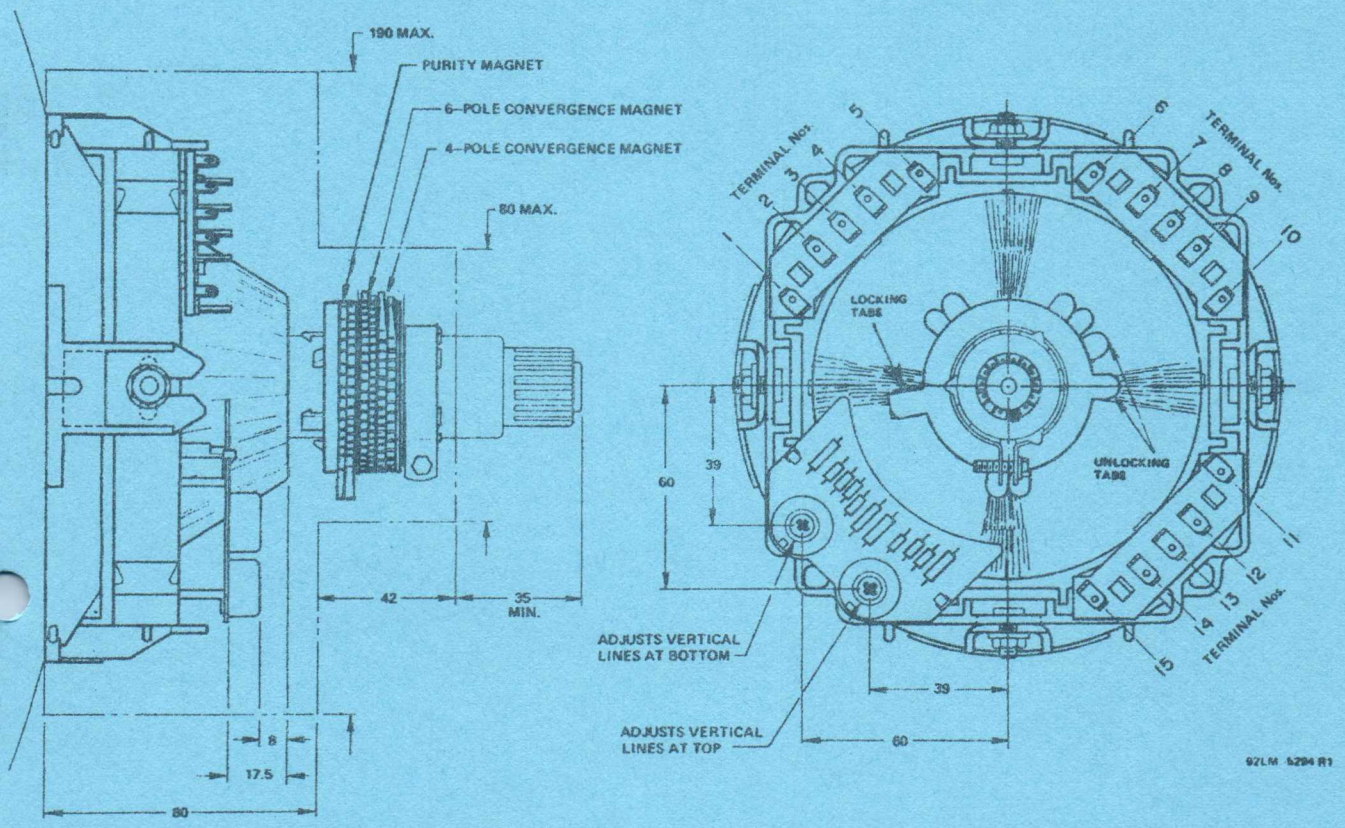
Panel Contour

Sagittal Heights with reference to centerface at Points 3.18 beyond edge of min. screen.

Station No.	Coordinates Y Axis	Coordinates X Axis	Sagittal Height	Station No.	Coordinates Y Axis	Coordinates X Axis	Sagittal Height
1 (Minor)	0	201.07	17.91	11	242.32	192.38	46.10
2	25.40	200.96	18.21	12 (Diagonal)	257.35	183.95	48.34
3	50.80	200.69	19.18	13	261.09	173.53	47.40
4	76.20	200.20	20.73	14	262.46	152.40	44.32
5	101.60	199.54	22.91	15	263.86	127.00	41.15
6	127.00	198.68	25.70	16	265.00	101.60	38.53
7	152.40	197.64	29.11	17	265.89	76.20	36.50
8	177.80	196.39	33.12	18	266.52	50.80	35.05
9	203.20	194.97	37.74	19	266.90	25.40	34.16
10	228.60	193.34	43.00	20 (Major)	267.03	0	33.86

Dimensions in mm unless otherwise noted.

Figure 5 – Dimensional Outline



Term. 1: Pin Correction
Term. 2: Vertical High
Term. 3: IC
Term. 4: IC
Term. 5: Horizontal High
Term. 6: IC
Term. 7: IC
Term. 8: IC
Term. 9: IC
Term. 10: IC
Term. 11: Pin Correction
Term. 12: IC
Term. 13: Pin Correction CT
Term. 14: Vertical Low
Term. 15: Horizontal Low

Figure 6 – Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

Convergence and Purity

The slight correction required for static convergence and color purity in the precision in-line system is supplied by three pairs of permanent magnets in one assembly which is mounted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of approximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished by varying the magnetic strength in the pair of magnets nearest the base to produce a vertical field. The other two pairs of magnets are used for static convergence, a four-pole magnet as shown in **Figure 7** (the pair nearest the base) to move the outside beams equally in opposite directions and a six-pole magnet as shown in **Figure 8** (the middle pair) to move the outside beams equally in the same direction. In both the four-pole and six-pole devices the field in the center is zero so the center beam is unaffected. These devices are used to converge any orientation of the outside beams to the center beam at the center of the screen with substantially no motion of the center beam and without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

Convergence of the three beams over the entire screen is accomplished by (1) positioning of the yoke with respect to the beams and (2) application of vertical-frequency correction current through a quadrupole winding on the yoke. The yoke is adjusted and secured in its optimum position in the tube factory. The quadrupole coils on the yoke are driven by a small circuit included in the vertical section of the deflection yoke. This circuit is internally connected in series with the vertical deflection coils and forms an integral part of the self-convergence system. The two controls provided are adjusted at the same time the mechanical position of the yoke is established. The convergence action of these controls is shown in **Figure 9**. One control adjusts the two outside beams in a horizontal direction to converge the vertical crosshatch lines in the upper half of the raster. The other control performs a similar function in the lower half of the raster. These controls are located in an accessible position, as shown in **Figure 6**, for readjustment in the receiver as required for optimum performance.

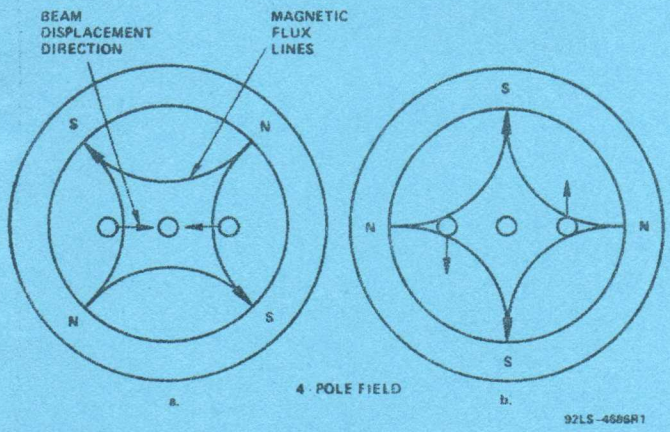


Figure 7 – Beam Motion Produced by the Four-Pole Convergence Magnet

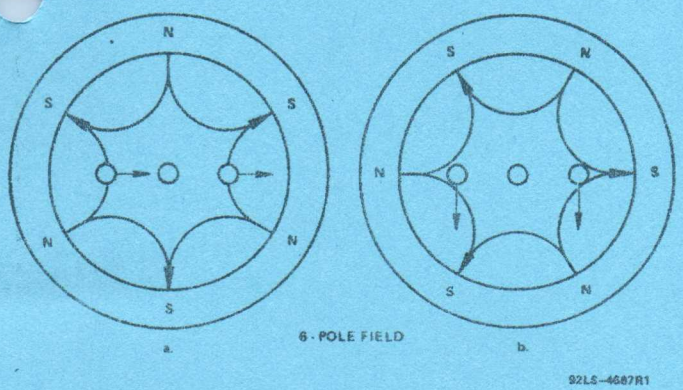


Figure 8 – Beam Motion Produced by the Six-Pole Convergence Magnet

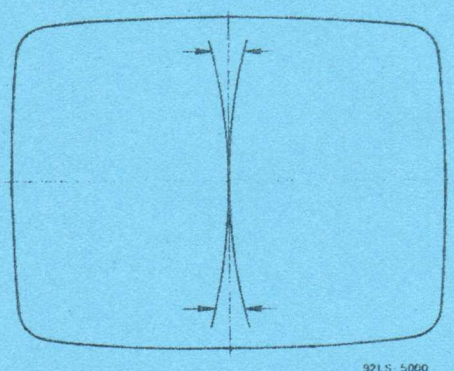
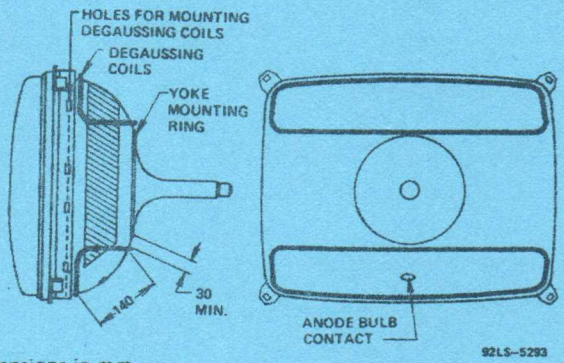


Figure 9 – Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

Magnetic Shield and Degaussing

The A67-613X tube employs an internal magnetic shield and, because of the line screen and its insensitivity to vertical beam register, allows simpler degaussing than the delta gun tubes.



Dimensions in mm

Figure 10 – Relative Placement of Typical Degaussing Coil

Degaussing Coils

The recommended degaussing system for the A67-613X utilizes two series connected coils symmetrically placed as shown in **Figure 10** with one coil on top of the funnel and one located under the funnel. Each coil consists of 200 turns of 0.5 mm wire with a circumference of 1100 to 1200 mm. These are connected to produce a vertical cross axial degaussing field. Rectangular holes are provided in the rim bands to facilitate mounting of the automatic degaussing coils.

Degaussing Circuit

A recommended degaussing circuit as shown in **Figure 11** uses a conventional dual PTC device. For proper degaussing, a minimum value of 1400 peak-to-peak ampere turns (equivalent to an MMF of 350 ampere turns in each coil) is required. It is essential that the degaussing current reduces in a gradual manner to a quiescent level not exceeding 2.0 peak-to-peak ampere turns. For optimum performance the degaussing coils should always be connected to a very low source impedance at the horizontal frequency. If the circuit used does not have an inherent low impedance at the horizontal frequency, the degaussing coil should be shunted with a suitable capacitor. If the addition of a short across the coils increases the horizontal frequency currents in the degaussing coils by more than 20%, the inherent source impedance offered by the PTC and associated circuitry is indicated to be too high to provide satisfactory performance. Therefore a capacitor should be added across the degaussing coil to satisfy this requirement.

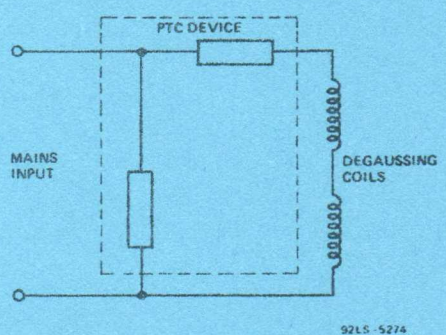


Figure 11 – Typical Degaussing Circuit

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. 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.

WARNING

X-Radiation:

This color picture tube does not emit x-radiation above the internationally accepted isoexposure rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

Implosion Protection:

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a recommended replacement 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 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 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 A67-613X 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 (1 MΩ).

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 of 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.

RCA Picture Tube Division

Color Picture Tube Assembly

A42-163X

90° Deflection - 29 mm Neck - 42 cm Diagonal Precision In-Line Color Picture Tube Assembly

Includes Factory Preset Yoke and Neck Components

- Self-Converging System — Dynamic Convergence Not Required
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type Yoke with Low Impedance — Ideal for Solid-State Deflection Circuits
- Integral Tube Components All Neck Components Included and Preset at Factory — No Setup Adjustments Required Yoke Permanently Affixed to Tube
- Line Screen With Tinted Phosphor — Enchanced Color and Contrast
- Moiré Minimized in 625 TV-Line Systems
- Quick-Heat Cathodes
- Internal Magnetic Shield
- Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs
- Integral Mounting Lugs

AL/197
Annex
- 6

RCA A42-163X is a 90° Color Picture Tube Assembly consisting of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke, and a permanent magnet purity and static convergence device. The picture tube incorporates selectively absorbent phosphors, an internal magnetic shield and quick-heat cathodes. The phosphor is tinted to selectively absorb room light striking it and permit only the phosphor color to be reflected.

The A42-163X features inherent self-convergence and integral tube components which provide optimum performance without dynamic convergence correction. The yoke and other neck components are preassembled on the tube, factory preset for optimum performance, and the yoke is permanently affixed to the tube in that position. The tube assembly can normally be installed by the receiver manufacturer or serviceman in the field without any convergence or purity setup operations — saving picture tube installation and setup costs. Reliable and stable convergence, purity, and white uniformity performance are obtained throughout tube life with the integral tube-component assembly.

The line-focus type PST yoke in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self convergence. The field configuration of this yoke and the geometry of the electron beams produce good convergence performance without dynamic convergence correction. Therefore convergence performance is independent of scan size, scan rate, pincushion correction, line-voltage fluctuations, or circuit changes through aging. Simple permanent-magnet devices are used to accomplish static convergence and purity which are factory preset for optimum performance.

Picture Tube Data

Electrical:

Heater:			
Voltage	6.3		V
Current	700		mA
Focusing Method	Electrostatic		
Focus Lens	Bipotential		
Convergence Method	Magnetic (Preset)		
Deflection Method	Magnetic		
Deflection Angles (Approx.):			
Diagonal	90		deg
Horizontal	78		deg
Vertical	60		deg
Direct Interelectrode Capacitance (Approx.):			
Grid No.1 to all other electrodes	11.4		pF
Grid No.3 to all other electrodes	5.6		pF
Red cathode to all other electrodes	7.1		pF
Green or blue cathode to all other electrodes	6.5		pF
Capacitance Between Anode and External Conductive Coating	1450	max.	pF
	750	min.	pF
Capacitance Between Anode and Metal Hardware (Approx.)	185		pF
Resistance Between Metal Hardware and External Conductive Coating	50	min.	MΩ

Optical:

Faceplate:	
Light transmission at center (Approx.)	74%
Surface	Polished
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green)	P22
Type	Selectively absorbent
Persistence	Medium-Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios (approx.)	0.826 mm

Printed in U.S.A./5-78
A42-163X

Mechanical:

Tube Dimensions:
- Overall length ..... 360.60 ± 6.35 mm
- At mold-match line:
  - Diagonal ..... 417.20 ± 2.00 mm
  - Horizontal ..... 359.00 ± 2.00 mm
  - Vertical ..... 280.19 ± 2.00 mm

Minimum Screen Dimensions (Projected):
- Diagonal ..... 382.30 mm
- Horizontal ..... 322.10 mm
- Vertical ..... 241.58 mm
- Area ..... 755 sq cm

Bulb Funnel Designation ..... JEDEC No.J415D

Bulb Panel Designation ..... JEDEC No.F417A

Anode Bulb Contact Designation ..... Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)

Base Designation[a] ..... JEDEC No.B12-260

Basing Designation ..... JEDEC No.13G

Pin Position Alignment ..... Pin No.1 Aligns Approx. with Anode Bulb Contact

Operating Position ..... Anode Bulb Contact Up

Gun Configuration ..... Horizontal In-Line

Weight (Approx.) ..... 8.5 kg

Implosion Protection

Type ..... Reinforcing Bars and Tension Band

Maximum and Minimum Ratings, Absolute-Maximum Values[b]:

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

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing Electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d,e]	6.9	max.	V
	5.7	min.	V
Heater-Cathode Voltage:[f]			
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	200	max.	V
Peak value	200	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing Electrode) Voltage ..... 16.8% to 20% of Anode voltage

Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot ..... See CUTOFF DESIGN CHART in Figure 2
- At cathode voltage of 75 V ..... 165 to 360 V
- At cathode voltage of 125 V ..... 335 to 670 V
- At cathode voltage of 175 V ..... 510 to 975 V

Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Cutoff 1.5

Heater Voltage[d,e] ..... 6.3 V

Grid-No.3 Current[g] ..... ± 15 μA

Grid-No.2 Current ..... ± 5 μA

Grid-No.1 Current ..... ± 5 μA

To Produce White Light of	6550 K + 7 M.P.C.D. (Illum. D)	9300 K + 27 M.P.C.D.	
CIE coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:
- Horizontal ..... ± 8.0 mm
- Vertical ..... ± 8.0 mm

Deflection Yoke Data

Electrical:

Horizontal Deflection Coils:
- Parallel-connected:
  - Inductance at 1 V rms and 1 kHz ..... 0.158 ± 5% mH
  - Resistance at 25° C ..... 0.40 ± 7% Ω
  - Peak-to-peak deflection current at 25 kV edge-to-edge scan, typical ..... 11.8 A
- Series-connected:
  - Inductance at 1 V rms and 1 kHz ..... 0.632 ± 5% mH
  - Resistance at 25° C ..... 1.60 ± 7% Ω
  - Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical ..... 5.9 A

Vertical Deflection Coils, Series-Connected:
- Inductance at 1 V rms and 1 kHz ..... 1.15 ± 5% mH
- Resistance at 25° C, coils only ..... 2.22 ± 7% Ω
- Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical ..... 3.5 A

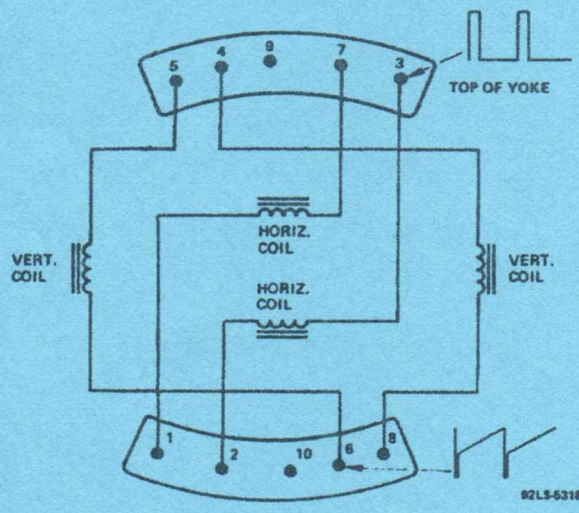
Typical Raster Pincushion Distortion:[h]
- East/west 4.0%
- North/south 2.8%

Maximum Ratings, Absolute-Maximum Values:[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μs ..... 700 max. V

Peak Pulse Voltage Between Horizontal and Vertical Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μs ..... 625 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded. For series operation it is recommended that the horizontal deflection coils be driven electrically balanced with respect to the vertical deflection coils.



Note 1 – For completion of the vertical circuit in series operation, connect a jumper between terminals 5 and 8.

Note 2 – For parallel operation of the horizontal windings, connect jumpers between terminals 1 and 2 and between terminals 3 and 7.

Note 3 – For series operation of the horizontal windings, connect a jumper between terminals 2 and 7.

Note 4 – Terminal 10 has an internal connection – Do Not Use.

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

a The mating socket assembly with associated circuit board and mounted components must not weigh more than one-half kilogram. 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.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry of 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply voltage be regulated at or slightly below the Typical Design Value with an adequate regulation circuit. Details of this specific circuit should be reviewed with RCA Picture Tube Division. The surge voltage across the heater must be limited to 9.5 volts rms.

e Although the tube incorporates a "quick heat" design, a faster turn-on can be accomplished with "instant on" operation. If "instant on" operation is utilized, the Absolute-Maximum heater voltage under standby conditions is 5.5 volts. The Typical Design heater voltages for "instant on" operation are: 6.0 volts under operating conditions and 5.0 volts under standby conditions. All other voltages normally applied to the tube must be removed during standby operation.

f For maximum reliability, the series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm.

g A high internal impedance in the focus circuit can result in a change in the focus voltage with a change in the grid-No.3 leakage current.

h Typical measured values at a distance 5 times the picture height in accordance with IEC Recommendation – Publication 107-1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

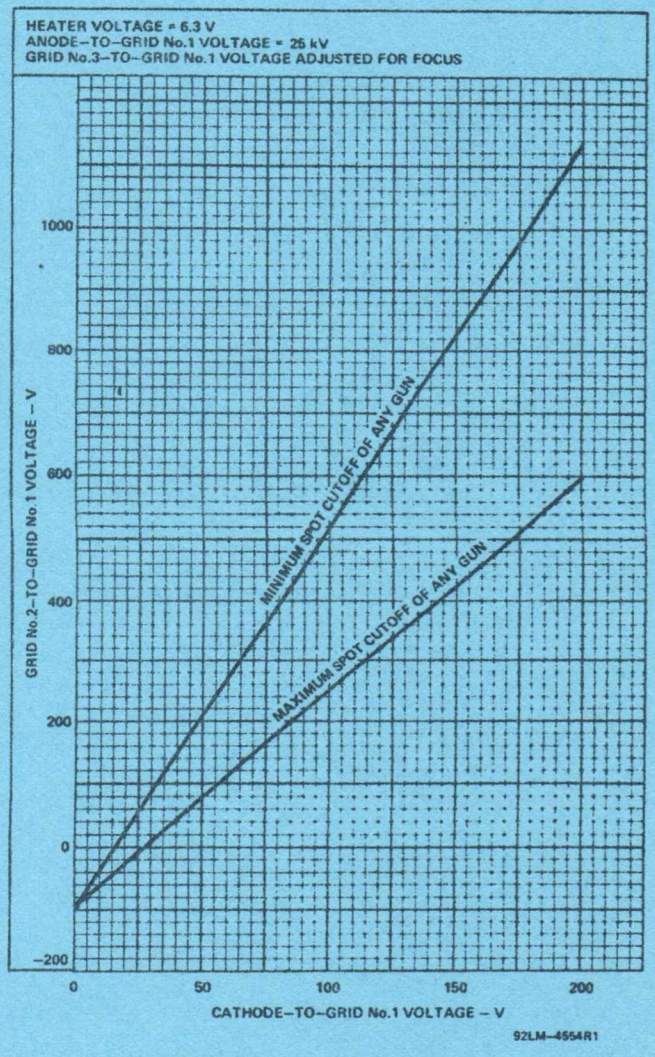
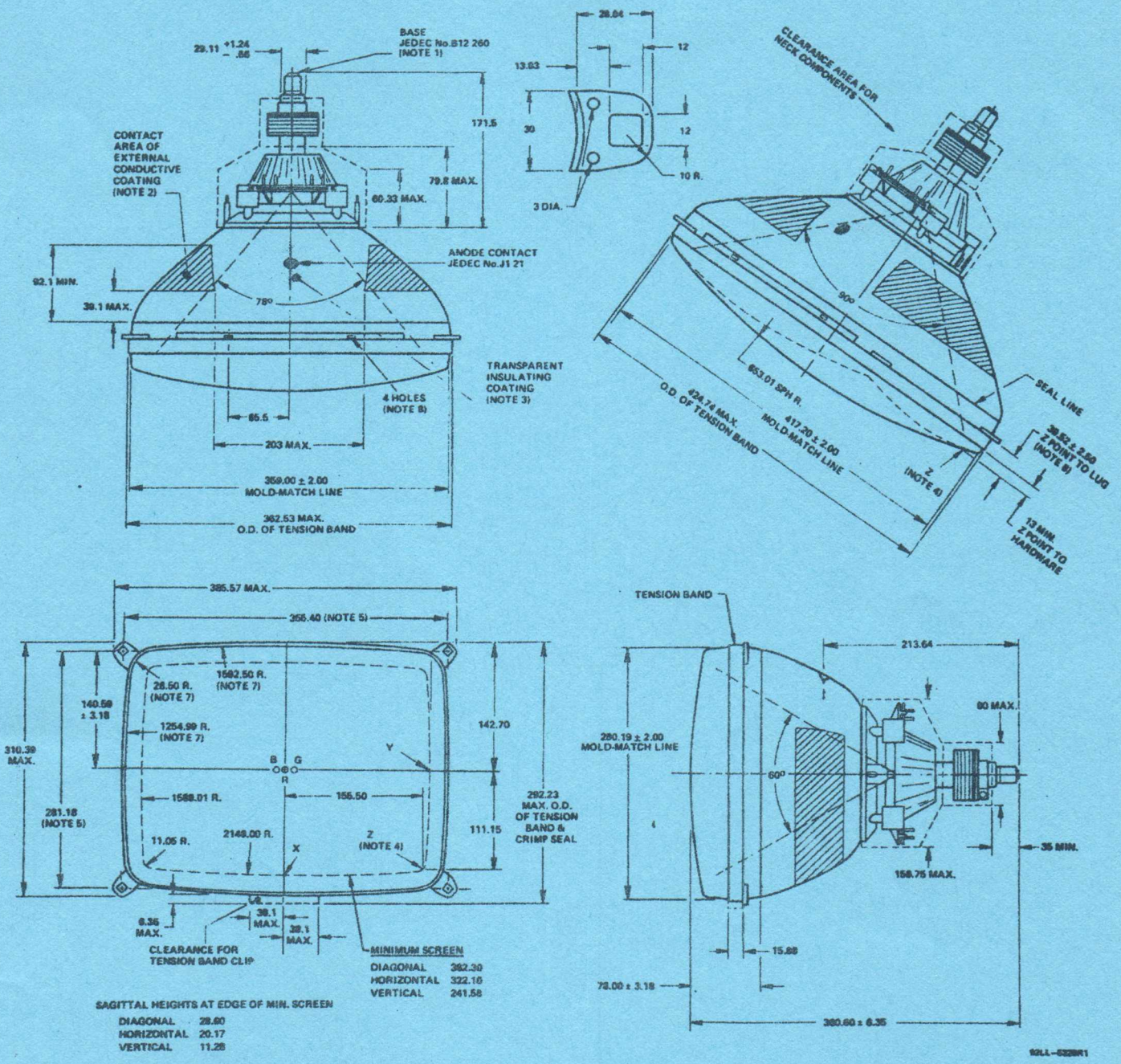


Figure 2 – Cutoff Design Chart



Dimensions in mm unless otherwise noted

Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

Figure 3 – Dimensional Outline

Note 4 – "X", "Y", and "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 positioned on the hole centers.

Note 6 – One of four brackets may deviate 2 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 24 mm x 2.5 mm.

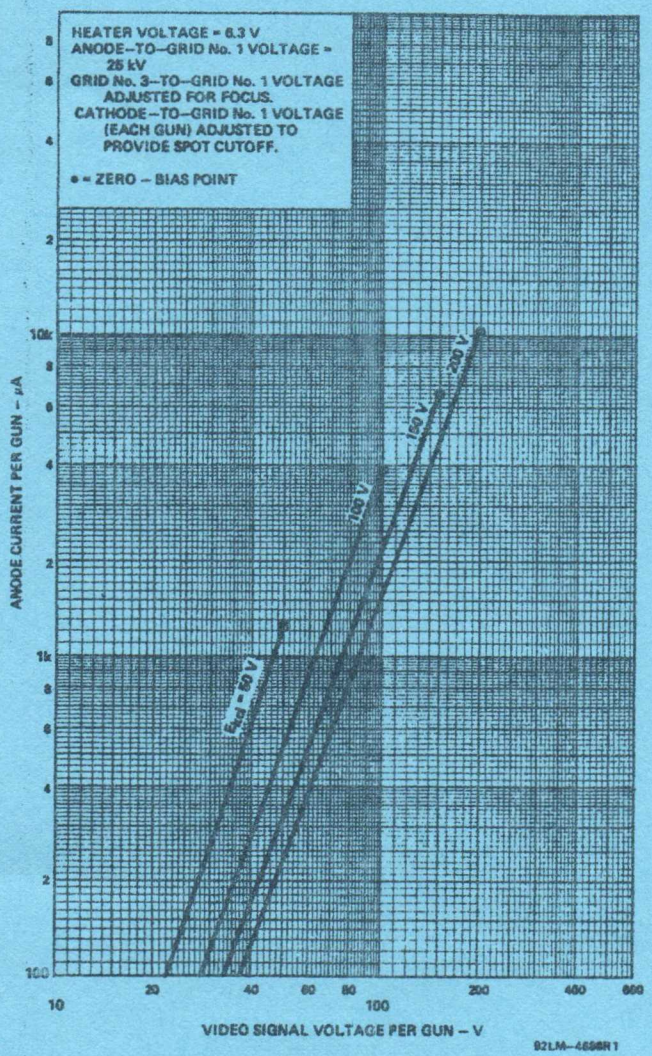


Figure 4 — Typical Drive Characteristics, Cathode-Drive Service

Basing Specification JEDEC No.13G

Pin 1: Grid No.3
Pin 3: Cathode of Blue Beam
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Beam
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Beam
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

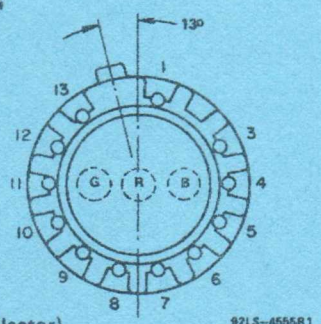


Figure 5 — Bottom View of Base

Convergence and Purity

The slight correction required for static convergence and color purity in the precision in-line system is supplied by three pairs of permanent magnets in one assembly which is mounted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of approximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished by varying the magnetic strength in the pair of magnets nearest the yoke to produce a vertical field. The other two pairs of magnets are used for static convergence, a four-pole magnet as shown in **Figure 6** (the pair nearest the base) to move the outside beams equally in opposite directions and a six-pole magnet as shown in **Figure 7** (the middle pair) to move the outside beams equally in the same direction. In both the four-pole and six-pole devices the field in the center is zero so the center beam is unaffected. These devices are used to converge any orientation of the outside beams to the center beam at the center of the screen with substantially no motion of the center beam and

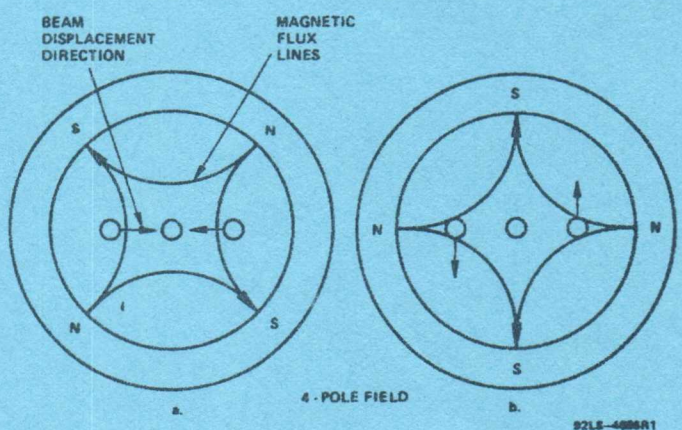


Figure 6 — Beam Motion Produced by the Four-Pole Convergence Magnet

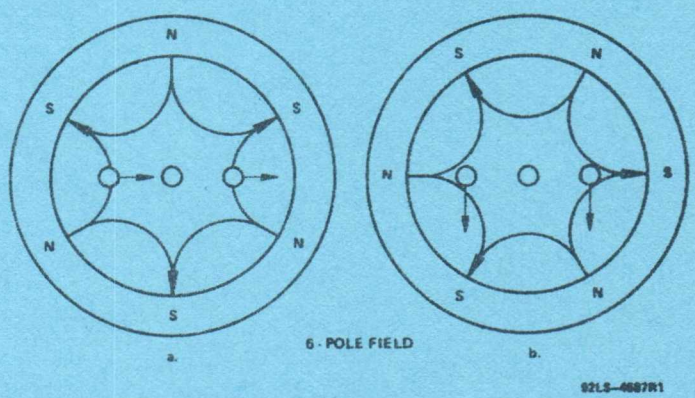


Figure 7 — Beam Motion Produced by the Six-Pole Convergence Magnet

without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

Convergence of the three beams over the entire screen is accomplished by positioning of the yoke with respect to the beams. The yoke is adjusted and secured in its optimum position in the tube factory.

Magnetic Shield and Degaussing

The A42-163X incorporates an internal magnetic shield; however, it must be operated with external degaussing straps. The internal magnetic shield together with the prescribed external degaussing straps provide good shielding from the earth's magnetic field. The internal shield and external straps have the further advantage of shielding much of the tube from the line-rate AC fields found in many solid-state receivers.

In order to be effective, the picture tube and the external straps should be thoroughly degaussed in the presence of the vertical component of the earth's magnetic field. This initial degaussing should be performed with the tube mounted in the TV receiver. The treatment will correct for localized areas of misregister resulting from magnetization of the metal shield and tube parts. The vertical component of the earth's field is essentially constant with any receiver's orientation and the degaussing will also compensate for this field.

After the initial degaussing, automatic degaussing may be accomplished. A suggested automatic degaussing system is described which will develop an adequate degaussing field strength to assure good performance; this system also provides optimum degaussing with a coil having greatly reduced copper wire content.

The degaussing system has been designed to include two internal magnetic shield parts and two external degaussing straps with coils to complete the magnetic circuit of the system. The internal magnetic shield is not adequate for shielding from the earth's magnetic field without the external degaussing straps to complete the magnetic circuit. These must be used together to achieve satisfactory shielding performance.

External Degaussing Straps

Figures 8 and **9** show the details of the required external straps. These straps must be made within the dimensions shown. Deviations from the recommended dimensions may cause inadequate degaussing action, improper shielding and/or a variation in yoke loading that can affect beam landing and convergence. Holes may be added to the straps at the user's convenience to accommodate springs and terminals for the purpose of fastening them to the tube and/or for grounding the external coating of the tube.

Degaussing Coils

The degaussing coils are made by winding 150 turns of 0.3 mm diameter wire in the shape required to fit over the narrow end of the strap part as shown in **Figure 10**. The two pieces, one right hand and one left hand are assembled through the coil from opposite sides of the coil and fastened by at least one rivet. The coil is now held in the cutout section formed by the two assembled pieces of the strap. Two such assemblies are required for each tube and when mounted on the tube, the two coils should be connected in series to produce a vertical cross-axial degaussing field. When properly connected, the instantaneous polarity of the magnetic field at the top of both strap assemblies is the same. Likewise, the polarity at the bottom of both straps should be the same but opposite from that at the top. The resistance of each of the coils is approximately 8.6 ohms. Insulation must be adequate to prevent the degaussing circuit from shorting to the straps. The intent is to provide a minimum of 1800 peak-to-peak ampere-turns in each coil so as to have a minimum of 3600 peak-to-peak ampere-turns available with the two coils on the two strap assemblies. Variations in wire size, and turns can be optimized to match the receiver circuit.

Mounting of the Degaussing Straps

A suggested mounting system is shown in **Figure 11** using plastic cable ties to attach the strap assemblies. To use this method, holes should be provided in the ends of the degaussing straps. Mating holes are provided in the implosion protection hardware of the tube to complete the assembly. The use of the plastic ties will maintain the insulation integrity of the tube mounting hardware relative to the picture tube external coating and degaussing straps. Even though most of the tube's external conductive coating area is in contact with the degaussing straps, it is recommended that some type of contact fingers be fastened to the under-side of the strap assemblies to assure positive contact with the coating.

Automatic Integral Degaussing Circuit

A recommended "off-the-line" automatic integral degaussing circuit, shown in **Figure 12**, using a conventional dual PTC device will provide the necessary 12 amperes peak-to-peak degaussing current and reduce the residual current to the required 3 mA peak-to-peak. The low value of residual current is required because of the high efficiency of the degaussing system. For optimum performance the degaussing coils should always be connected to a very low source impedance at the horizontal frequency. If the circuit used does not have an inherent low impedance at the horizontal frequency, the degaussing coil should be shunted with a suitable capacitor. If the addition of a short across the coils increases the horizontal frequency currents in the

degaussing coils by more than 20%, the inherent source impedance offered by the PTC and associated circuitry is indicated to be too high to provide satisfactory performance. Therefore a capacitor should be added across the degaussing coil to satisfy this requirement.

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. 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.

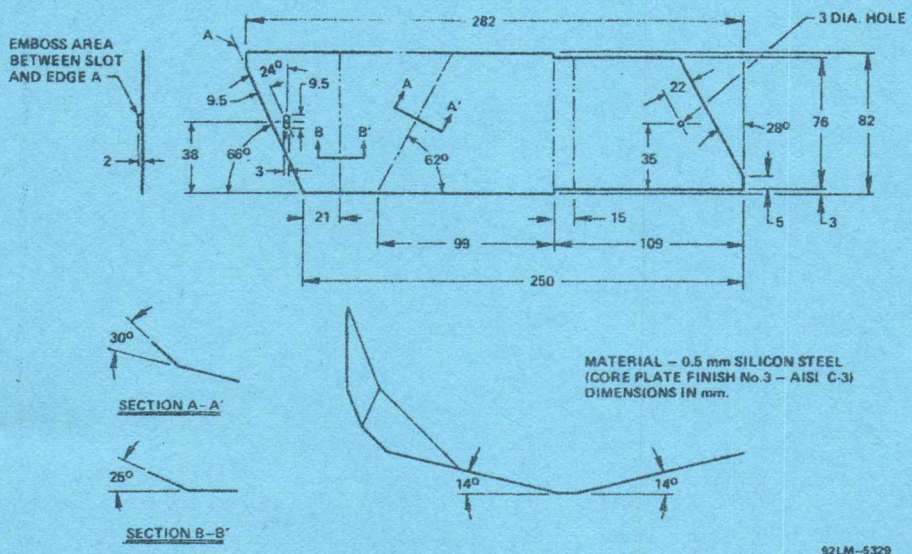


Figure 8 – Degaussing Strap (Left-Hand Side)

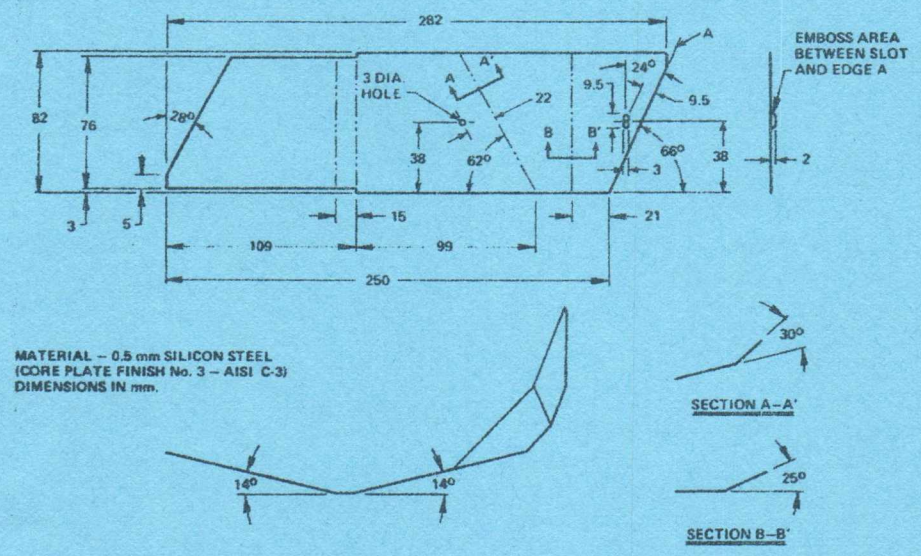
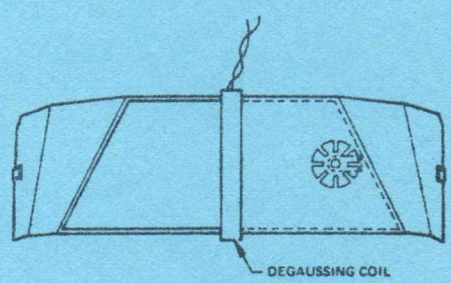


Figure 9 – Degaussing Strap (Right-Hand Side)



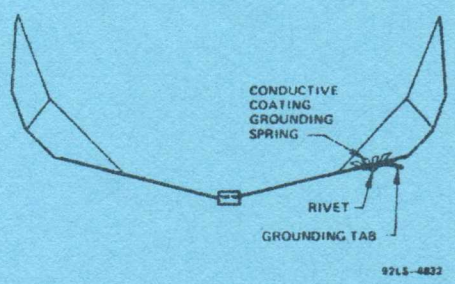
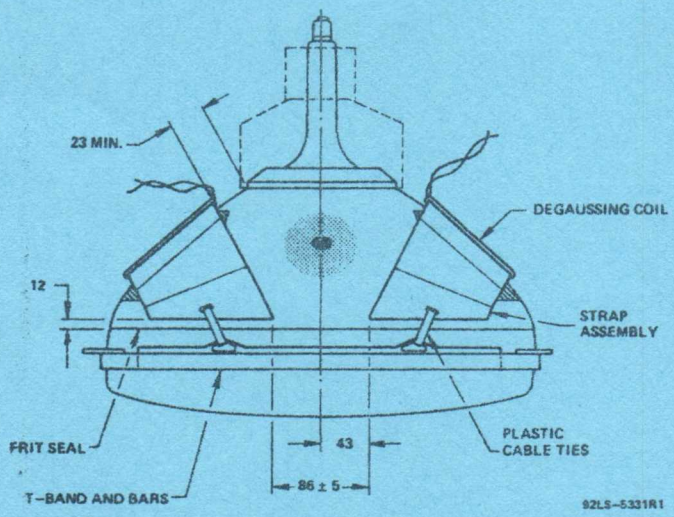


Figure 10 – Degaussing Strap Assembly



Dimensions in mm.

Figure 11 – Degaussing Straps Mounted on an RCA-A42-163X

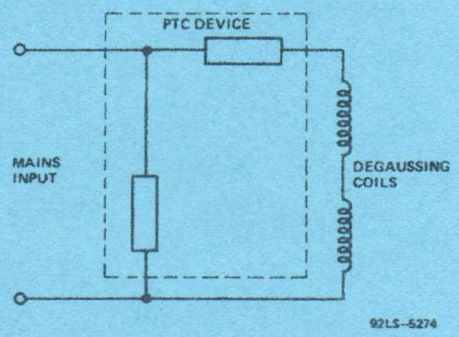


Figure 12 – Recommended Degaussing Circuit

WARNING

X-Radiation

This color picture tube does not emit x-radiation above the internationally accepted isoexposure rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

Implosion Protection

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a recommended replacement 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 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 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 A42-163X 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 (1 MΩ).

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 of 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.

RCA Picture Tube Division

Color Picture Tube Assembly

A51-163X

90° Deflection - 29 mm Neck - 51 cm Diagonal Precision In-Line Color Picture Tube Assembly

Includes Factory Preset Yoke and Neck Components

- **Self-Converging System — Dynamic Convergence Not Required**
- **Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids**
- **PST (Precision Static Toroid) Yoke — Precision Wound, Line-Focus Type Yoke with Low Impedance — Ideal for Solid-State Deflection Circuits**
- **Integral Tube Components All Neck Components Included and Preset at Factory — No Setup Adjustments Required Yoke Permanently Affixed to Tube**
- **Line Screen With Tinted Phosphor — Enhanced Color and Contrast**
- **Moiré Minimized in 625 TV-Line Systems**
- **Internal Magnetic Shield**
- **Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs**
- **Integral Mounting Lugs**

RCA A51-163X is a 90° Color Picture Tube Assembly consisting of a precision in-line color picture tube, a Precision Static Toroid (PST) self-converging yoke, and a permanent magnet purity and static convergence device. The picture tube incorporates selectively absorbent phosphors, and an internal magnetic shield. The phosphor is tinted to selectively absorb room light striking it and permit only the phosphor color to be reflected.

The A51-163X features inherent self-convergence and integral tube components which provide optimum performance without dynamic convergence correction. The yoke and other neck components are preassembled on the tube, factory preset for optimum performance, and the yoke is permanently affixed to the tube in that position. The tube assembly can normally be installed by the receiver manufacturer or serviceman in the field without any convergence or purity setup operations — saving picture tube installation and setup costs. Reliable and stable convergence, purity, and white uniformity performance are obtained throughout tube life with the integral tube-component assembly.

The line-focus type PST yoke in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self convergence. The field configuration of this yoke and the geometry of the electron beams produce good convergence performance without dynamic convergence correction. Therefore convergence performance is independent of scan size, scan rate, pincushion correction, line-voltage fluctuations, or circuit changes through aging. Simple permanent-magnet devices are used to accomplish static convergence and purity which are factory preset for optimum performance.

Picture Tube Data

Electrical:

Heater:			
Voltage	6.3		V
Current	900		mA
Focusing Method	Electrostatic		
Focus Lens	Bipotential		
Convergence Method	Magnetic (Preset)		
Deflection Method	Magnetic		
Deflection Angles (Approx.):			
Diagonal	90		deg
Horizontal	78		deg
Vertical	60		deg
Direct Interelectrode Capacitance (Approx.):			
Grid No.1 to all other electrodes	11.4		pF
Grid No.3 to all other electrodes	5.6		pF
Green cathode to all other electrodes	7.1		pF
Red or blue cathode to all other electrodes	6.5		pF
Capacitance Between Anode and External Conductive Coating	2300	max.	pF
	1300	min.	pF
Capacitance Between Anode and Metal Hardware (Approx.)	250		pF
Resistance Between Metal Hardware and External Conductive Coating	50	min.	MΩ

Optical:

Faceplate:	
Light transmission at center (approx.)	72.5%
Surface	Polished
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green)	P22
Type	Selectively absorbent
Persistence	Medium-Short
Array	Vertical Line Trios
Spacing between corresponding points on line trios (approx.)	0.826 mm

Printed in U.S.A./5-78
A51-163X

Mechanical:

Tube Dimensions:
- Overall length ..... 416.99 ± 6.35 mm
- At mold-match line:
  - Diagonal ..... 513.46 ± 2.00 mm
  - Horizontal ..... 440.46 ± 2.00 mm
  - Vertical ..... 341.76 ± 2.00 mm

Minimum Screen Dimensions (Projected):
- Diagonal ..... 479.98 mm
- Horizontal ..... 404.42 mm
- Vertical ..... 303.30 mm
- Area ..... 1194 sq cm

Bulb Funnel Designation ..... JEDEC No.J510D

Bulb Panel Designation ..... JEDEC No.F513A

Anode Bulb Contact Designation ..... Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)

Base Designation[a] ..... JEDEC No.B12-260

Basing Designation ..... JEDEC No.13G

Pin Position Alignment ..... Pin No.1 Aligns Approx. with Anode Bulb Contact

Operating Position ..... Anode Bulb Contact Up

Gun Configuration ..... Horizontal In-Line

Weight (Approx.) ..... 12.9 kg

Implosion Protection

Type ..... Reinforcing Bars and Tension Band

Maximum and Minimum Ratings, Absolute-Maximum Values[b]

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

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing Electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d]	6.9	max.	V
	5.7	min.	V
Heater-Cathode Voltage:[e]			
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	200	max.	V
Peak value	200	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing Electrode) Voltage ..... 16.8% to 20% of Anode voltage

Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot ..... See CUTOFF DESIGN CHART in Figure 2
- At cathode voltage of 75 V ..... 165 to 360 V
- At cathode voltage of 125 V ..... 335 to 670 V
- At cathode voltage of 175 V ..... 510 to 975 V

Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Cutoff 1.5

Heater Voltage[d] ..... 6.3 V

Grid-No.3 Current[f] ..... ± 15 μA

Grid-No.2 Current ..... ± 5 μA

Grid-No.1 Current ..... ± 5 μA

To Produce White Light of	6550 K + 7 M.P.C.D. (Illum. D)	9300 K + 27 M.P.C.D.	
CIE coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:
- Horizontal ..... ± 8.0 mm
- Vertical ..... ± 8.0 mm

Deflection Yoke Data

Electrical:

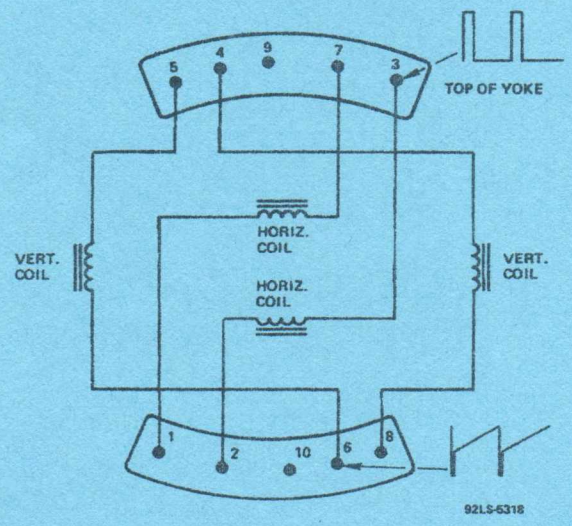
Horizontal Deflection Coils:		
Parallel-connected:		
Inductance at 1 V rms and 1 kHz	0.166 ± 5%	mH
Resistance at 25° C	0.363 ± 7%	Ω
Peak-to-peak deflection current at 25 kV edge-to-edge scan, typical	11.8	V
Series-connected:		
Inductance at 1 V rms and 1 kHz	0.664 ± 5%	mH
Resistance at 25° C	1.452 ± 7%	Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	5.9	A
Vertical Deflection Coils, Series-Connected:		
Inductance at 1 V rms and 1 kHz	1.14 ± 5%	mH
Resistance at 25° C, coils only	1.87 ± 7%	Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	3.6	A
Typical Raster Pincushion Distortion:[g]		
East/west	4.2%	
North/south	3.5%	

Maximum Ratings, Absolute-Maximum Values[b]

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μs ..... 700 max. V

Peak Pulse Voltage Between Horizontal and Vertical Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μs ..... 625 max. V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded. For series operation it is recommended that the horizontal deflection coils be driven electrically balanced with respect to the vertical deflection coils.



Note 1 — For completion of the vertical circuit in series operation, connect a jumper between terminals 5 and 8.

Note 2 — For parallel operation of the horizontal windings, connect jumpers between terminals 1 and 2 and between terminals 3 and 7.

Note 3 — For series operation of the horizontal windings, connect a jumper between terminals 2 and 7.

Note 4 — Terminal 10 has an internal connection — Do Not Use.

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

---

a The mating socket assembly with associated circuit board and mounted components must not weigh more than one-half kilogram. 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.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry of 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply voltage be regulated at or slightly below the Typical Design Value with an adequate regulation circuit. Details of this specific circuit should be reviewed with RCA Picture Tube Division. The surge voltage across the heater must be limited to 9.5 volts rms.

e For maximum reliability, the series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm.

f A high internal impedance in the focus circuit can result in a change in the focus voltage with a change in the grid-No.3 leakage current.

g Typical measured values at a distance 5 times the picture height in accordance with IEC Recommendation — Publication 107-1960 — Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

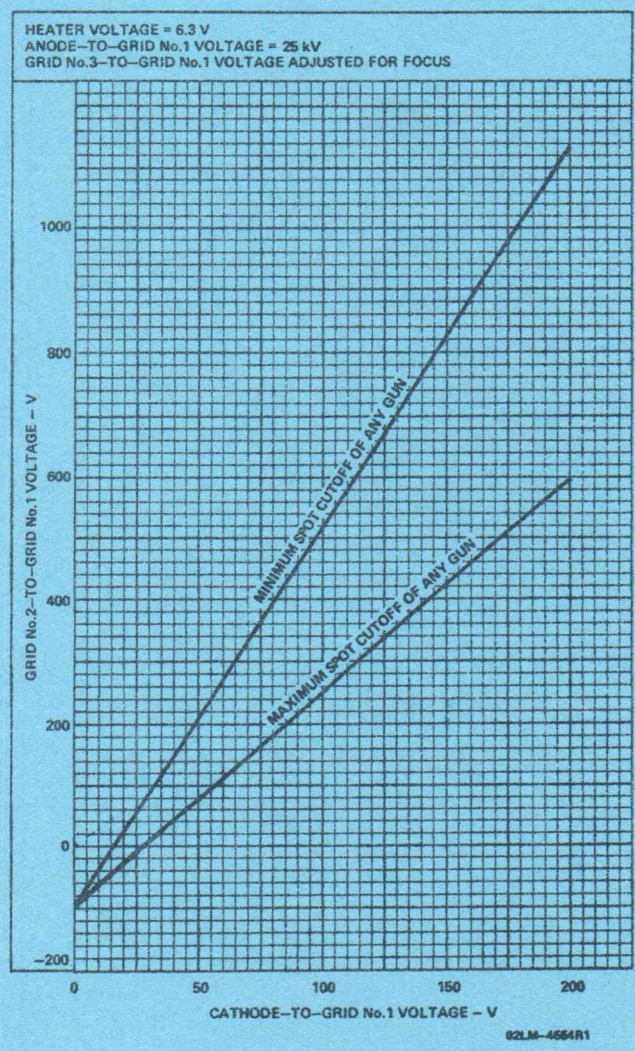
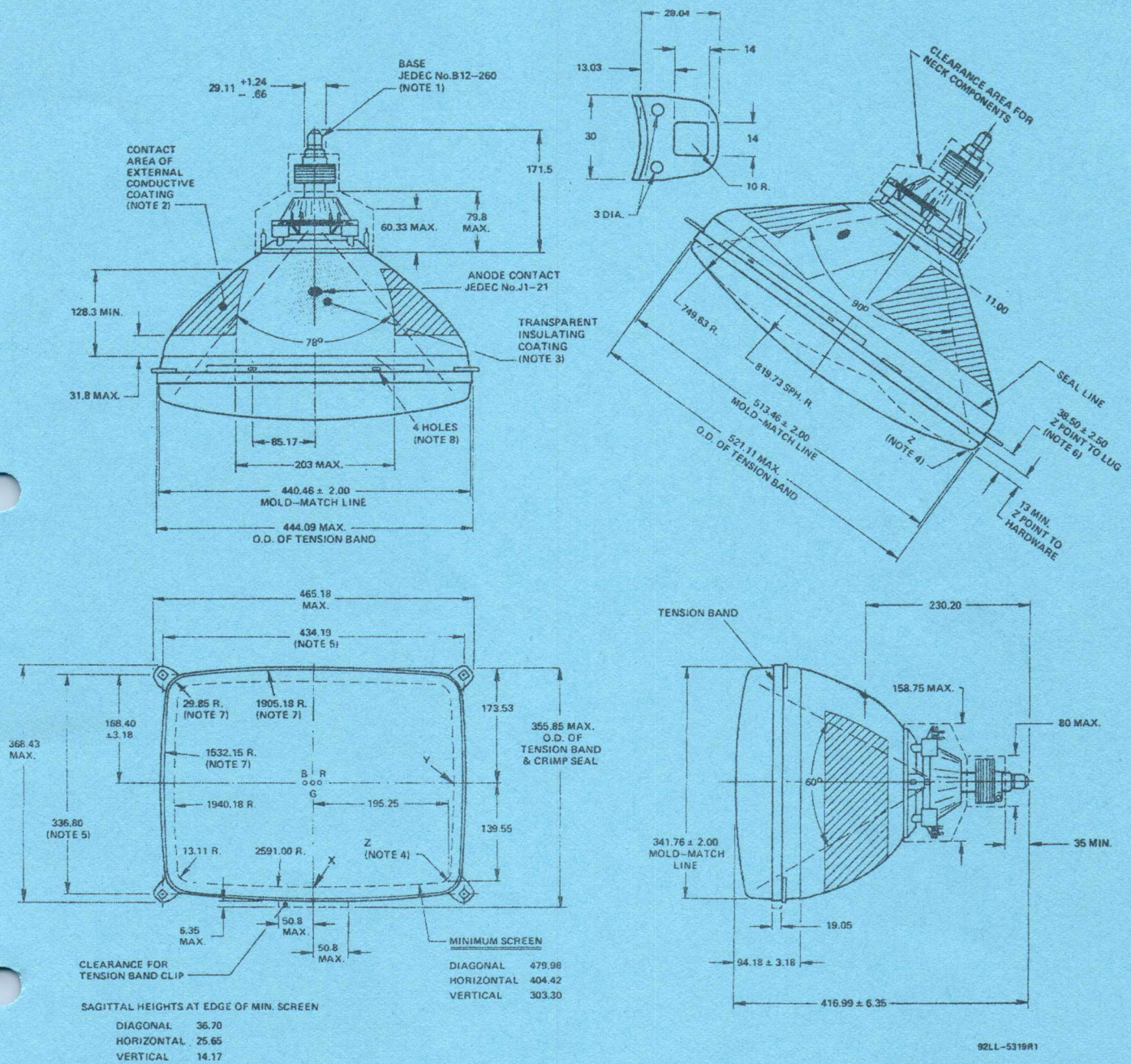


Figure 2 — Cutoff Design Chart



Dimensions in mm unless otherwise noted

Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

Figure 3 – Dimensional Outline

Note 4 – "X", "Y", and "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 positioned on the hole centers.

Note 6 – One of four brackets may deviate 2 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 24 mm x 2.5 mm.

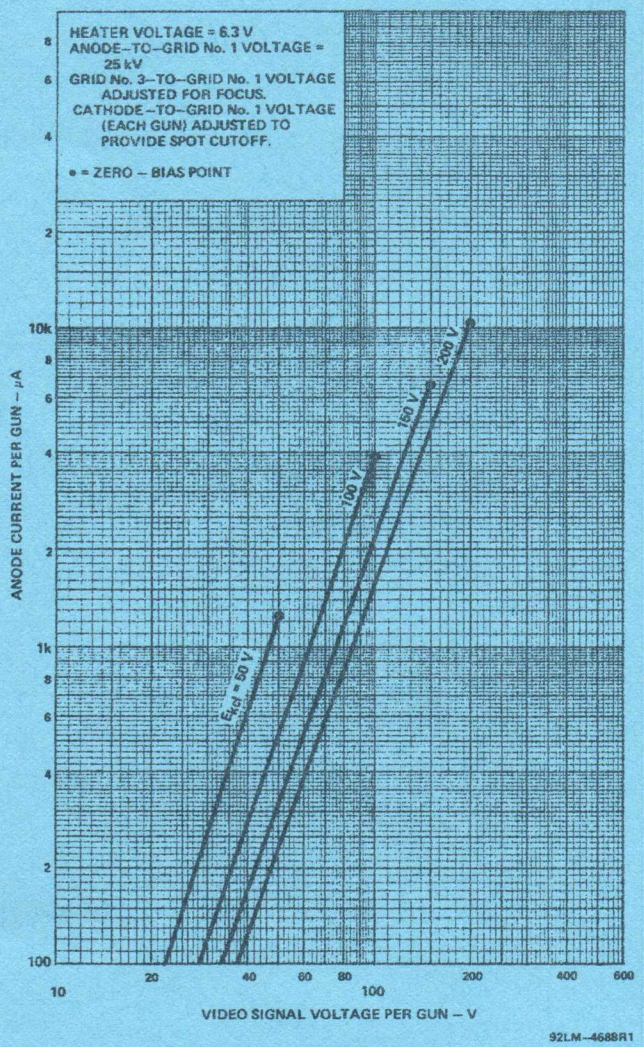


Figure 4 — Typical Drive Characteristics, Cathode-Drive Service

Basing Specification JEDEC No.13G

Pin 1: Grid No.3
Pin 3: Cathode of Blue Beam
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Beam
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Beam
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

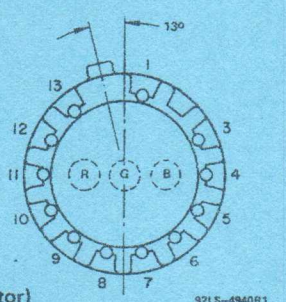


Figure 5 — Bottom View of Base

Convergence and Purity

The slight correction required for static convergence and color purity in the precision in-line system is supplied by three pairs of permanent magnets in one assembly which is mounted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of approximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished by varying the magnetic strength in the pair of magnets nearest the yoke to produce a vertical field. The other two pairs of magnets are used for static convergence, a four-pole magnet as shown in **Figure 6** (the pair nearest the base) to move the outside beams equally in opposite directions and a six-pole magnet as shown in **Figure 7** (the middle pair) to move the outside beams equally in the same direction. In both the four-pole and six-pole devices the field in the center is zero so the center beam is unaffected. These devices are used to converge any orientation of the outside beams to the center beam at the center of the screen with substantially no motion of the center beam and

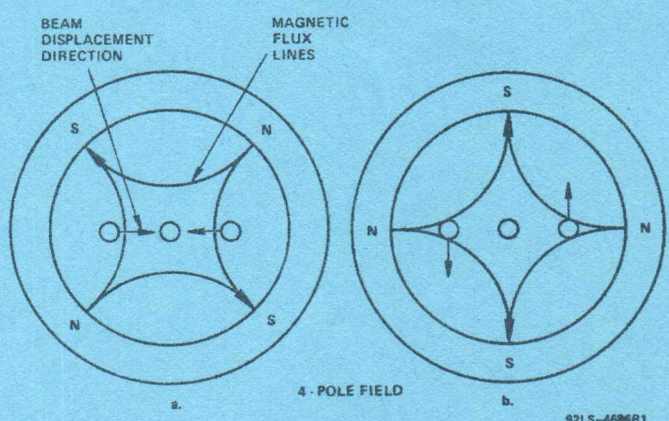


Figure 6 — Beam Motion Produced by the Four-Pole Convergence Magnet

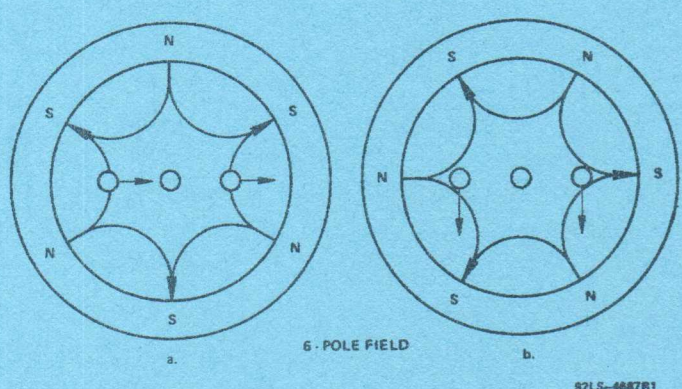


Figure 7 — Beam Motion Produced by the Six-Pole Convergence Magnet

without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

Convergence of the three beams over the entire screen is accomplished by positioning of the yoke with respect to the beams. The yoke is adjusted and secured in its optimum position in the tube factory.

Magnetic Shield and Degaussing

The A51-163X incorporates an internal magnetic shield; however, it must be operated with external degaussing straps. The internal magnetic shield together with the prescribed external degaussing straps provide good shielding from the earth's magnetic field. The internal shield and external straps have the further advantage of shielding much of the tube from the line-rate AC fields found in many solid-state receivers.

In order to be effective, the picture tube and the external straps should be thoroughly degaussed in the presence of the vertical component of the earth's magnetic field. This initial degaussing should be performed with the tube mounted in the TV receiver. The treatment will correct for localized areas of misregister resulting from magnetization of the metal shield and tube parts. The vertical component of the earth's field is essentially constant with any receiver's orientation and the degaussing will also compensate for this field.

After the initial degaussing, automatic degaussing may be accomplished. A suggested automatic degaussing system is described which will develop an adequate degaussing field strength to assure good performance; this system also provides optimum degaussing with a coil having greatly reduced copper wire content.

The degaussing system has been designed to include two internal magnetic shield parts and two external degaussing straps with coils to complete the magnetic circuit of the system. The internal magnetic shield is not adequate for shielding from the earth's magnetic field without the external degaussing straps to complete the magnetic circuit. These must be used together to achieve satisfactory shielding performance.

External Degaussing Straps

Figures 8 and **9** show the details of the required external straps. These straps must be made within the dimensions shown. Deviations from the recommended dimensions may cause inadequate degaussing action, improper shielding and/or a variation in yoke loading that can affect beam landing and convergence. Holes may be added to the straps at the user's convenience to accommodate springs and terminals for the purpose of fastening them to the tube and/or for grounding the external coating of the tube.

Degaussing Coils

The degaussing coils are made by winding 150 turns of 0.3 mm diameter wire in the shape required to fit over the narrow end of the strap part as shown in **Figure 10**. The two pieces, one right hand and one left hand are assembled through the coil from opposite sides of the coil and fastened by at least one rivet. The coil is now held in the cutout section formed by the two assembled pieces of the strap. Two such assemblies are required for each tube and when mounted on the tube, the two coils should be connected in series to produce a vertical cross-axial degaussing field. When properly connected, the instantaneous polarity of the magnetic field at the top of both strap assemblies is the same. Likewise, the polarity at the bottom of both straps should be the same but opposite from that at the top. The resistance of each of the coils is approximately 8.6 ohms. Insulation must be adequate to prevent the degaussing circuit from shorting to the straps. The intent is to provide a minimum of 1800 peak-to-peak ampere-turns in each coil so as to have a minimum of 3600 peak-to-peak ampere-turns available with the two coils on the two strap assemblies. Variations in wire size, and turns can be optimized to match the receiver circuit.

Mounting of the Degaussing Straps

A suggested mounting system is shown in **Figure 11** using plastic cable ties to attach the strap assemblies. To use this method, holes should be provided in the ends of the degaussing straps. Mating holes are provided in the implosion protection hardware of the tube to complete the assembly. The use of the plastic ties will maintain the insulation integrity of the tube mounting hardware relative to the picture tube external coating and degaussing straps. Even though most of the tube's external conductive coating area is in contact with the degaussing straps, it is recommended that some type of contact fingers be fastened to the under-side of the strap assemblies to assure positive contact with the coating.

Automatic Integral Degaussing Circuit

A recommended "off-the-line" automatic integral degaussing circuit, shown in **Figure 12**, using a conventional dual PTC device will provide the necessary 12 amperes peak-to-peak degaussing current and reduce the residual current to the required 3 mA peak-to-peak. The low value of residual current is required because of the high efficiency of the degaussing system. For optimum performance the degaussing coils should always be connected to a very low source impedance at the horizontal frequency. If the circuit used does not have an inherent low impedance at the horizontal frequency, the degaussing coil should be shunted with a suitable capacitor. If the addition of a short across the coils increases the horizontal frequency currents in the

degaussing coils by more than 20%, the inherent source impedance offered by the PTC and associated circuitry is indicated to be too high to provide satisfactory performance. Therefore a capacitor should be added across the degaussing coil to satisfy this requirement.

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. 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.

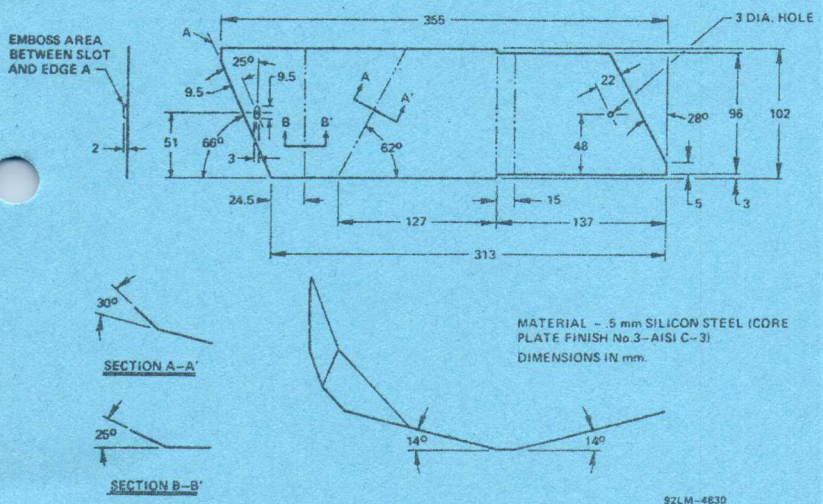


Figure 8 – Degaussing Strap (Left-Hand Side)

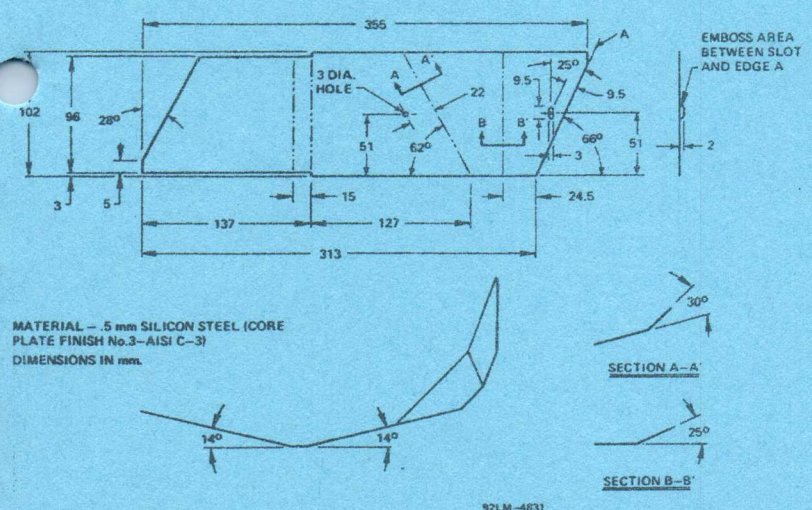
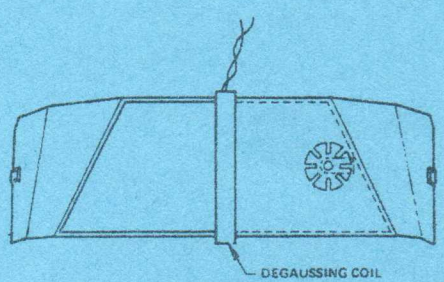


Figure 9 – Degaussing Strap (Right-Hand Side)



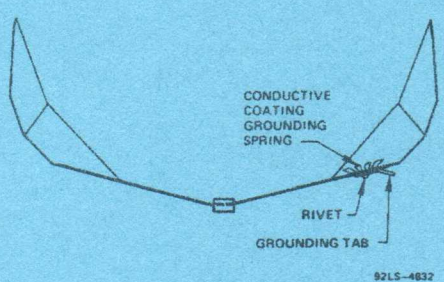
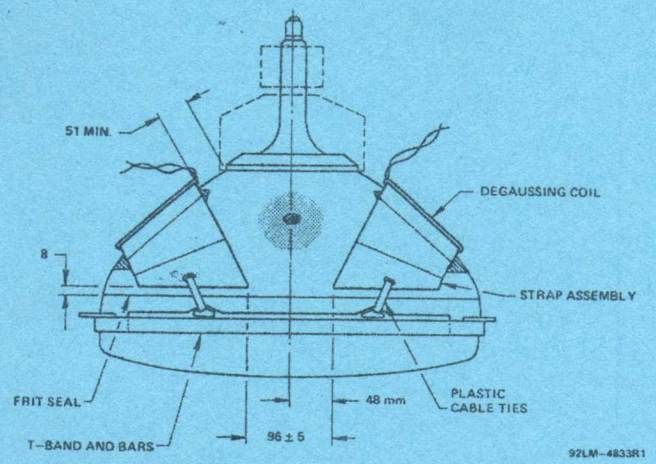


Figure 10 – Degaussing Strap Assembly



Dimenisons in mm

Figure 11 — Degaussing Straps Mounted on an RCA-A51-163X

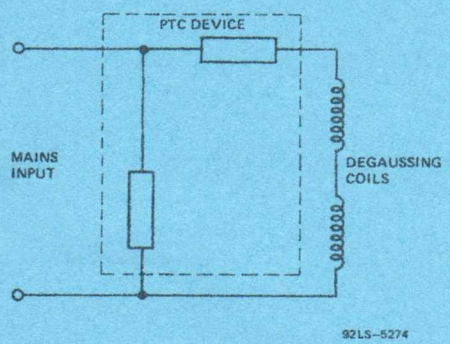


Figure 12 — Recommended Degaussing Circuit

WARNING

X-Radiation

This color picture tube does not emit x-radiation above the internationally accepted isoexposure rate of 0.5 mR/h if it is operated within the Absolute-Maximum Ratings.

Implosion Protection

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or a recommended replacement 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 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 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 A51-163X 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 (1 MΩ).

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 of 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.

90° Precision In-Line HI-LITE MATRIX Color Picture Tube

- Super Arch Mask – Minimizes Thermal Expansion Effects
- Contoured-line Screen -- Smooth Curved Phosphor Lines at Sides of Screen -- Ragged Stair-Step Edge Eliminated
- HI-LITE MATRIX Line Screen – Minimizes Vertical Register Sensitivity Increased Picture Brightness Without Sacrifice of Contrast
- Improved Precision In-Line Electron Gun – Better Focus Performance
- Designed for a Self-Converging ST Yoke System – Reduced Receiver Costs Lower Deflection Power
- Moiré Minimized in 625 TV-Line Systems

C76465

RCA-13VAUP22 is a 90° negative guard band MATRIX Precision In-Line Color Picture Tube featuring an improved in-line electron gun. It is designed to be used in conjunction with a long-core, hybrid saddle-toroidal yoke to provide a self-converging deflection system. The new tube also incorporates a Super Arch Mask which minimizes the effects of mask doming caused by uneven thermal expansion during tube operation and a contoured-line screen -- the phosphor lines at the sides of the screen are curved to follow the contour of the glass bulb panel to eliminate the ragged edge produced by [illegible] phosphor lines.

Focus performance has been improved in the 13VAUP22 through the use of a redesigned bipotential precision in-line electron gun. This is achieved by providing a wider space between the beams thus allowing a larger electron lens. Extremely accurate beam alignment is obtained through the use of unique, triple-aperture electrodes making the inherent self-convergence feature of the precision in-line system practical.

C76465

The 13VAUP22, with its 29-mm neck diameter and a new contour in the yoke region, is especially designed to operate with a saddle-toroidal yoke resulting in a lower deflection power system. The field configuration of this yoke is such that when accurately aligned with the precisely-spaced electron beams it produces the inherent self-convergence feature of the precision in-line system. Good convergence performance is achieved without the application of any dynamic convergence correction and therefore is independent of scan size, pincushion correction, line-voltage fluctuation, or circuit changes due to aging. Simple 4-pole and 6-pole permanent-magnet devices, similar to devices used on other RCA Precision In-Line tubes, are recommended for static convergence and purity adjustments.

General Data

Electrical:

Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	90	deg
Horizontal	78	deg
Vertical	60	deg
Direct Interelectrode Capacitance (Approx.):		
Grid No.1 to all other electrodes	13.3	pF
Grid No.3 to all other electrodes	4.6	pF
Each cathode to all other electrodes	6.1	pF
All cathodes to all other electrodes	15.1	pF
Capacitance Between Anode and External Conductive Coating (Including Metal Hardware)	1250 max. 650 min.	pF pF
Resistance Between Metal Hardware and External Conductive Coating	50 min.	MΩ

Printed in U.S.A. 11-77
13VAUP22

Optical:

Faceplate:

Light transmission at center (Approx.)	86%
Surface	Polished

Screen:

Matrix	Black Opaque Material
Type	Negative Guard Band
Phosphor, rare-earth (Red) sulfide (Blue & green)	P22
Persistence	Medium-Short
Array	Vertical Line Trios
	Contoured to Screen Edge
Spacing between corresponding points on line trios at center (Approx.)	0.026 in (0.66 mm)

Mechanical:

Tube Dimensions:

Overall length	13.763 ± .250 in (349.58 ± 6.35 mm)
Reference line to center of face	8.013 ± .188 in (203.53 ± 4.78 mm)
Neck length	5.750 ± .188 in (146.05 ± 4.78 mm)
At O.D. of tension band	
Diagonal	14.500 ± .093 in (368.30 ± 2.36 mm)
Horizontal	12.488 ± .093 in (317.20 ± 2.36 mm)
Vertical (including tension band clip)	9.965 ± .093 in (253.11 ± 2.36 mm)

Minimum screen dimensions (projected):

Diagonal	13.180 in (334.77 mm)
Horizontal	11.104 in (282.04 mm)
Vertical	8.328 in (211.53 mm)
Area	90 sq in (581 sq cm)

Bulb Funnel Designation	JEDEC No.J366
Bulb Panel Designation	JEDEC No.F387A
Bulb Contact Designation	Recessed Small Cavity Cap (JEDEC No.J1-21)
Base Designation [a]	JEDEC No.B12-260
Basing Designation	JEDEC No.13M
Pin Position Alignment	Pin No.11 Aligns Approx. with Anode Bulb Contact
Gun Configuration	Horizontal In-Line
Weight (Approx.)	12 lb (5.5 kg)

Implosion Protection

Type ..... Tension Band

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	30	max.	kV
	20	min.	kV
Anode Current, Long Term Average	1000	max.	μA
Grid No.3 (Focusing electrode) Voltage	7000	max.	V
Peak Grid No.2 Voltage	1500	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bias value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC) [b]	6.9	max.	V
	5.7	min.	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	200	max.	V
Peak value	300	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing electrode) Voltage	18.8 to 22 % 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 75 V	170 to 370 V
At cathode voltage of 125 V	335 to 670 V
At cathode voltage of 175 V	505 to 970 V
Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun (With grid No.2 of gun having highest cathode voltage adjusted to give 150 volts spot cutoff)	1.35
Heater Voltage [b]	6.3 V
Grid-No.3 Current	± 10 μA
Grid-No.2 Current	± 5 μA
Grid-No.1 Current	± 5 μA

To Product White Light of	6650 K + 7 M.P.C.D. (Illum. D)	9300 K + 27 M.P.C.D.	
CIE Coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (Average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:	
Horizontal	± 0.30 in (± 7.5 mm)
Vertical	± 0.30 in (± 7.5 mm)
Center Convergence Displacement in Any Direction of the Blue and Red Beams	0.21 in (5.3 mm)
Center Convergence Displacement in Any Direction Between Green Beam and Converged Blue and Red Beams	0.075 in (1.9 mm)

Maximum Required Correction for Register[c] (Including effect of earth's magnetic field when using recommended components) as Measured at the Center of the Screen in the Horizontal Direction ..... 0.004 in (0.10 mm) max.

Limiting Circuit Values

High-Voltage Circuits:
Grid-No.3 circuit resistance ..... 30 max. MΩ

Low-Voltage Circuits:
Effective grid-No.1-to-cathode circuit resistance ..... 0.75 max. MΩ

X-Radiation Characteristics

Measured in accordance with the procedure of JEDEC Publication No.64D.

A picture tube should not 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 3. 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 Title 21, Code of Federal Regulations, Subchapter J. Maximum X-radiation as a function of anode voltage at 300 μA anode current is shown by the curves in Figure 4. 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 ..... *31 kV
For tube face only ..... 33 kV

WARNING: If the value for the tube face only is used as design criteria, adequate shielding must be provided in the receiver for the anode 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 ..... 32 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 set manufacturer provides the necessary attenuation to reduce the X-radiation from the anode contact by a factor equivalent to the difference between the anode button isoexposure-rate limit curve (Figure 3) and the isoexposure-rate limit curve for the entire tube.

The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one pound (one-half kilogram).

For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

Register is defined as the relative position of the beam trios with respect to the associated phosphor-line trios.

WARNING

X-Radiation

Operation of this color picture tube at abnormal conditions which exceed the 0.5 mR/h isoexposure-rate curves shown in Figure 3 may produce soft X-rays which may constitute a health hazard on prolonged exposure at close range unless adequate external 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.

This color picture tube incorporates integral X-radiation shielding and must be replaced with a tube of the same type number or an RCA recommended replacement to assure continued safety.

Implosion Protection

This picture tube employs integral implosion protection and must be replaced with a tube of the same type number or an RCA recommended replacement 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 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 control brackets may produce a shock hazard.

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.

It is the sole responsibility of the manufacturer of television receivers and other equipment utilizing this color picture tube to provide protective circuitry and design in the event of failure of this color picture tube.

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

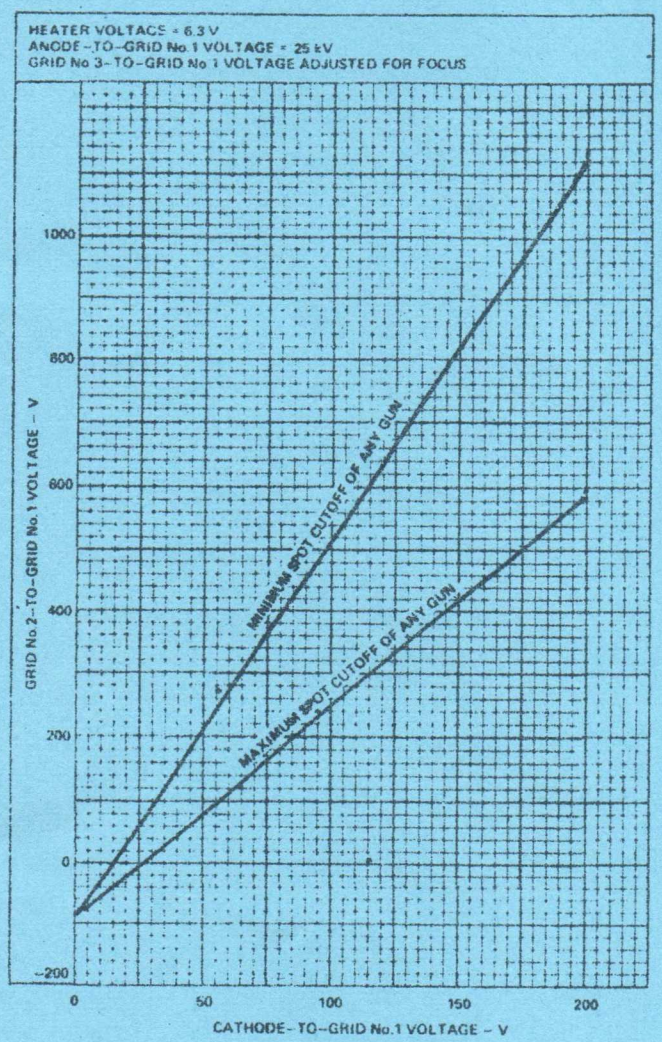


Figure 1 – Cutoff Design Chart

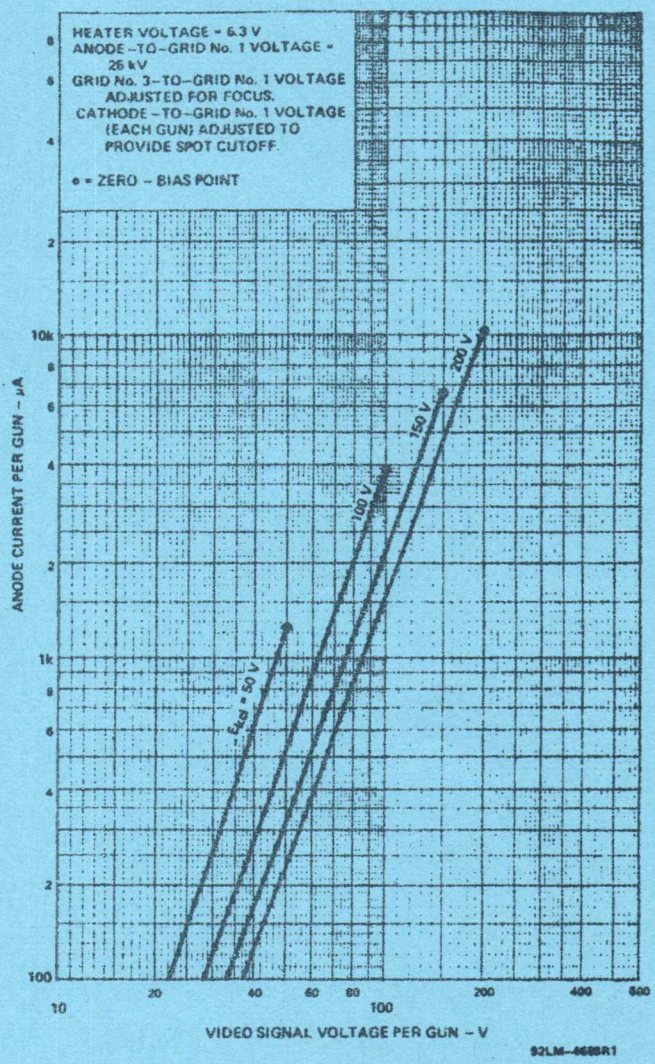


Figure 2 – Typical Drive Characteristics, Cathode-Drive Service

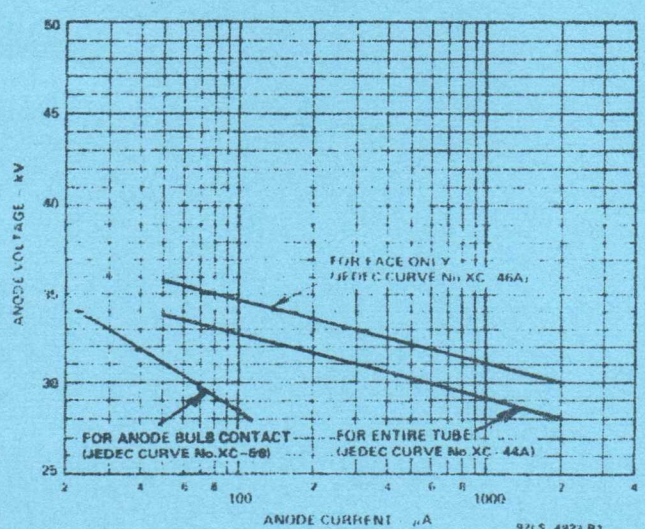


Figure 3 – 0.5 mR/h Isoexposure – Rate Limit Curves

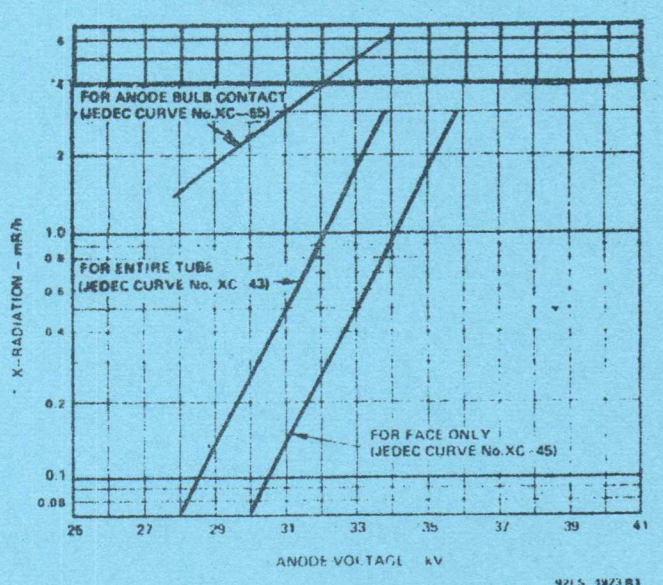
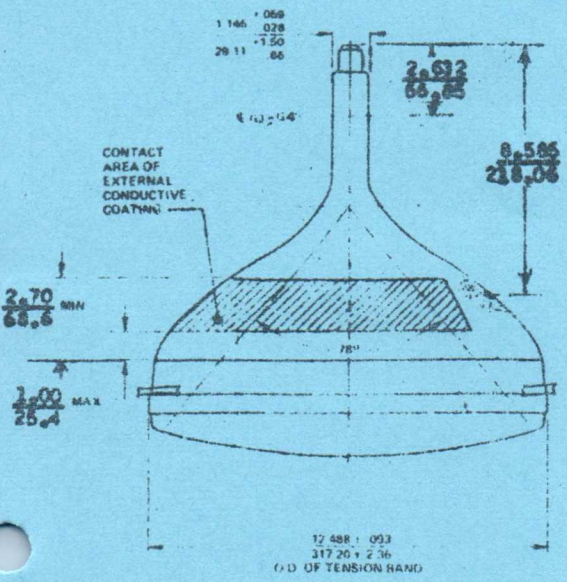
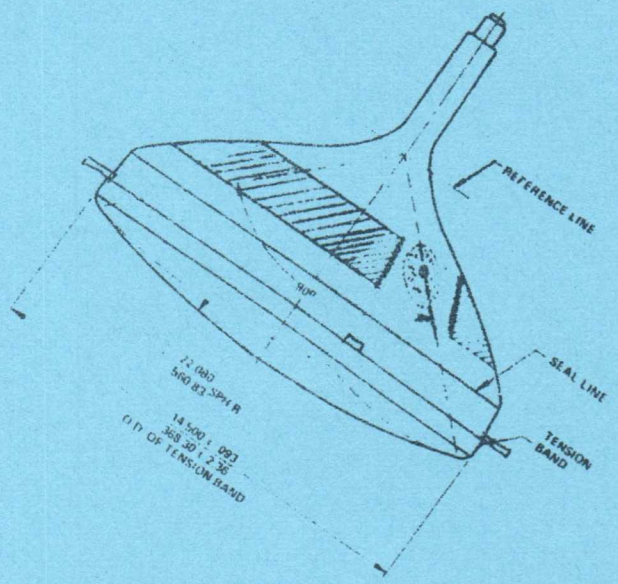
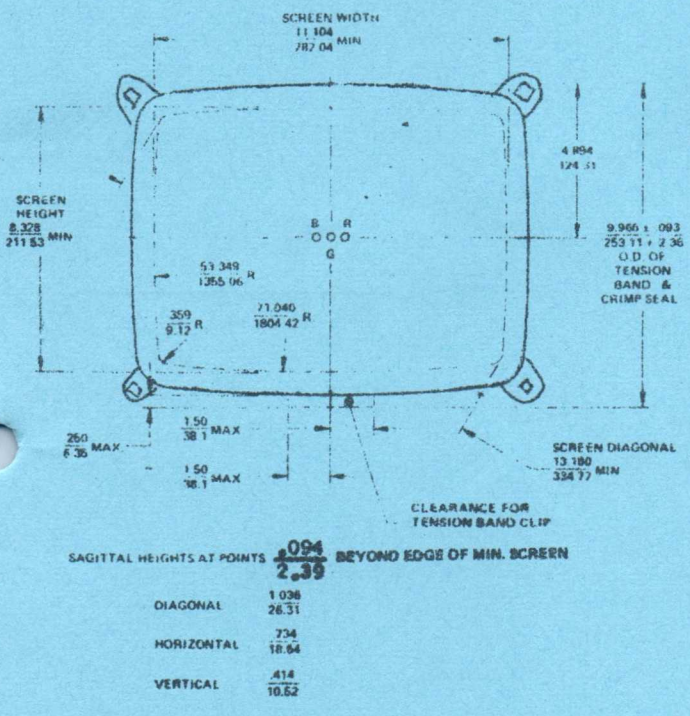


Figure 4 – X-Radiation Limit Curves at a Constant Anode Current of 300 µA (X-radiation at a constant anode voltage varies linearly with anode current)

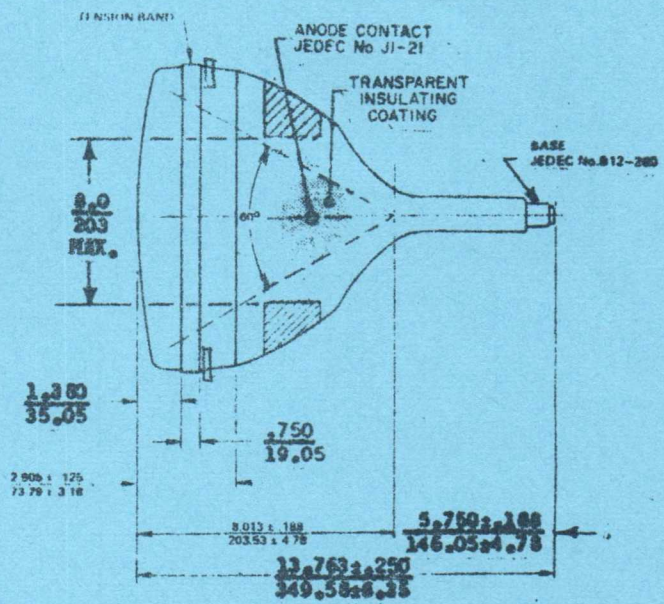






SAGITTAL HEIGHTS AT POINTS $\frac{.094}{2.39}$ BEYOND EDGE OF MIN. SCREEN

DIAGONAL	1.036 26.31
HORIZONTAL	.734 18.64
VERTICAL	.414 10.52



Dimensions in $\frac{\text{Inches}}{\text{mm}}$ unless otherwise noted

The millimetre dimensions are derived from the original inch dimensions (1 inch = 25.4 mm exactly)

Figure 5 – Dimensional Outline

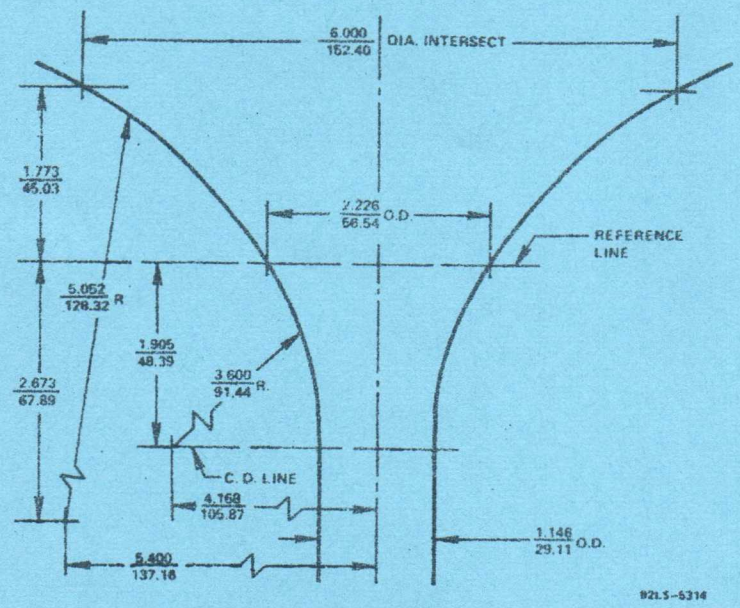
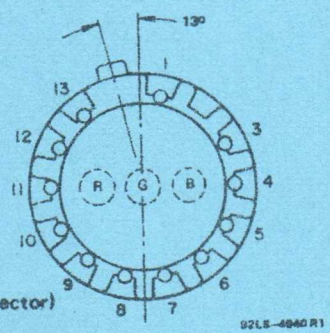


Figure 6 – Funnel Contour in Yoke Region

Basing Specification JEDEC No. 13M

Pin 1: Grid No.3
Pin 3: Cathode of Blue Gun
Pin 4: LC*
Pin 5: LC*
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Gun
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: LC*
Pin 12: Cathode of Green Gun
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating



The corresponding socket terminal, if present, for this pin should be either grounded or remain unconnected and without a spark gap.

Figure 7 – Bottom View of Base – JEDEC No. B12-260

Color Picture Tube

Developmental Type

J20141

90° Deflection - 29 mm Neck - 42 cm Diagonal Precision In-Line Color Picture Tube Assembly

Includes Factory Preset Yoke and Neck Components

- Self-Converging System — Dynamic Convergence Not Required
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- Saddle-Toroidal Yoke — Low Deflection Power
- Integral Tube Components — All Neck Components Included and Preset at Factory — No Setup Adjustments Required — Yoke Permanently Affixed to Tube
- Tinted Phosphor — Enhanced Color & Contrast
- Line Screen — Minimizes Vertical Register Sensitivity
- Quick-Heat Cathodes
- Internal Magnetic Shield
- Moiré Minimized in 625 TV-Line Systems
- Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs
- Integral Mounting Lugs

RCA J20141 is a 90° Color Picture Tube Assembly consisting of a precision in-line color picture tube with a selectively absorbent (tinted) phosphor and quick-heat cathodes, a hybrid saddle-toroidal self-converging yoke, and a permanent magnet purity and static convergence device. The picture tube also incorporates an internal magnetic shield. The quick-heat cathode design provides a typical warmup time of 7.5 seconds to produce 50 per cent of stabilized emission current when operated at nominal heater voltage from a source impedance of 1 ohm.

The J20141 features inherent self-convergence and integral tube components which provide optimum performance without dynamic convergence correction. The yoke and other neck components are preassembled on the tube, factory preset for optimum performance, and the yoke is permanently affixed to the tube in that position. The tube assembly can normally be installed by the receiver manufacturer or serviceman in the field without any convergence or purity setup operations — saving picture tube installation and setup costs. Reliable and stable convergence, purity, and white uniformity performance are obtained throughout tube life with the integral tube-component assembly.

The saddle-toroidal yoke in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self convergence. The field configuration of this yoke and the geometry of the electron beams produce convergence within existing commercial limits without the application of dynamic convergence correction; therefore, dynamic convergence circuitry is not required. Convergence performance is independent of scan size, scan rate, pincushion correction, line-voltage fluctuations, or circuit changes through aging. Simple permanent-magnet devices are used to accomplish static convergence and purity which are factory preset for optimum performance.

Picture Tube Data

Electrical:

Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Preset)	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	90	deg
Horizontal	78	deg
Vertical	60	deg
Direct Interelectrode Capacitance (Approx.):		
Grid No.1 to all other electrodes	11.4	pF
Grid No.3 to all other electrodes	5.6	pF
Red cathode to all other electrodes	6.7	pF
Green or blue cathodes to all other electrodes	5.5	pF
Capacitance Between Anode and External Conductive Coating	1450 max. 750 min.	pF pF
Capacitance Between Anode and Metal Hardware (Approx.)	185	pF
Resistance Between Metal Hardware and External Conductive Coating	50 min.	MΩ

Optical:

Faceplate:		
Light transmission at center (Approx.)	74 %	
Surface	Polished	
Screen:		
Phosphor, rare-earth (Red) sulfide (Blue & green)	P22	
Type	Selectively absorbent	
Persistence	Medium-Short	
Array	Vertical Line Trios	
Spacing between corresponding points on line trios (Approx.)	0.826 mm	

Printed in U.S.A./6-77
J20141

Mechanical:

Tube Dimensions:

Overall length	360.60 ± 6.35	mm
At mold-match line:		
Diagonal	417.20 ± 2.36	mm
Horizontal	359.00 ± 2.36	mm
Vertical	280.19 ± 2.36	mm
Minimum Screen Dimensions (Projected):		
Diagonal	382.30	mm
Horizontal	322.10	mm
Vertical	241.58	mm
Area	755	sq cm
Bulb Funnel Designation	JEDEC No.J415D	
Bulb Panel Designation	JEDEC No.F417A	
Anode Bulb Contact Designation	Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)	
Base Designation[a]	JEDEC No.B12-260	
Basing Designation	JEDEC No.13G	
Pin Position Alignment	Pin No.1 Aligns Approx. with Anode Bulb Contact	
Operating Position	Anode Bulb Contact Up	
Gun Configuration	Horizontal In-Line	
Weight (Approx.)	8.5 kg	

Implosion Protection

Type ..... Reinforcing Bars and Tension Band

Maximum and Minimum Ratings, Absolute-Maximum Values[b]:

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

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing Electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bais value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d]	6.9	max.	V
	5.7	min.	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	200	max.	V
Peak value	200	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing Electrode) Voltage	16.8% to 20% of Anode voltage
Grid-No.2 Voltage for Visual Extinction of Undeflected, Focused Spot	See CUTOFF DESIGN CHART in Figure 2
At cathode voltage of 75 V	165 to 360 V
At cathode voltage of 125 V	335 to 670 V
At cathode voltage of 175 V	510 to 975 V
Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Cutoff	1.5
Heater Voltage[d]	6.3 V
Grid-No.3 Current	± 15 μA
Grid-No.2 Current	± 5 μA
Grid-No.1 Current	± 5 μA

	Illum. D.	Color	
To Produce White Light of[f]	6550 K + 7 M.P.C.D.	9300 K + 27 M.P.C.D.	
CIE coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (Average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:		
Horizontal	± 9.0	mm
Vertical	± 9.0	mm

Limiting Circuit Values

High-Voltage Circuits:			
Grid-No.3 circuit resistance	7.5	max.	MΩ
Low-Voltage Circuits:			
Effective grid-No.1-to-cathode-circuit resistance	0.75	max.	MΩ

Deflection Yoke Data

Electrical:

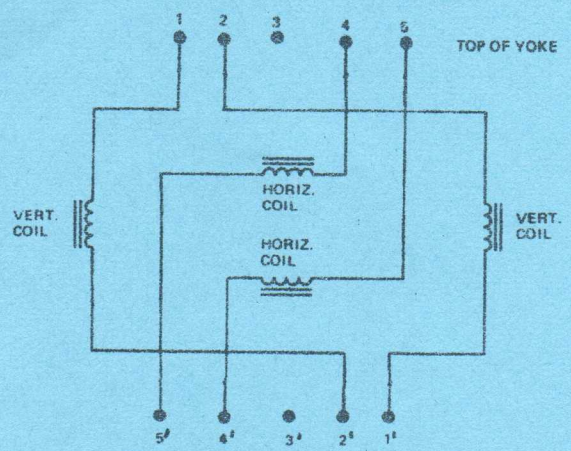
Horizontal Deflection Coils:		
Parallel-connected:		
Inductance at 1 V rms and 1 kHz	0.43 ± 5%	mH
Resistance at 25° C	0.52 ± 7%	Ω
Peak-to-peak deflection current at 25 kV edge-to-edge scan, typical	7.2	A
Series-connected:		
Inductance at 1 V rms and 1 kHz	1.7 ± 5%	mH
Resistance at 25° C	2.0 ± 7%	Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	3.6	A

Vertical Deflection Coils, Parallel-connected:		
Inductance at 1 V rms and 1 kHz	5.0 ± 5%	mH
Resistance at 25° C, coils only	2.0 ± 7%	Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	2.24	A
Vertical Deflection Coils, Series-Connected:		
Inductance at 1 V rms and 1 kHz	20 ± 5%	mH
Resistance at 25° C, coils only	8.0 ± 7%	Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	1.12	A
Raster Pincushion Distortion:[e]		
East/west		%
North/south		%

Maximum Ratings, Absolute-Maximum Values[b]:

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μs	1500 max.	V
Peak Pulse Voltage Between Horizontal and Vertical Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μs	1500 max.	V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded. For series operation it is recommended that the horizontal deflection coils be driven electrically balanced with respect to the vertical deflection coils.



Note 1 – For parallel operation of the horizontal windings, connect jumpers between terminals 4 and 5 and between terminals 4' and 5'.

Note 2 – For series operation of the horizontal windings, connect a jumper between terminals 4 and 4'.

Note 3 – For parallel operation of the vertical windings, connect jumpers between terminals 1 and 2 and between terminals 1' and 2'.

Note 4 – For series operation of the vertical windings, connect a jumper between terminals 2 and 2'.

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

---

a The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one-half kilogram.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry of 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

e Measured in accordance with IEC Recommendation – Publication 107-1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

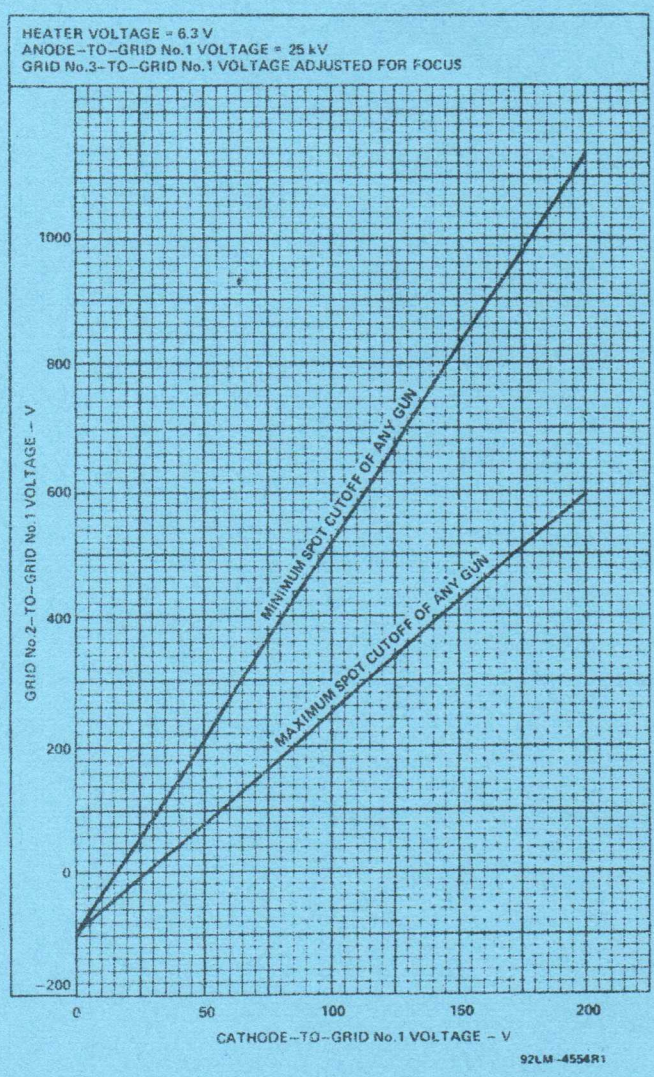
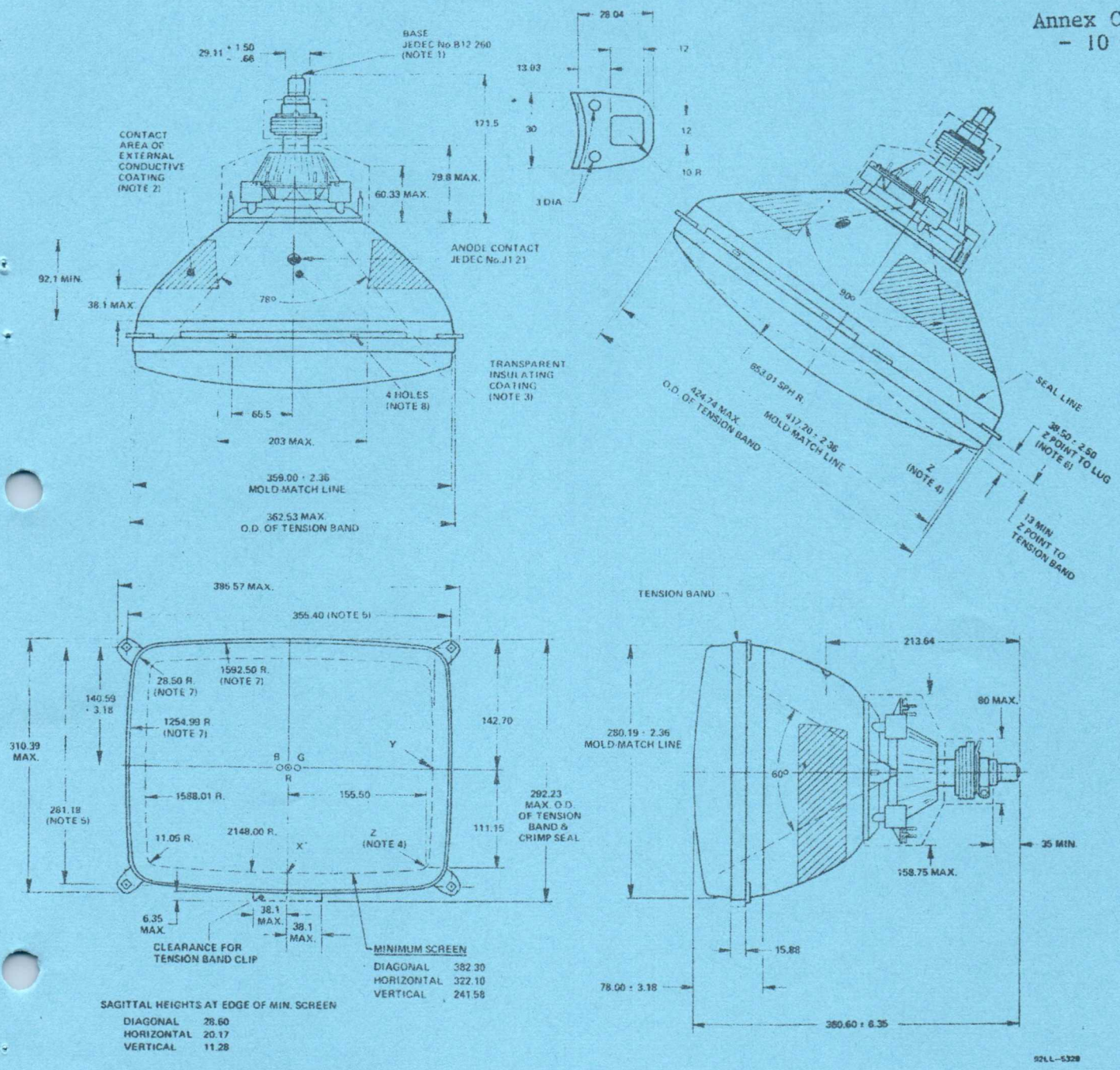


Figure 2 – Cutoff Design Chart



Dimensions in mm unless otherwise noted

Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

Note 4 – "X", "Y", and "Z" reference points are located on the outside surface of the facepiate 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 positioned on the hole centers.

Note 6 – One of four brackets may deviate 2 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 24 mm x 2.5 mm.

Figure 3 – Dimensional Outline

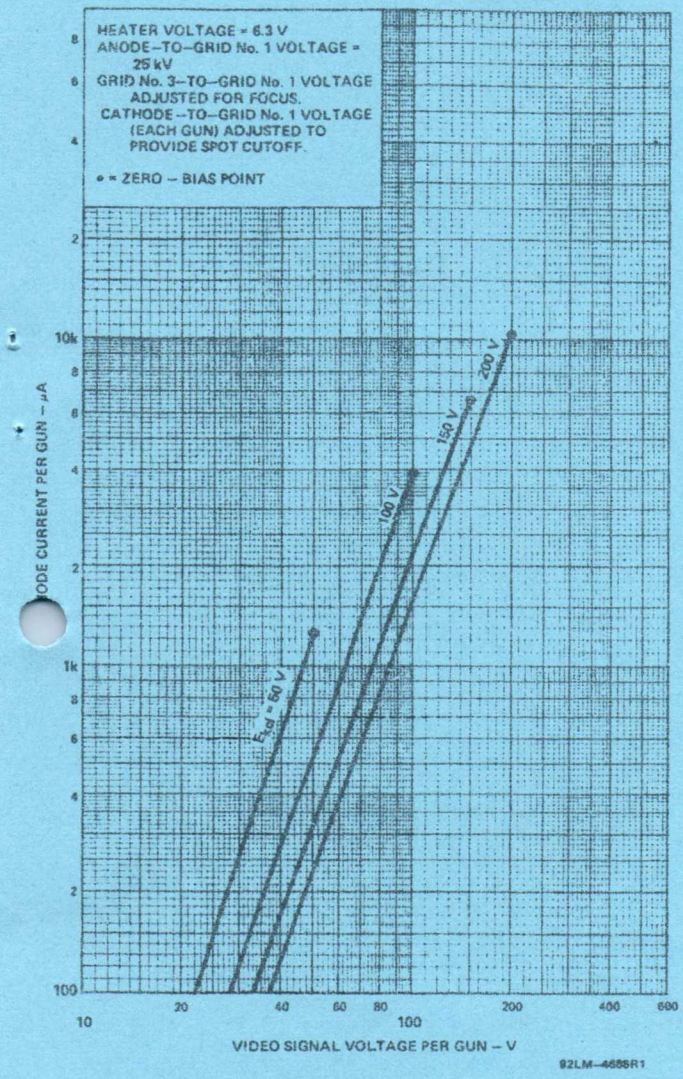


Figure 4 — Typical Drive Characteristics, Cathode-Drive Service

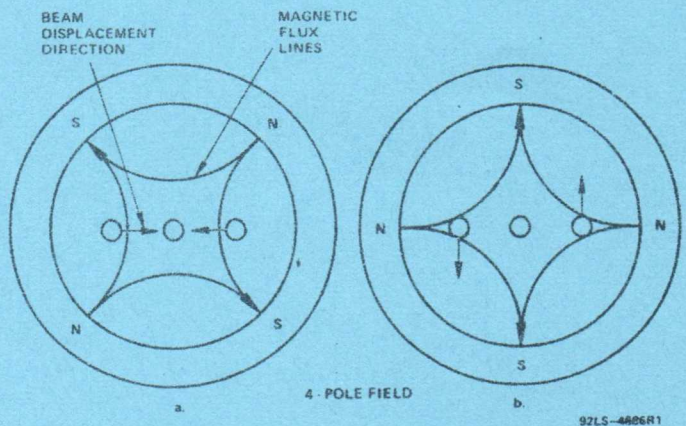


Figure 6 — Beam Motion Produced by the Four-Pole Convergence Magnet

Basing Specification JEDEC No.13G

Pin 1: Grid No.3
Pin 3: Cathode of Blue Gun
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Gun
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Gun
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

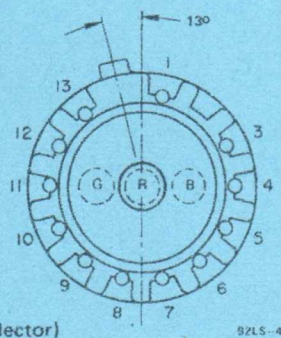


Figure 5 — Bottom View of Base

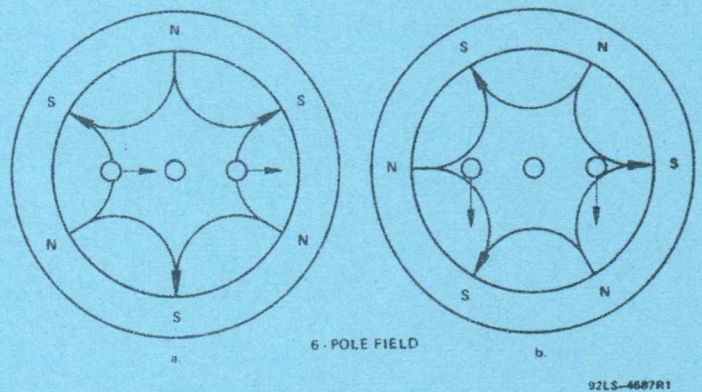


Figure 7 — Beam Motion Produced by the Six-Pole Convergence Magnet

90° Deflection - 29 mm Neck - 51 cm Diagonal Precision In-Line Color Picture Tube Assembly

Includes Factory Preset Yoke and Neck Components

- Self-Converging System — Dynamic Convergence Not Required
- Precision In-Line Electron Gun Assembly — Horizontal In-Line, Triple-Beam, Bipotential Gun Incorporating Unitized Grids
- Saddle-Toroidal Yoke — Low Deflection Power
- Integral Tube Components All Neck Components Included and Preset at Factory — No Setup Adjustments Required Yoke Permanently Affixed to Tube
- Tinted Phosphor — Enhanced Color & Contrast
- Line Screen — Minimizes Vertical Register Sensitivity
- Quick-Heat Cathodes
- Internal Magnetic Shield
- Moiré Minimized in 625 TV-Line Systems
- Banded-Type Implosion Protection — For "Push-Through" Cabinet Designs
- Integral Mounting Lugs

RCA-J20140 is a 90° Color Picture Tube Assembly consisting of a precision in-line color picture tube with a selectively absorbent (tinted) phosphor and quick-heat cathodes, a hybrid saddle-toroidal self-converging yoke, and a permanent magnet purity and static convergence device. The picture tube also incorporates an internal magnetic shield. The quick-heat cathode design provides a typical warmup time of 7.5 seconds to produce 50 per cent of stabilized emission current when operated at nominal heater voltage from a source impedance of 1 ohm.

The J20140 features inherent self-convergence and integral tube components which provide optimum performance without dynamic convergence correction. The yoke and other neck components are preassembled on the tube, factory preset for optimum performance, and the yoke is permanently affixed to the tube in that position. The tube assembly can normally be installed by the receiver manufacturer or serviceman in the field without any convergence or purity setup operations — saving picture tube installation and setup costs. Reliable and stable convergence, purity, and white uniformity performance are obtained throughout tube life with the integral tube-component assembly.

The saddle-toroidal yoke in combination with the horizontal in-line electron gun provides the precision arrangement required to achieve inherent self convergence. The field configuration of this yoke and the geometry of the electron beams produce convergence within existing commercial limits without the application of dynamic convergence correction; therefore, dynamic convergence circuitry is not required. Convergence performance is independent of scan size, scan rate, pincushion correction, line-voltage fluctuations, or circuit changes through aging. Simple permanent-magnet devices are used to accomplish static convergence and purity which are factory preset for optimum performance.

Picture Tube Data

Electrical:

Heater:		
Voltage	6.3	V
Current	700	mA
Focusing Method	Electrostatic	
Focus Lens	Bipotential	
Convergence Method	Magnetic (Preset)	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Diagonal	90	deg
Horizontal	78	deg
Vertical	60	deg
Direct Interelectrode Capacitance (Approx.):		
Grid No.1 to all other electrodes	11.4	pF
Grid No.3 to all other electrodes	5.6	pF
Green cathode to all other electrodes	6.7	pF
Red or blue cathode to all other electrodes	5.5	pF
Capacitance Between Anode and External Conductive Coating	2300 max. / 1300 min.	pF
Capacitance Between Anode and Metal Hardware (Approx.)	250	pF
Resistance Between Metal Hardware and External Conductive Coating	50 min.	MΩ

Optical:

Faceplate:		
Light transmission at center (Approx.)	72.5 %	
Surface	Polished	
Screen:		
Phosphor, rare-earth (Red) sulfide (Blue & green)	P22	
Type	Selectively absorbent	
Persistence	Medium-Short	
Array	Vertical Line Trios	
Spacing between corresponding points on line trios (Approx.)	0.826 mm	

Printed in U.S.A./6-77
J20140

Mechanical:

Tube Dimensions:

Overall length	416.99 ± 6.35	mm
At mold-match line:		
Diagonal	513.46 ± 2.36	mm
Horizontal	440.46 ± 2.36	mm
Vertical	341.76 ± 2.36	mm

Minimum Screen Dimensions (Projected):

Diagonal	479.98	mm
Horizontal	404.42	mm
Vertical	303.30	mm
Area	1194	sq cm

Bulb Funnel Designation	JEDEC No.J510D
Bulb Panel Designation	JEDEC No.F513A
Anode Bulb Contact Designation	Recessed Small Cavity Cap (IEC 67-III-2, JEDEC No.J1-21)
Base Designation[a]	JEDEC No.B12-260
Basing Designation	JEDEC No.13G
Pin Position Alignment	Pin No.1 Aligns Approx. with Anode Bulb Contact
Operating Position	Anode Bulb Contact Up
Configuration	Horizontal In-Line
Weight (Approx.)	12.9 kg

Implosion Protection

Type	Reinforcing Bars and Tension Bands

Maximum and Minimum Ratings, Absolute-Maximum Values[b]:

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

Anode Voltage	27.5	max.	kV
	20	min.	kV
Anode Current, Long-Term Average[c]	1000	max.	μA
Grid-No.3 (Focusing Electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
Positive bias value	400	max.	V
Positive operating cutoff value	200	max.	V
Negative bais value	0	max.	V
Negative peak value	2	max.	V
Heater Voltage (AC or DC)[d]	6.9	max.	V
	5.7	min.	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	200	max.	V
Peak value	200	max.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Peak value	200	max.	V

Typical Design Values

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

For anode voltage of 25 kV

Grid-No.3 (Focusing Electrode) Voltage	16.8% to 20% of Anode voltage
Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot	See CUTOFF DESIGN CHART in Figure 2
At cathode voltage of 75 V	165 to 360 V
At cathode voltage of 125 V	335 to 670 V
At cathode voltage of 175 V	510 to 975 V
Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Cutoff	1.5
Heater Voltage[d]	6.3 V
Grid-No.3 Current	± 15 μA
Grid-No.2 Current	± 5 μA
Grid-No.1 Current	± 5 μA

	Illum. D. 6550 K + 7 M.P.C.D.	Color 9300 K + 27 M.P.C.D.	
To Produce White Light of			
CIE coordinates:			
X	0.313	0.281	
Y	0.329	0.311	
Percentage of total anode current supplied by each beam (Average):			
Red	34	23	%
Blue	28	35	%
Green	38	42	%
Ratio of cathode currents:			
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Red/green:			
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:			
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	

Raster Centering Displacement, Measured at Center of Screen:		
Horizontal	± 10.5	mm
Vertical	± 10.5	mm

Limiting Circuit Values

High-Voltage Circuits:		
Grid-No.3 circuit resistance	7.5 max.	MΩ
Low-Voltage Circuits:		
Effective grid-No.1-to-cathode-circuit resistance	0.75 max.	MΩ

Deflection Yoke Data

Electrical:

Horizontal Deflection Coils:

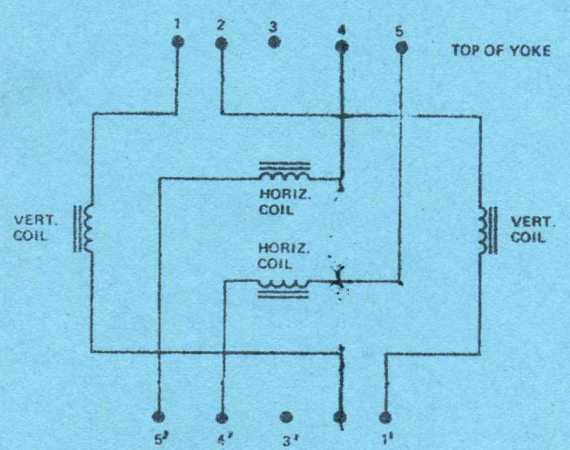
Parallel-connected:		
Inductance at 1 V rms and 1 kHz	0.43 ± 5%	mH
Resistance at 25° C	0.52 ± 7%	Ω
Peak-to-peak deflection current at 25 kV edge-to-edge scan, typical	7.2	A
Series-connected:		
Inductance at 1 V rms and 1 kHz	1.7 ± 5%	mH
Resistance at 25° C	2.0 ± 7%	Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	3.6	A

Vertical Deflection Coils, Parallel-connected:		
Inductance at 1 V rms and 1 kHz	5.0 ± 5%	mH
Resistance at 25° C, coils only	2.0 ± 7%	Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	2.24	A
Vertical Deflection Coils, Series-Connected:		
Inductance at 1 V rms and 1 kHz	20 ± 5%	mH
Resistance at 25° C, coils only	8.0 ± 7%	Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	1.12	A
Raster Pincushion Distortion:[e]		
East/west		%
North/south		%

Maximum Ratings, Absolute-Maximum Values[b]:

Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μs	1500 max.	V
Peak Pulse Voltage Between Horizontal and Vertical Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μs	1500 max.	V

The horizontal and vertical coils or circuits should be interconnected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded. For series operation it is recommended that the horizontal deflection coils be driven electrically balanced with respect to the vertical deflection coils.



Note 1 – For parallel operation of the horizontal windings, connect jumpers between terminals 4 and 5 and between terminals 4' and 5'.

Note 2 – For series operation of the horizontal windings, connect a jumper between terminals 4 and 4'.

Note 3 – For parallel operation of the vertical windings, connect jumpers between terminals 1 and 2 and between terminals 1' and 2'.

Note 4 – For series operation of the vertical windings, connect a jumper between terminals 2 and 2'.

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

---

a The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one-half kilogram.

b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in device characteristics.

c The short-term average anode current should be limited by circuitry of 1500 microamperes.

d For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

e Measured in accordance with IEC Recommendation – Publication 107-1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

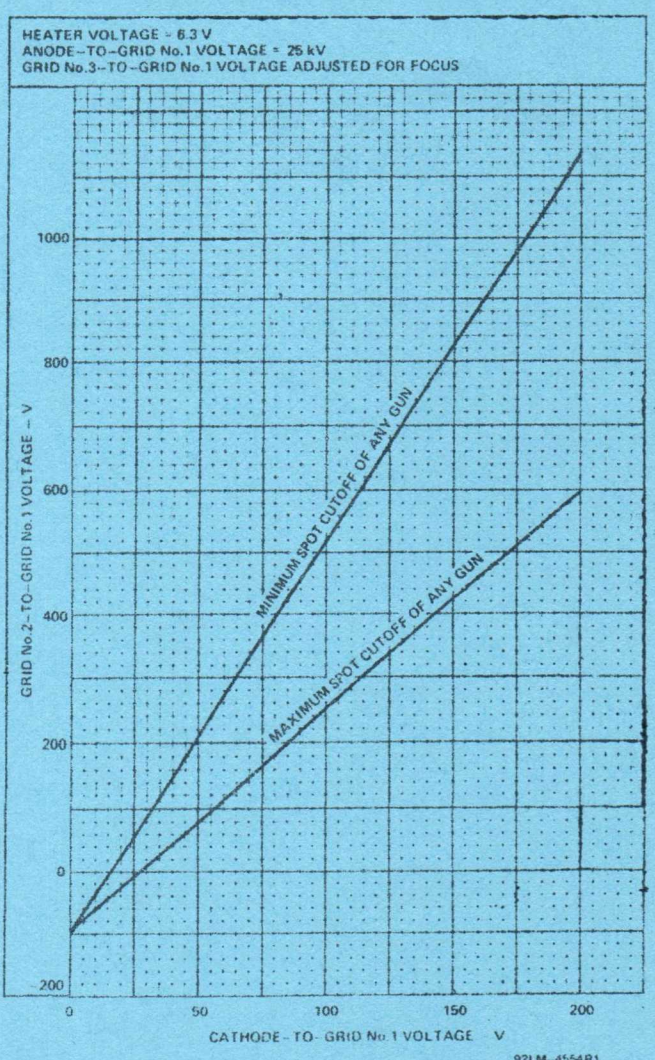
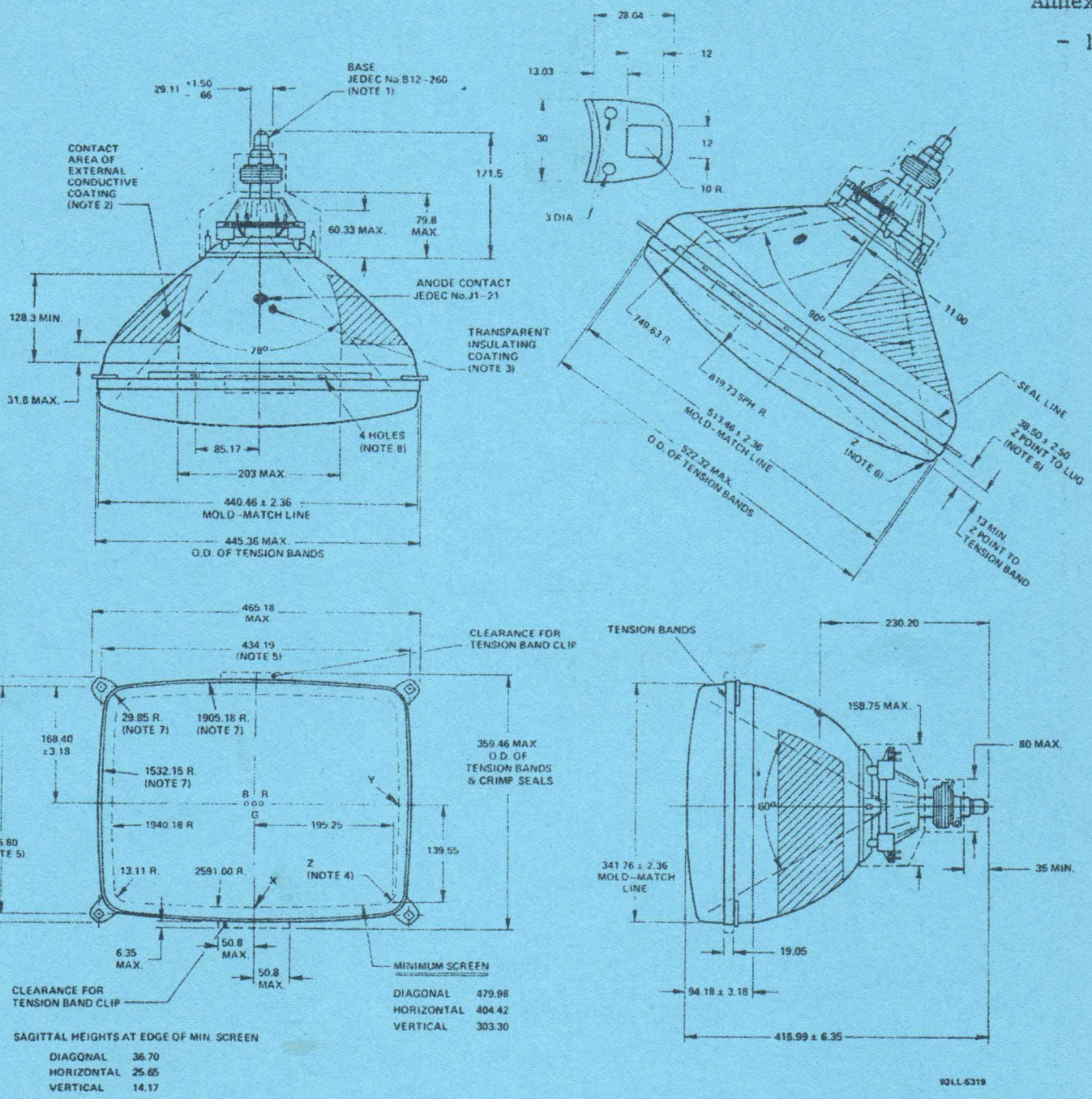


Figure 2 – Cutoff Design Chart



Dimensions in mm unless otherwise noted

Note 1 – Socket for this 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 this area, wipe only with soft, dry, lintless cloth.

Figure 3 – Dimensional Outline

Note 4 – "X", "Y", and "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 positioned on the hole centers.

Note 6 – One of four brackets may deviate 2 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 24 mm x 2.5 mm.

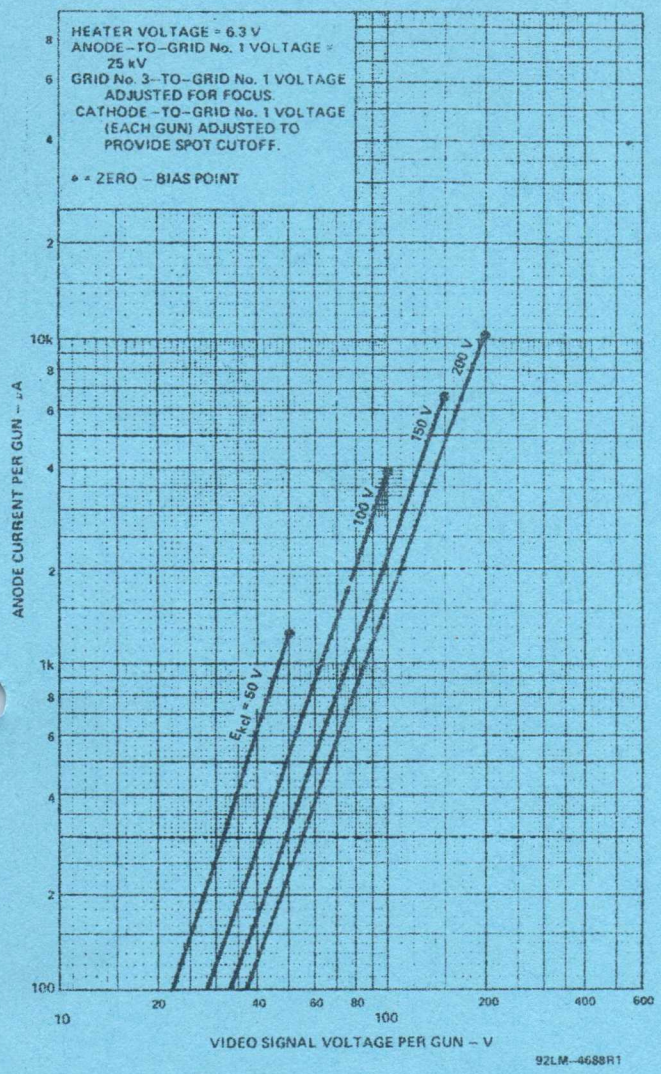


Figure 4 – Typical Drive Characteristics, Cathode-Drive Service

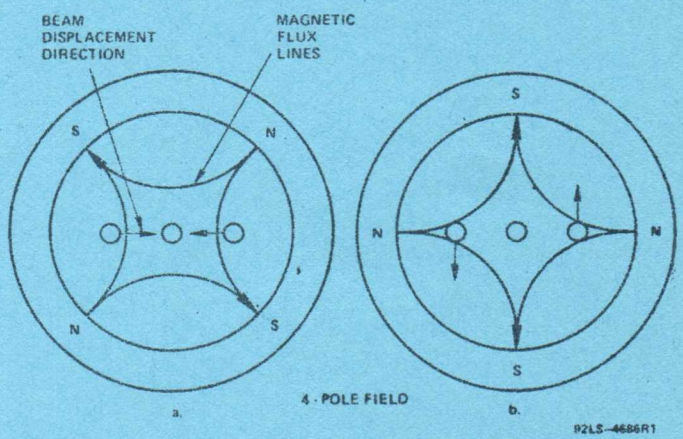


Figure 6 – Beam Motion Produced by the Four-Pole Convergence Magnet

Basing Specification JEDEC No.13G

Pin 1: Grid No.3
Pin 3: Cathode of Blue Gun
Pin 4: NC
Pin 5: NC
Pin 6: Heater
Pin 7: Heater
Pin 8: Cathode of Red Gun
Pin 9: Grid No.1
Pin 10: Grid No.2
Pin 11: NC
Pin 12: Cathode of Green Gun
Pin 13: IC (Do Not Use)
Cap: Anode (Grid No.4, Screen, Collector)
C: External Conductive Coating

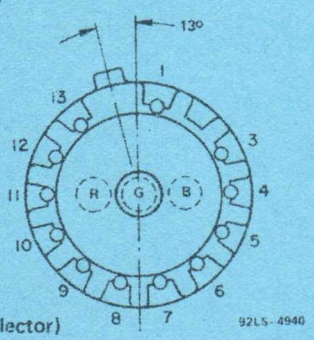


Figure 5 – Bottom View of Base

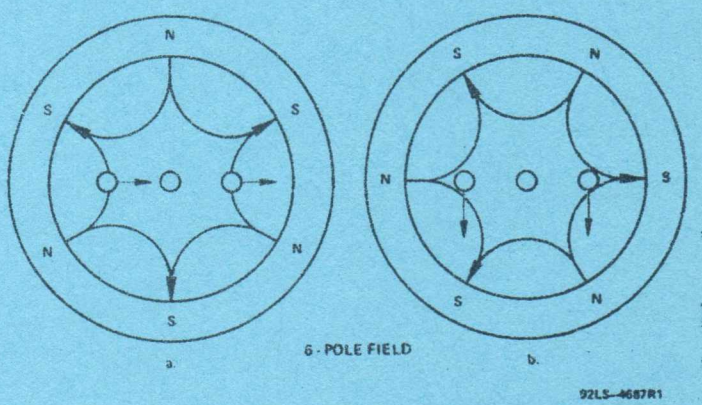


Figure 7 – Beam Motion Produced by the Six-Pole Convergence Magnet

RCA Picture Tube Division | Lancaster, PA 17604 | U.S.A.