ANNEX ML-TE CRT75/02-03

Color Picture Tube Assembly

A51-610X

110^o 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

6.3 700	V mA		
Elec	trostatic		
Bipotential			
Magnetic	(Preset)		
N	Magnetic		
110 97 77	deg deg deg		
	700 Elec Bip Magnetic 110 97		

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Product on 11 6 6-75 ASI-61CX

A51-610X

	Picture Tube Data (Cont'd)	na na anita ina ana any ina ana any ina N	
	Direct Interelectrode Capacitance (App)	0X 1	
	Grid No.1 to all other electrodes	11.4 DF	
	Grid No.3 to all other electrodes	56 pF	
	Green cathode to all other electrodes	6.7 pF	
		0.7 p.	
	Red or blue cathode to all other	F.C	
	electrodes	5.5 pF	
	Capacitance Between Anode and	1	
	External Conductive Coating	1750 max. pF	
		1350 min. pF	
	Resistance Between Metal Hardware		
	and External Conductive Coating	50 MS2	
		and the second second	
	Optical:		
	Faceplate:		
	Light transmission at center (Approx.	.) 52%	
	Surface	Polished	
	Screen:		
	Phosphor, rare-earth (red) sulfide (blu	ie & green) P22	
		Medium Short	
	Persistence	Vertical Line Trios	
١	Array	vertical Line (1105	
7	Spacing between corresponding	0.000	
	points on line trios (Approx.)	0.826 mm	
	Mechanical:		
	Tube Dimensions:	000.00 . 0.00	
	Overall length	336.88 ± 6.35 mm	
	At mold-match line:		
	Diagonal	513.46 ± 2.36 mm	
	Horizontal	$440.46\pm2.36~\text{mm}$	
	Vertical	341.76 ± 2.36 mm	
	Minimum Screen Dimensions (Projected	1: .	
	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 Re	ecessed Small Cavity	
	Cao (IEC 67-111)	2, JEDEC No.J1-21)	
		JEDEC No.B12-260	
	5		
		Aligns Approx. with	
b		Anode Bulb Contact	
7	Operating Position, Preferred Anode B	luib Contact on Top	
	Gun Configuration	Horizontal In-Line	
	Weight (Approx.)	12.2 kg	
	Weight Approx./	12.2 19	
	Implosion Protection:		
	Type Reinforcing Bar	s and Tension Bands	
	, p		
	••		
	Maximum and Minimum Ratings,		
	Theolute-Maximum Valuesb:		
	Unless otherwise specified, voltage value	ies are positive with	
	respect to grid No.1.		
		27.5 max. kV	
	Anode Voitage		
		[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	
		Vere mark, V	
	Cathode Voltage:	100	
	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	
		160 may 11	

6.9 max.

15.7 min.

V

V

CRT75/02-03 2 -Heater-Cathode Voltage Heater negative with respect to cathode. During equipment warm-up period 450 max. V not exceeding 15 seconds After equipment warm-up period: 200 max. V DC component value 200 max. V Peak value 300 max. V In service mode Heater positive with respect to cathode: V 0 max. DC component value V 200 max. Peak value Typical Design Values: Unless otherwise specified, voltage values are positive with respect to grid No.1. For anode voltage of 25 kV 16.8% to 20% of Grid-No.3 (Focusing electrode) Voltage Anode voltage Grid-No.2 Voltage for Visual Extinction See CUTOFF DESIGN of Undeflected Focused Spot CHART in Figure 2 335 to 670 V At cathode voltage of 125 V At cathode voltage of 150 V 425 to 820 V 510 to 975 V At cathode voltage of 175 V Maximum Batio of Cathode Voltages, Highest Gun to Lowest Gun with Cathode Voltage Adjusted for 1.50 Spot Cutoff 6.3 V Heater Voltaged,e ± 15 µA Grid-No.3 Current ±5 µA Grid-No.2 Current ±5µA Grid-No.1 Current Illum. D Color 9300° K + 65500 K + To Produce White Light of 7 M.P.C.D. 27 M.P.C.D. CIE Coordinates: 0.313 0.281 X 0.311 Y 0.329 Percentage of total anode current supplied by each beam (average): 34 23 4 Red 28 35 % Blue 42 20 Green 38 Ratio of cathode currents: Red/blue: 0.50 Minimum 1.05 0.67 Typical 1.22 1.55 0.90 Maximum Red/green: 0.40 0.75 Minimum 0.88 0.56 Typical Maximum 1.05 0.70 Blue/green: 0.50 0.60 Minimum 0.83 Typical 0.72 0.90 1.00 Maximum Raster Centering Displacement, Measured at Center of Screen: ±8.0 mm Horizontal Vertical ±8.0 mm Limiting Circuit Values: High-Voltage Circuits: Grid-No.3 circuit resistance 7.5 max. $M\Omega$ Low Voltage Circuits: Effective grid-No.1-to cathode- $0.75 \text{ max}. M\Omega$ 'circuit resistance

ANNEX ML-TE

Heater Voltage (AC or DC)d,e

ANNEX ML-TE

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A51-610X

CRT75/02-03

Deflection Yoke Data

· Peak Pulse Voltage Across

Pulse Duration of 12.5 µs

Horizontal Coils at 15,625 Hz

for a Maximum Pulse Duration of 12.5 µs

Peak Pulse Voltage Between Horizontal and Vertical or Quadrupole Coils at 15,625 Hz for a Maximum

Horizontal Section:		
Inductance at 1 V rms and 1 kHz	0.28 ± 5%	mH
Resistance at 25° C	0.36 ± 7%	\$3
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:9		
Inductance at 1 V rms and 1 kHz Resistance at 25° C:	3.2 ± 5%	mΗ
At vertical current = 0 A dc	4.8 ± 10%	Ω
At vertical current = 1.55 A dc	$3.9 \pm 10\%$	\$2
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 V	alues: b	

VERTICAL 03 04 20 06 HCR-20NTAL 4 7 12 05 20 D11 6805 66.0 HORIZ 1820 of 820 pf QUADRUPOLE COILS VERT 3 470 15 TO N/S PINCUSHION 13 HORIZONTAL SECTION CORRECTION 11 470 SUICON DIODE IN4002 VERTICAL SECTION AGERMANIUM DIODE IN270

92 5 - 4999R

Figure 1 - Circuit of the Deflection Yoke

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.

700 max. V

700 max. V

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

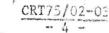
The equipment manufacturer should design so that initially and throughout life no Absolute-Maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment,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

С The short term average anode current should be limited by circuttry 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.
- 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.
- 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 voke 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.







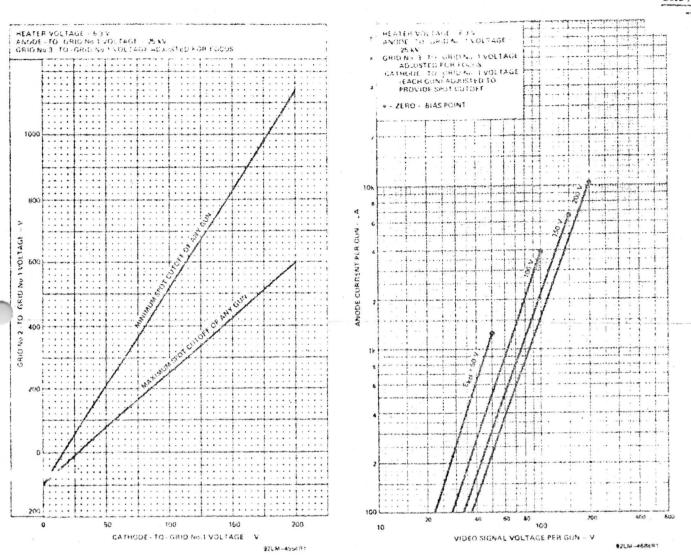
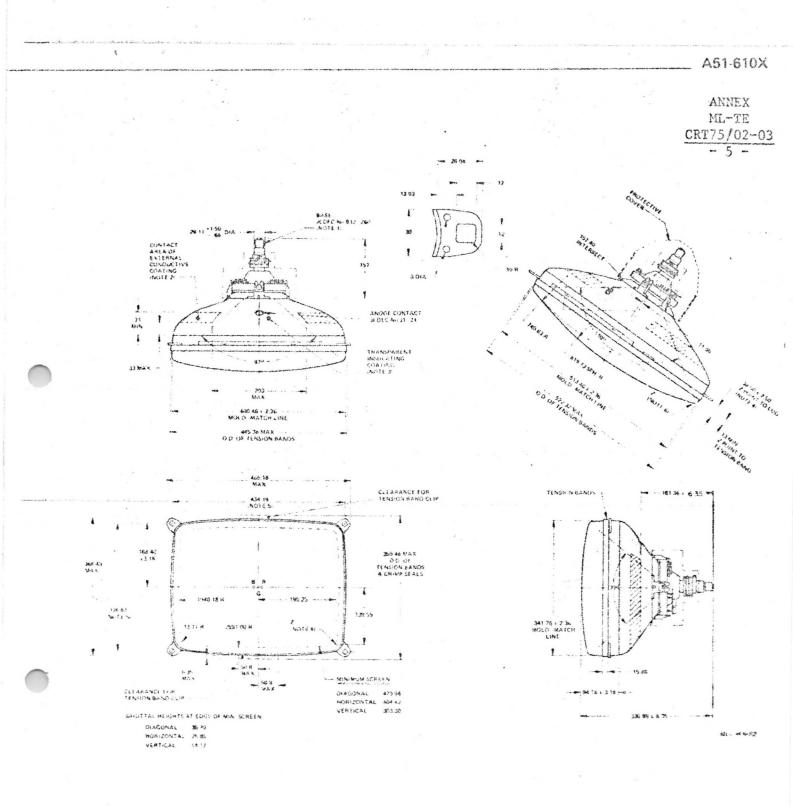




Figure 3 - Typical Drive Characteristics. **Cathode-Drive Service**

Basing Specification JEDEC No.13D Pin 1: Grid No.3 Pin 3: Cathode of Blue Gun Pin 4: NC Pin 5: NC 12 Pin 6: Heater Pin 7: Heater Pin 8: Cathode of Red Gun Fin 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 P

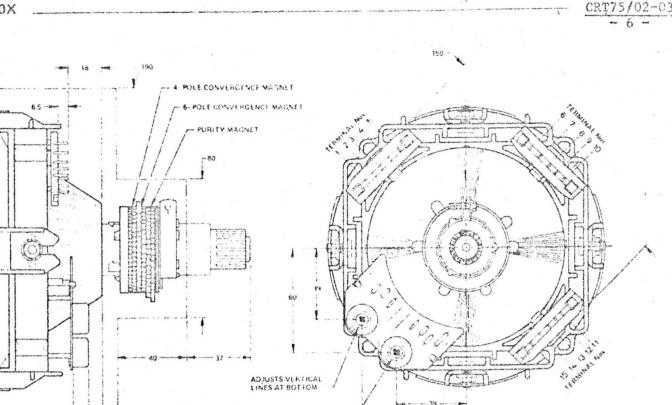


Figure 6 - Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

Term. 6: IC

Term. 7: NC

Term. 8: 1C

Term. 9:1C

Term. 10: IC

ADJUSTS VERTICAL

LINES AT TOP

Convergence and Purity

-

175

Term. 1: Pin Correction

Term. 2: Vertical High

Term. 5: Horizontal High

Term. 3:1C

Term 4-10

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.

Term 11: Pin Correction

Term 14. Vertical Low

Term. 15: Horizontal Low

Term. 13: Pin Correction CT

Term. 12: 1C

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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 guadrupole 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.

A51-610X

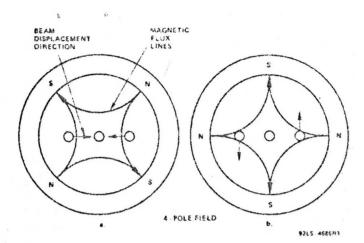
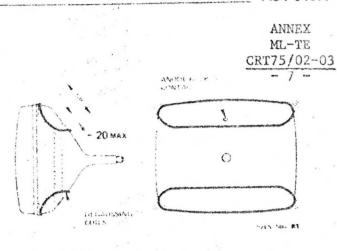
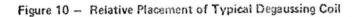


Figure 7 — Beam Motion Produced by the Four-Pole Convergence Magnet



Dimensions in mm



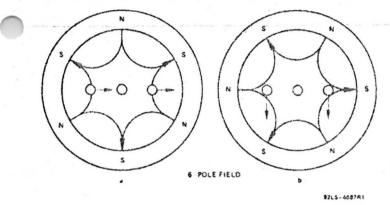
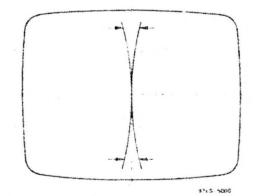
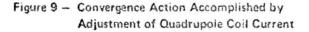


Figure 8 – Beam Motion Produced by the Six-Pole Convergence Magnet





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.

A51-610X

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

A56-610X



ML-TE CRT75/04-05

110^o 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 Logistion 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
- Moire 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-hest cathodec. 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 A56610X 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 volve 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 per-

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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 · ·	4 . 1 . * · · ·				
Electrical:	and the stat	Andre ,			
Heater:	and and a star	- 18			
Voltage	6.3	V			
Current	700	mA			
Focusing Method	Elec	trostatic			
Focus Lens	Bipotential				
Convergence Method	Magnetic (Preset)				
Deflection Method	Rend to E pil	Magnetic			
Deflection Angles (Approx.):		Villa de			
Diagonal	110	: deg			
Horizontal	97	deg			
Vertical	77	deg			

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03

Deflection Yoke Data

Peak Pulse Voltage Across

Horizontal Coils at 15,625 Hz

for a Maximum Pulse Duration of 12.5 µs

Peak Pulse Voltage Between Horizontal

Horizontal Section:f		
Inductance at 1 V rms and 1 kHz	$0.27 \pm 5\%$	mH
Resistance at 25° C	$0.35 \pm 7\%$	S
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:9		
Inductance at 1 V rms and 1 kHz	$3.3 \pm 5\%$	mH
Resistance at 25° C:		
At vertical current = 0 A dc	$4.5 \pm 10\%$	Ω
At vertical current = 1.5 A dc	$4.0 \pm 10\%$	Ω
Typical operation with edge-to-edge		
scan at 25 kV:		
Peak-to-peak deflection current	3.0	A
Raster Pincushion Distortion:h	and the second second	
	0.00/	
East/West	9.0%	
North/South	8.5%	
Maximum Ratings, Absolute-Maximum	Values: b	

700 max. V

04 20 DE HORIZONTAL 4.70 05 20 DI 6805 68.0 HORIZ 820 AF 820 0 QUADRUPOLE COILS 12 VERT. 3 470 1 15 TO N/S PINCUSHION 13 HORIZONTAL SECTION CORRECTION 11 470 14 * SILICON DIODE 1N4002 VERTICAL SECTION A GERMANIUM DIODE 1N270 9215-499981

VERTICAL

21

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.

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

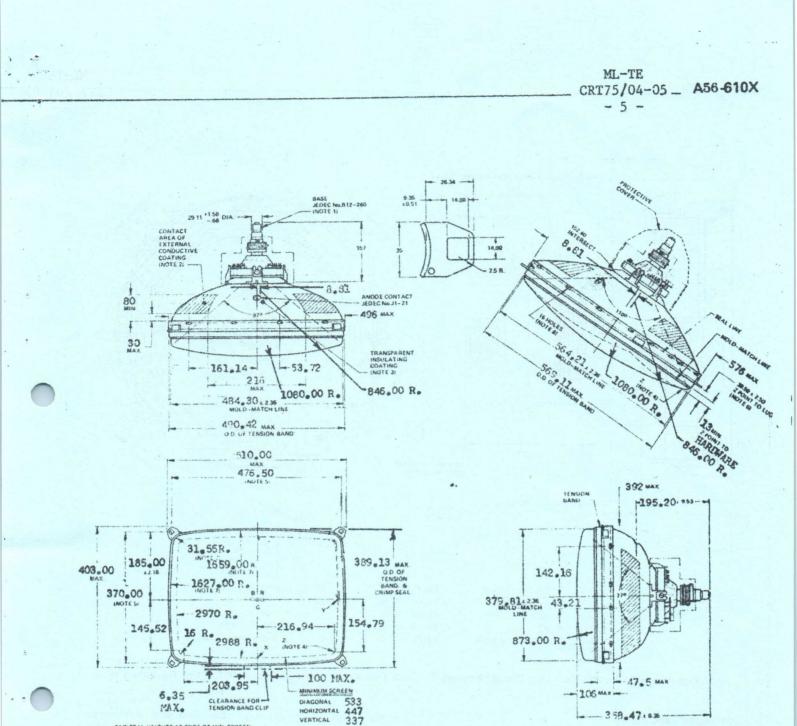
The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

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.

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

Figure 1 - Circuit of the Deflection Yoke

- 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.
- 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.
- Measured between terminals 5 and 15.
- q Measured between terminals 2 and 14 with terminals 1, 11, and 13 connected together. The vertical section of the yoke includes the auadrupole 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.

VERTICAL

- 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.

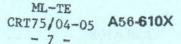
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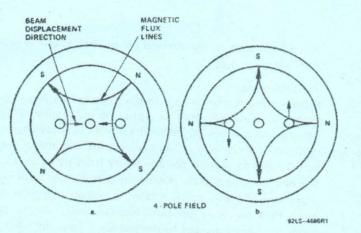
- Note 6 One of four brackets may deviate 2 mm max. from the plane of the other three.
- Note 7 The radius is to the outside of the class at the mold-match line and is intended to define the shape of the required cutout for "push-through" cabinet designs.
- Note 8 Mounting holes for degaussing coils 14.73 mm x 5.08 mm.

Dimensions in mm unless otherwise noted

SAGITTAL HEIGHTS AT EDGE OF MIN. SCREEN DIAGONAL

40.41 HORIZONTAL 27.89





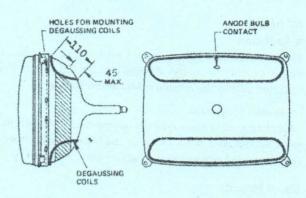
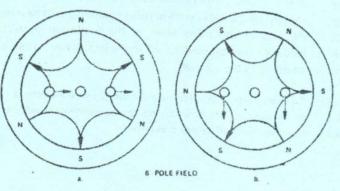


Figure 7 – Beam Motion Produced by the Four-Pole Convergence Magnet

Dimensions in mm





9315-468741

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

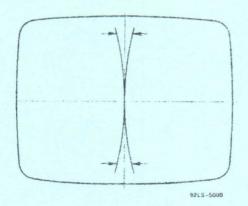


Figure 9 – Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

Magnetic Shield and Degaussing

The A56-610X 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.

B/I Picture Tube

Color Picture Tube Assembly

the way

A56-611X

44

AL/1978/2 110° Deflection - 29mm Neck - 56cm Diagonal Annex CRT **Precision In-Line Color Picture Tube Assembly Includes Factory Preset Yoke and Neck Components**



- 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

RCA A56-611X is a 110º 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

prrection 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 in-

- stalled in the receiver by the manufacturer or field serviceman without making any convergence or purity adjustmentssaving installation and adjustment costs. The integral tube-
- , component construction provides reliable and stable convergence, purity, and white uniformity performance throughout tube life.

- 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

Picture Tube Data

Electrical:

Heater	
Voltage 6.3	V
Current 700 n	nA
Focusing Method Electrosta	tic
Focus Lens Bipotent	tial
Convergence Method Magnetic (Perce	nt)
Deflection Method Magne	tic
Deflection Angles (Approx.)	
Diagonal 110 0	deg
Horizontal	deg
Vertical 78 0	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 [1750 max.	DF
External Conductive Coating	pF
	P.
Capacitance Between Anode	
and Metal Hardware 300	pF
Resistance Between Metal Hardware	
and External Conductive Coating 50 min. N	AΩ

Optical:

Faceplate: Light transmission at center (Approx.) 71.5 Surface Polishe	
Screen:	
Phosphor, rare-earth (red) sulfide (blue & green) P2	22
Type Selectively absorber	nt
Persistence Medium-Sho	
Array Vertical Line Trie	os
Spacing between corresponding points	
on line trios at center (Approx.) 0.826 m	m

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

Mechanical:
Tube Dimensions:
Overall length
At mold-match line:
Diagonal
Horizontal
Vertical
Minimum Screen Dimensions (Projected):
Diagonal
Horizontal 447 mm
Vertical
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 ⁸ , 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

Туре	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 20	max.	kV kV
Anode Current, Long-Term Average ^C	1000	max.	μΑ
Grid-No.3 (Focusing electrode) Voltage	6000	max.	v
Feak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage: Positive bias value Positive operating cutoff value Negative bias value Negative peak value	0	max. max. max. max.	<pre>>> >> >> >> >> >>>>>>>>>>>>>>>>>>>>></pre>
Heater Voltage (AC or DC) ^{d,e} Heater-Cathode Voltage: ^f Heater negative with respect to cathode:	{6.9 5.7	max. min.	v v
During equipment warm-up period not exceeding 15 seconds After equipment warm-up period:	450	max.	v
DC component value Peak value	200 300	max.	v v
Heater positive with respect to cathode: DC component value Peak value	0 200	max. max.	v 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 Voltag Highest Gun to Lowest Gun With			
Cathode Voltage Adjusted for Spot			
Heater Voltaged,e	•••••	6.3 V	
Grid-No.3 Current9		± 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:		0.004	
X Y		0.281	
Percentage of total anode	0.323	0.511	
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 Maximum	0.88	0.56	
Blue/green:	1.05	0.70	
Minimum	0.50	0.60	
Typical	0.72	0.83	
Maximum	0.90	1.00	
Raster Centering Displacement, Measured at Center of Screen: Horizontal Vertical			

Deflection Yoke Data

Horizontal Section:	
Inductance at 1 V rms and 1 kHz0.27 ± 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:	
Inductance at 1 V rms and 1 kHz \dots $3.2 \pm 5\%$	mH
Resistance at 25° C:	0
At vertical current = $0 \text{ A dc} \dots 4.8 \pm 10\%$	Ω
At vertical current = $1.55 \text{ A dc} \dots 3.9 \pm 10\%$	34
Typical operation with edge-to-	
edge scan at 25 kV: Peak-to-peak deflection current 3.1	A
for to peak derice their enternet to the second sec	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 μ s	700 max. V
The horizontal and vertical coils or circuits should	be intercon-

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.

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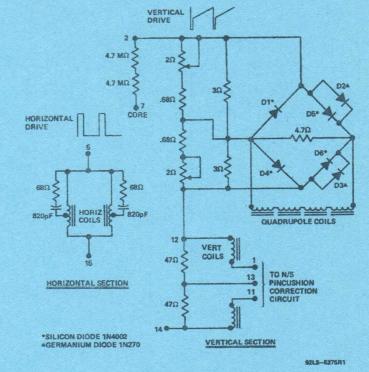
- ^a The mating socket assembly with associated circuit board and mounted components must not weigh more than one-half kilogram. To minimize the torsional forces on the tube base pins, the center of gravity of this assembly should be located on the vertical plane through the picture tube axis. Caution 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.
- 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.
- 9 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.





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

A56-611X

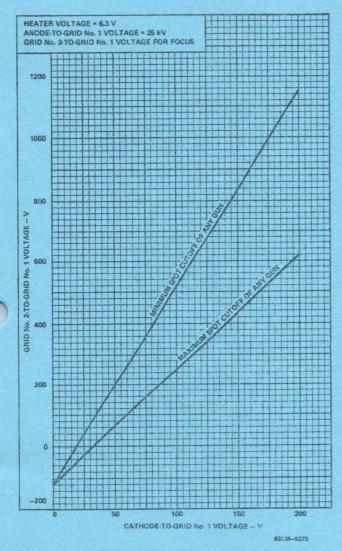


Figure 3 - Cutoff Design Chart

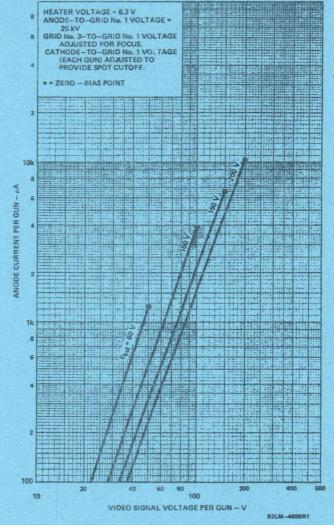


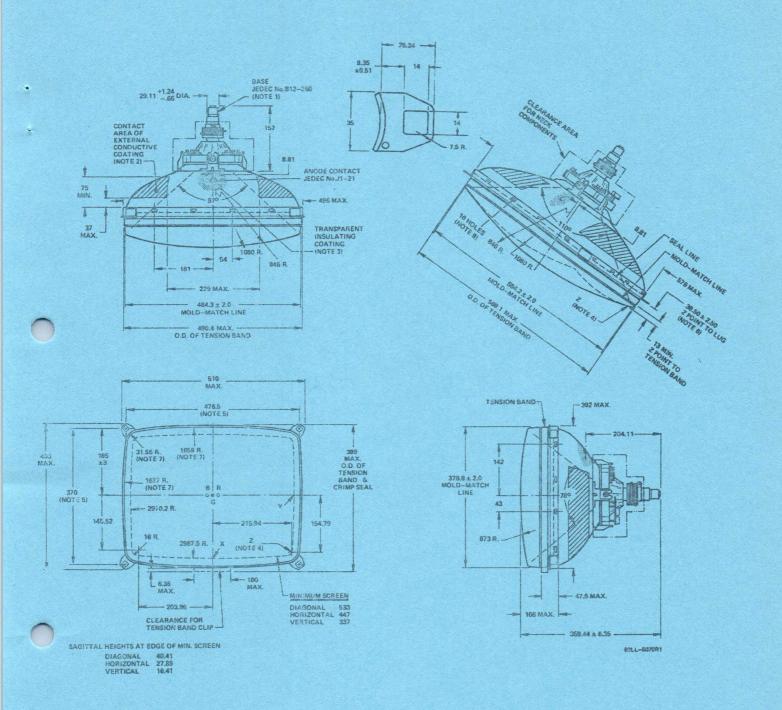
Figure 4 – Typical Drive Characteristics, Cathode-Drive Service

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.

AL/1978/2 Annex CRT A56-611X - 48 -



Dimensions in mm unless otherwise noted

Figure 5 - Dimensional Outline

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A56-611X

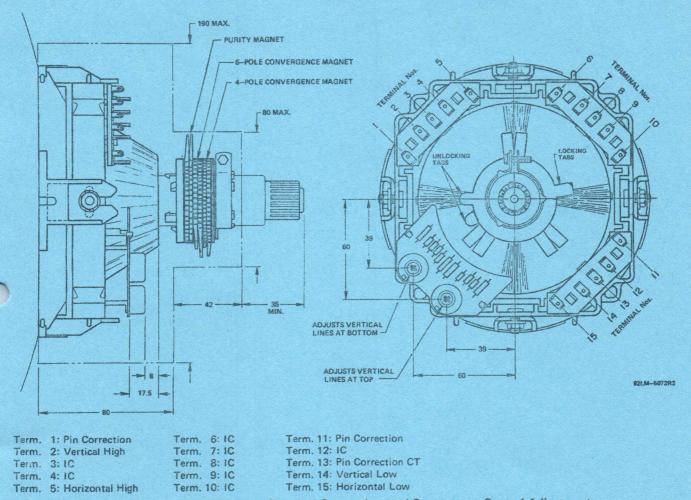


Figure 6 - Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

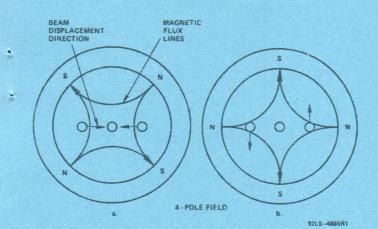
Convergence and Purity

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

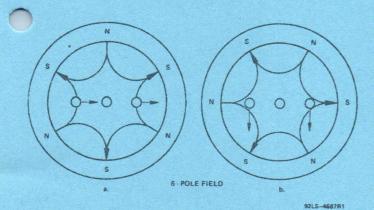
without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

AL/1978/2 Annex CRT

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 voke 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 voke 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.









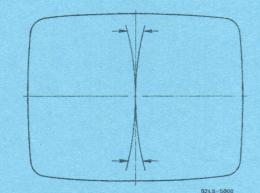
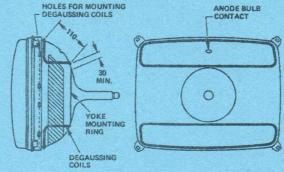


Figure 9 – Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

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

8215-6278

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.

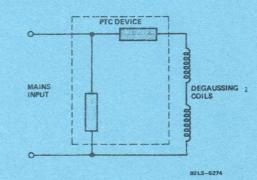


Figure 11 - Typical Degaussing Circuit

A56-611X _

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 remationally 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

orting 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 ($1M\Omega$).

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 Assembly

17 JUL 1979

A56-613X

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



Includes Factory Preset Yoke and Neck Components

Self-Converging System

BA Picture Tube Division

- 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

RCA A56-613X is a 110º 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 90° precision in-line system. Additional convergence

ection 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, spurity, and white uniformity performance throughout tube life.

- 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

Picture Tube Data

Electrical:

Heater	
Voltage 6.3	V
Current	mA
Focusing Method Ele	ctrostatic
Focus Lens	ipotential
Convergence Method Magneti	c (Preset)
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Diagonal 110	deg
Horizontal	deg
Vertical	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	max. oF
External Conductive Coating	nin. pF
	min. pr
Capacitance Between Anode and Metal Hardware	pF
	pr
Resistance Between Metal Hardware	
and External Conductive Coating 50 r	min. MS2

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 0.826 mm

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

Mechanical:	
Tube Dimensions:	
Overall length 31	58.44 ± 6.35 mm
At mold-match line:	
Diagonal	564.2 ± 2.0 mm
Horizontal	484.3 ± 2.0 mm 379.8 ± 2.0 mm
Vertical	3/3.8 I 2.0 mm
Minimum Screen Dimensions (Projected):	
Diagonal	
Horizontal	
Vertical	
Area	14/1 sq cm
Bulb Funnel Designation J	IEDEC No.J561D
Bulb Panel Designation J	EDEC No.F564D
Anode Bulb Contact Designation Reces	
Cap (IEC 67-111-2, J	IEDEC No.J1-21)
Base Designation ^a JEI	DEC No.812-260
Pin Position Alignment Pin No.1 Alig	ans Approx, with
	ode Bulb Contact
Operating Position Anode	Bulb Contact Up
Gun Configuration H	orizontal In-Line
_Weight (Approx.)	

imal	neinn	Protecti	nn
111122-21	1031011	. LOIGCE	UN

Туре	. Rim Bands and Tension Band
------	------------------------------

Maximum and Minimum Ratings,

Absolute-Maximum Values^b

Unless	otherwise	specified;	voltage	values ar	e positive	with	respect
to grid	No.1.						

Anode Voltage	{27.5 20	max.	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 Negative peak value	2	max.	v
Heater Voltage (AC or DC)d,e	6.9 5.7	max.	V V
Heater-Cathode Voltage: f Heater negative with respect to cathode: During equipment warm-up period			
After equipment warm-up period:	450	max.	V
DC component value	200	max.	V
Peak value Heater positive with respect to cathode:	300	max.	V
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
	Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot See CUTOFF DESIGN
	CHART in Figure 3
٩	At cathode voltage of 125 V345 to 675 VAt cathode voltage of 150 V435 to 835 VAt cathode voltage of 175 V530 to 990 V

Maximum Ratio of Cathode Voltage	ës,		
Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot	Curath		1.50
Heater Voltaged,e			
Grid-No.3 Current9		±1	5 µA
Grid-No.2 Current		±	5μΑ
Grid-No.1 Current		t	5 UA
	6550 K +	9300 K	
To Produce White Light of	7 M.P.C.D.	27 M.P.(C.D.
	((IIIum. D)		
CIE Coordinates:	0.212	0.281	
Ŷ		0.311	
Percentage of total anode	0.020	0.011	
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 Maximum	0.88	0.56	
Blue/green:	1.05	0.70	
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 mm
Vertical		± 8.0	0 mm
D. G. J. V.L. D.			
Deflection Yoke Data			
Horizontal Section:h			
Inductance at 1 V rms and 1 kHz		0.27 ± 5%	mΗ Ω
Resistance at 25° C		0.35 1.7%	36
edge scan at 25 kV:			
Peak-to-peak deflection curre	nt	12.0	A
Stored energy			mJ
Vertical Section, Including			
Quadrupole Coil Circuit:			
Inductance at 1 V rms and 1 kHz		32 + 5%	mH

Quadrupole Coil Circuit:	
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	Α
Typical Raster Pincushion Distortion:k	
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 12.5 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	

nected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

- 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.

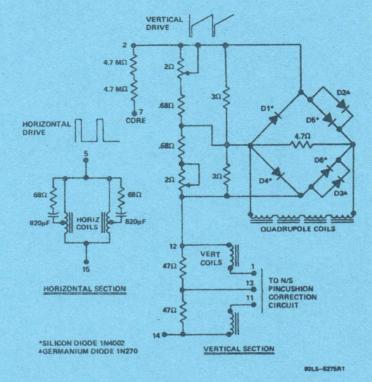
The device manufacturer chooses these values to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environment variations, and the effects of changes in operating conditions due to variations in device characteristics.

The equipment manufacturer should design so that initially and hroughout 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.
- 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.

- 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.
- I 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.
- 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.





Basing Specification JEDEC No. 13G

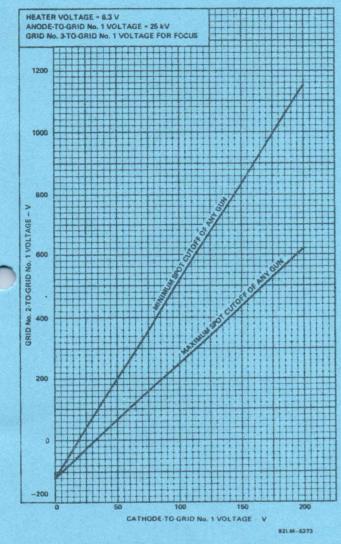
- Pin 1: Grid No.3
- Pin 3: Cathode of Blue Beam
- Pin 4: NC
- Pin 5: NC
- Pin 6: Heater
- Pin 7: Heater
- Pin 8: Cathode of Red Beam
- Pin 9: Grid No.1 Pin 10: Grid No.2
- Pin 10: Grid No.2 Pin 11: NC
- Pin 12: Cathode of Green Beam
- Pin 13: IC (Do Not Use)

Cap: Anode (Grid No.4, Screen, Collector) C: External Conductive Coating 9215-

Figure 2 - Bottom View of Base



4





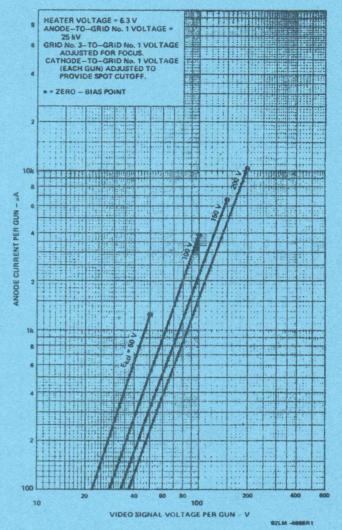


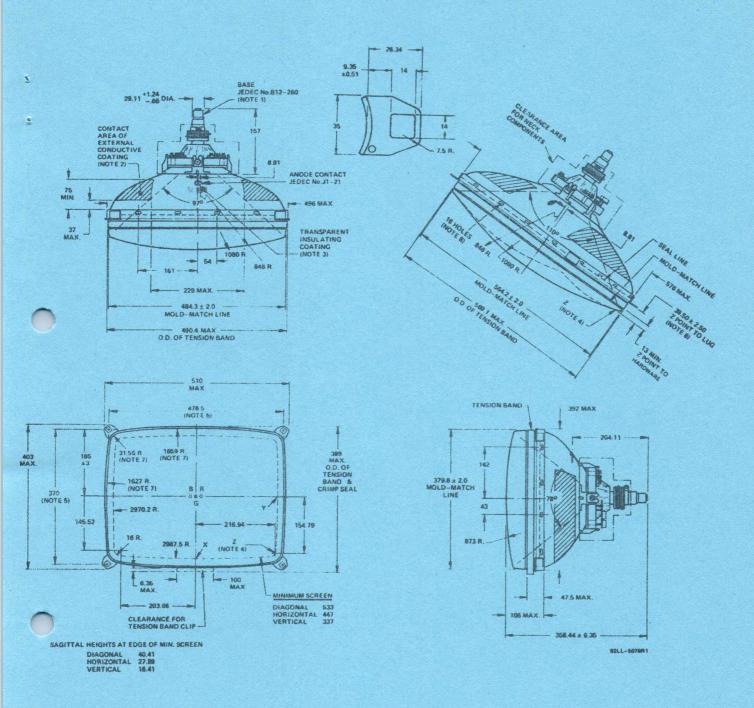
Figure 4 – Typical Drive Characteristics, Cathode-Drive Service

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.

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Dimensions in mm unless otherwise noted

Figure 5 - Dimensional Outline

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A56-613X

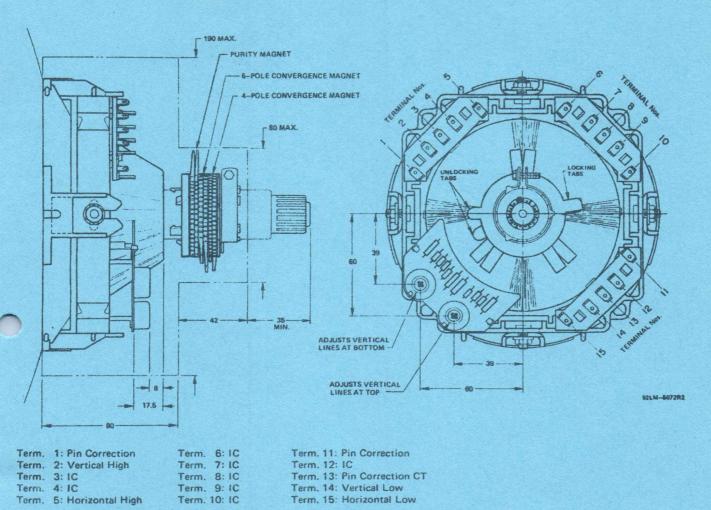


Figure 6 - Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

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 erformance. 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.

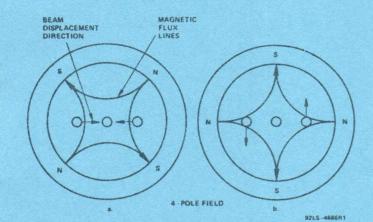
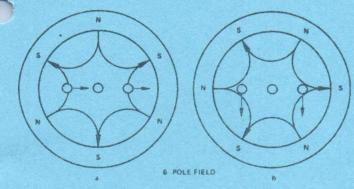


Figure 7 — Beam Motion Produced by the Four-Pole Convergence Magnet



9215-468781



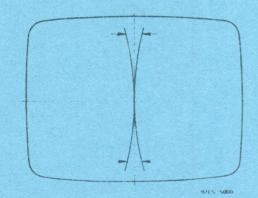
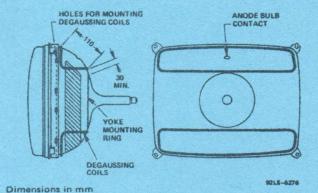


Figure 9 – Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

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.





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.

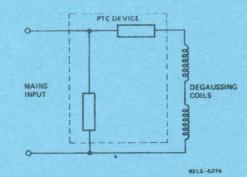


Figure 11 - Typical Degaussing Circuit

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 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 perated 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

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 (1M Ω).

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.



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Color Picture Tubo

A67-127X

MATRIX Screen

- 90⁰ 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 ex-

Formerly RCA Developmental Type C76380.

tend 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.

General Data

-			100		33	
FI	Ph.	c.4		cal	٠	

Electron Guns, Three with Axes Titled Toward Tube Axis
Heater: 6.3 V Current 900 mA
Focusing Method Electrostatic
Focus Lens Bipotential
Convergence Method Magnetic
Deflection Method Magne*
Deflection Angles (Approx.): Diagonal
Direct Interelectrode Capacitance (Approx.): Grid No.1 of any gun to all other electrodes Grid No.3 to all other electrodes All cathodes to all other electrodes 15
Capacitance Between Anode and {2500 max.pF External Conductive Coating 2000 min, pF
Capacitance Between Anode and Rim Band PF
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$

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	ca	

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 absorbant
Persistence
adjacent dot trios (Approx.) 0.66 mm

Mechanical:

Tube Dimensions:

Overall length
Neck length
Diagonal
Horizontal
Vertical
Minimum Screen Dimensions (Projected):
Diagonal
Horizontal 527.71 mm
Vertical
Area 2032 sq cm
Bulb Funnel Designation JEDEC No.J663/.
Bulb Panel Designation JEDEC No.F667A
Anode Bulb Contact Designation Recessed Small Cavity Cap (JEDEC No.J1-21)
Base Designation ^a
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.)

Implosion Protection

Type Rim Bands and Tension Band

Maximum and Minimum Ratings,

Absolute-Maximum Valuest

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

Anode Voltage	27.5	max. min.	kV kV	
Anode Current, Long-Term Average ^C	1000	max.	ЦА	
Anoue Guitent, Long-term Maeloge	1000	max.	mo	
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	PER LA			
	16.9	max.	V	
Under operating conditions	5.7	min.	V	
Under standby conditions ^e	5.5	max.	V	

			- 30
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	mex.	V
Heater positive with respect to cathode:			
DC component value	0	max.	V
Poak volue	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	1	6.8% to 20 Anode vo	
Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot See	CUTOFF DI	ESIGN CH	ART
At grid-No.1 voltage of75 V At grid-No.1 voltage of125 V At grid-No.1 voltage of175 V	· · · · · · · · · · · · · · · · · · ·	. 95 to 2 205 to 5 315 to 7	95 V 35 V 80 V
Maximum Ratio of Grid-No.2 Voltage, Gun to Lowest Gun in Any Tube (At gr spot cutoff voltage of -IO0 V)	Highest id-No.1		1.86
Heater Voltage:d Under operating conditions: When standby operation is not ut When 5.0-V standby operation is Under standby conditions ⁹	utilized ^e	6.	0 V
Grid-No.3 Current (Total)			
Grid-No.2 Current			5 µA
Grid-No.1 Current		±!	5μΑ
	Illum. D	Color	
To Produce White Light of		9300° K	
CIE Coordinates:	7 M.P.C.D.	27 M.P.C	.U.
X	0.313	0.281	
Υ		0.311	
Percentage of total anode current			
supplied by each beam (average):	~		~
Blue	34 28	23 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	
Minimum	0.72	0.83	
Minimum Typical Maximum	0.72 0.90		
Minimum	0.72 0.90	0.83	
Minimum Typical Maximum Displacements, Measured at Center of So	0.72 0.90 creen:	0.83 1.00	mm
Minimum Typical Maximum Displacements, Measured at Center of So Raster centering displacement: Horizontal Vertical	0.72 0.90 creen:	0.83 1.00	mm mm
Minimum Typical Maximum Displacements, Measured at Center of So Raster centering displacement: Horizontal Vertical Lateral distance between the blue be	0.72 0.90 creen:	0.83 1.00 ±11.4 ±11.4	mm
Minimum Typical Maximum Displacements, Measured at Center of So Raster centering displacement: Horizontal Vertical Lateral distance between the blue be and the converged red and green beau	0.72 0.90 creen:	0.83 1.00 ±11.4 ±11.4	mm
Minimum Typical Maximum Displacements, Measured at Center of Sc Raster centering displacement: Horizontal Vertical Lateral distance between the blue be and the converged red and green bear Radial convergence displacement excluding effects of dynamic	0.72 0.90 creen: am ms	0.83 1.00 ±11.4 ±11.4 ±6.4	mm mm
Minimum Typical Maximum Displacements, Measured at Center of So Raster centering displacement: Horizontal Vertical Lateral distance between the blue be and the converged red and green beau Radial convergence displacement	0.72 0.90 creen: am ms	0.83 1.00 ±11.4 ±11.4 ±6.4	mm mm
Minimum Typical Maximum Displacements, Measured at Center of Sc Raster centering displacement: Horizontal Vertical Lateral distance between the blue be and the converged red and green bear Radial convergence displacement excluding effects of dynamic convergence (each beam) Maximum Required Correction for	0.72 0.90 creen: am ms	0.83 1.00 ±11.4 ±11.4 ±6.4	mm mm
Minimum Typical Maximum Displacements, Measured at Center of Se Raster centering displacement: Horizontal Vertical Lateral distance between the blue be and the converged red and green bear Radial convergence displacement excluding effects of dynamic convergence (each beam) Maximum Required Correction for Register [‡] (Including effect of earth's	0.72 0.90 creen: am ms	0.83 1.00 ±11.4 ±11.4 ±6.4	mm mm
Minimum Typical Maximum Displacements, Measured at Center of Sc Raster centering displacement: Horizontal Vertical Lateral distance between the blue be and the converged red and green bear Radial convergence displacement excluding effects of dynamic convergence (each beam) Maximum Required Correction for Register ⁴ (Including effect of earth's magnetic field when using recommended	0.72 0.90 creen: am ms	0.83 1.00 ±11.4 ±11.4 ±6.4	mm mm
Minimum Typical Maximum Displacements, Measured at Center of Se Raster centering displacement: Horizontal Vertical Lateral distance between the blue be and the converged red and green bear Radial convergence displacement excluding effects of dynamic convergence (each beam) Maximum Required Correction for Register [‡] (Including effect of earth's	0.72 0.90 creen: am ms	0.83 1.00 ±11.4 ±11.4 ±6.4 ±9.4	mm mm

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

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

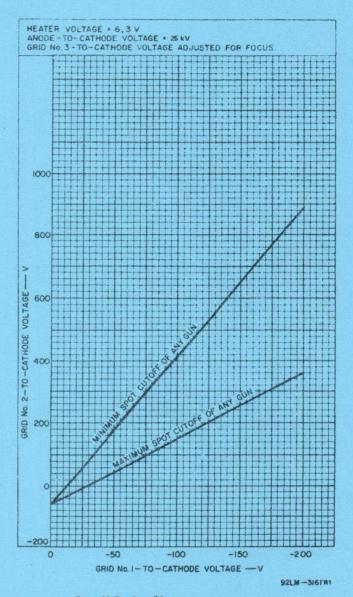
Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

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.

- 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.

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





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.

A67-127X

AL/1977/3 Annex CRT 38



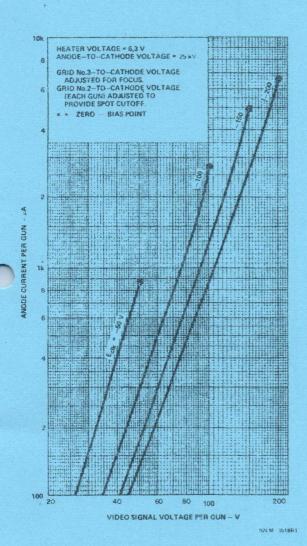


Figure 2 - Typical Drive Characteristics, Grid-Drive Service

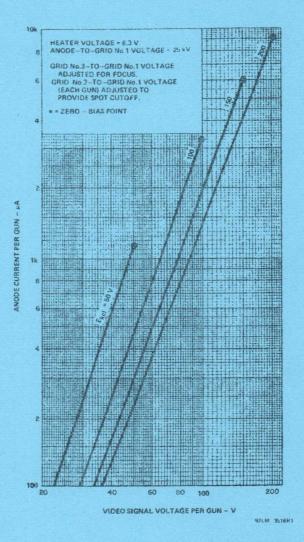


Figure 3 - Typical Drive Characteristics, Cathode-Drive Service

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 M Ω).

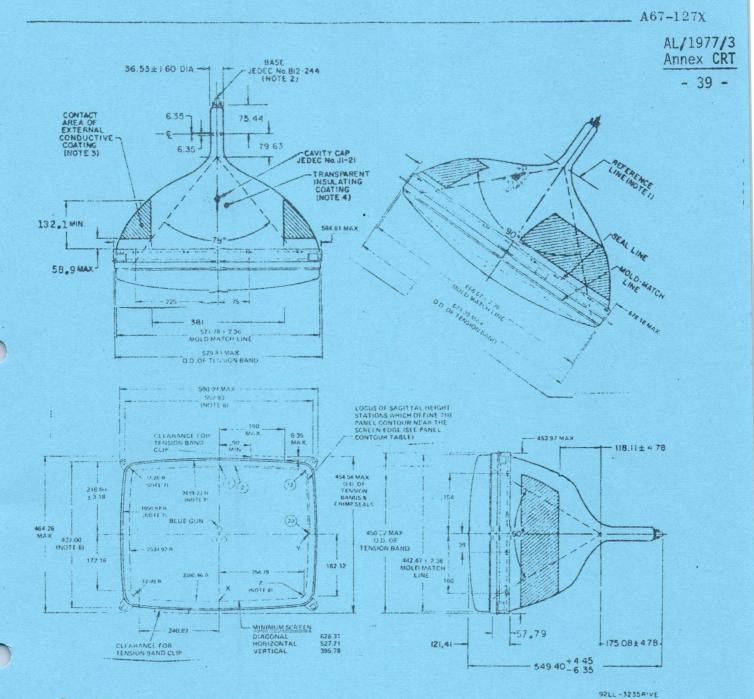
The color receiver mounting system should incorporate sufficient cushioning so that under normal conditions of shipment or handling an impact force of more than 35 g is never applied to the picture tube.

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.

	Coordinates		
Station No.	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 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

1 1

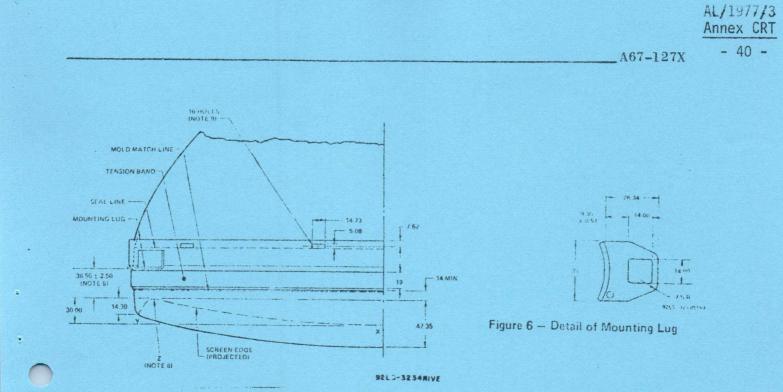


Figure 5 -- Detail of Panel

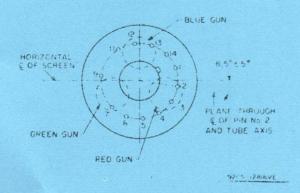


Figure 7 - Bottom View of Base

Pin 2: Cathode of Red Gun Pin 3: Grid No.1 of Red Gun Grid No.2 of Red Gun

Pin 6: Cathode of Green Gun Pin 7: Grid No.1 of Green Gun

(in 12: Grid No.1 of Blue Gun Pin 13: Grid No.2 of Blue Gun

Grid No.3

Heater

Pin 1: Heater

Pin 4:

Pin 5:

Pin. 9:

Pin 11:

Pin 14:

Cap:

C:

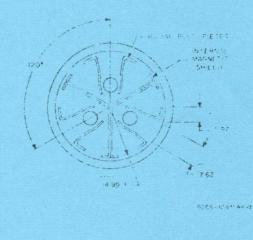
Base Specification - JEDEC No.14BE

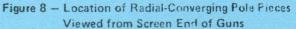
Grid No.2 of Green Gun

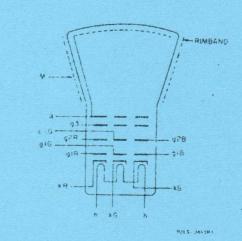
Cathode of Blue Gun

Anode (Grid No.4, Screen, Collector)

External Conductive Coating









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



O 1 SEPTEMBRE 1975.

Color Picture Tube

A67-155X

ANNEX ML-TE CRT75/02-03

0 -

New High-Resolution Bipotential Gun

Moire Minimized in 625 TV-Line Systems

Sharper Pictures - Greater detail

Improved Wide-Angle Temperature-

Compensated Shadow-Mask System

Banded-Type Implosion Protection --

110º Deflection-29mm Neck-67 cm Diagonal

- Wide Angle Deflection 1100
- 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

RCA-A67-155X is a 110º, 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, 90º 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 in corporates 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 he screen of a standard color picture tube, without reucing 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

Formerly RCA Developmental Type C76284

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.

General Data

Electrical:
Electron Guns, Three with Axes Titled Toward Tube Axis
Heater: Voltage
Focusing Method Electrostatic
Focus Lens
Convergence Method Magnetic
Deflection Method Magnetic
Deflection Angles (Approx.): Diagonal
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 [2500 max.pF External Conductive Coating
Capacitance Between Anode and Rim Band
Resistance Between Metai Hardware and External Conductive Coating
Optical:
Faceplate Filterglass Light transmission at center (Approx.)
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

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467-155X

For "Push-Through" cabinet designs Integral Mounting Lugs

A67-155X _

ANNEX ML-TE, CRT75/02-03 - 10 -

General Data (cont'd)

Mechanical:

Tube Dimensions:

Tube Dimensions.	
Overall length	
Reference line to center of face	
Neck length	
At mold-match line:	
Diagonal	
Horizontal 571.78 ± 2.36 mm	
Vertical	
Minimum Screen Dimensions (Projected):	
Diagonal	
Horizontal	
Vertical	
Area	
Bulb Funnel Designation JEDEC No.J663C	
Bulb Panel Designation JEDEC No.F667A	
Anode Bulb Contact Designation Recessed Small Cavity Cap (IEC 67-111-2, JEDEC No.J1-21)	
Base Designation ^a JEDEC No.B12-260	
g Designation	
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	e.
Gun Configuration Delta	
Weight (Approx.)	
and the second	

Implosion Protection:

Type	 	 Rim Bands and	Tension Bands

Maximum and Minimum Ratings,

Absolute-Maximum Valuesb

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

Anode Voltage 27.5 max. kl Anode Current, Long-Term Average ^C 1000 max. µ Grid-No.3 (Focusing electrode) Voltage 6000 max. µ Peak Grid-No.2 Voltage, 1000 max. µ Including Video Signal Voltage 1000 max. µ No.1 Voltage; 1000 max. µ No.1 Voltage; 1000 max. µ No.1 Voltage; 400 max. µ No.1 Voltage; 0 max. µ Negative operating cutoff value 200 max. µ Positive bias value 0 max. µ Positive peak value 0 max. µ Videar operating conditions 5.7 min. Under operating conditions ^e 5.5 max. µ Heater Cathode Voltage: 450 max. 450 max. Heater cathode Voltage: 450 max. 330 max. 450 max. 330 max. After equipment warm-up period: 275 max. 330 max. 100				
Anode Current, Long-Term Average ² 1000 max. Grid-No.3 (Focusing electrode) Voltage 6000 max. Peak Grid-No.2 Voltage, 1000 max. Including Video Signal Voltage 1000 max. No.1 Voltage: 400 max. Vegative bias value 400 max. Negative operating cutoff value 200 max. Positive bias value 0 max. Positive peak value 0 max. Videar operating conditions 65.7 min. Under operating conditions ^e 5.5 max. Heater Cathode Voltage: 450 max. Heater cathode Voltage: 450 max. Heater equipment warm-up period 275 max. After equipment varm-up period: 275 max. DC component value 275 max. Heater positive with respect to cathode: 0 max. DC component value 0 max. DC component value 0 max.	Anode Voltage			kV kV
Grid-No.3 (Focusing electrode) Voltage 6000 max. Peak Grid-No.2 Voltage, 1000 max. Including Video Signal Voltage 1000 max. No.1 Voltage: 400 max. iegative bias value 400 max. No.1 Voltage: 0 max. iegative bias value 0 max. Positive operating cutoff value 260 max. Positive peak value 0 max. Positive peak value 2 max. Heater Voltage (ac or dc):d (6.9 max. Under operating conditions 5.7 min. Under standby conditions ^e 5.5 max. Heater Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period 450 max. After equipment warm-up period: 275 max. DC component value 275 max. Heater positive with respect to cathode: 0 max. DC component value 0 max.	And Courses Long Trees Avenue	•		
Peak Grid-No.2 Voltage, Including Video Signal Voltage 1000 max. No.1 Voltage: Vegative bias value 400 max. Negative operating cutoff value 260 max. Positive operating cutoff value 0 max. Positive bias value 0 max. Positive peak value 0 max. Positive peak value 0 max. Heater Voltage (ac or dc):d (6.9 max. Under operating conditions (5.7 min. Under standby conditions ^e 5.5 max. Heater Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period 450 max. After equipment warm-up period: 275 max. DC component value 275 max. Heater positive with respect to cathode: 0 max. DC component value 0 max.	Anode Lurrent, Long-Term Average	1000	max.	pipi
Including Video Signal Voltage 1000 max. No.1 Voltage: 400 max. Negative bias value 200 max. Positive bias value 0 max. Positive peak value 2 max. Heater Voltage (ac or dc):d 6.9 max. Under operating conditions 5.7 min. Under standby conditions ^e 5.5 max. Heater Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period 450 max. After equipment warm-up period: 275 max. Peak value 330 max. Heater positive with respect to cathode: 0 max.	Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
legative bias value 400 max. Negative operating cutoff value 260 max. Positive operating cutoff value 0 max. Positive peak value 0 max. Positive peak value 2 max. Heater Voltage (ac or dc):d (6.9 max. Under operating conditions 5.7 min. Under standby conditions ^e 5.5 max. Heater Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period 450 max. After equipment warm-up period: 275 max. Peak value 330 max. Heater positive with respect to cathode: 0 max. DC component value 0 max. DC component value 0 max. Neater positive with respect to cathode: 0 max.		1000	max.	v
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Positive bias value 0 max. Positive peak value 2 max. Heater Voltage (ac or dc):d 2 max. Under operating conditions 6.9 max. Under standby conditions ⁰ 5.7 min. Under standby conditions ⁰ 5.5 max. Heater negative with respect to cathode: During equipment warm-up period 450 max. After equipment warm-up period: DC component value 275 max. Peak value 330 mex. Heater positive with respect to cathode: DC component value 0 max.		400	max.	V
Positive peak value 2 max. Heater Voltage (ac or dc):d (6.9 max. Under operating conditions (5.7 min. Under standby conditions ^e 5.5 max. Heater Cathode Voltage: 5.5 max. Heater negative with respect to cathode: During equipment warm-up period 450 max. After equipment warm-up period: 0 component value 330 max. Heater positive with respect to cathode: 0 max. 450 max. During equipment warm-up period: 0 max. 450 max. After equipment warm-up period: 0 max. 330 max. Decomponent value 0 max. 0 max.	Negative operating cutoff value	200	max.	V
Positive peak value 2 max. Heater Voltage (ac or dc):d (6.9 max. Under operating conditions (5.7 min.) Under standby conditions ^e 5.5 max. Heater Cathode Voltage: 5.5 max. Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds 450 max. After equipment warm-up period: 275 max. DC component value 330 max. Heater positive with respect to cathode: 0 max.	Positive bias value	0	max.	V
Under operating conditions 6.9 max. Under standby conditions ^e 5.7 min. Under standby conditions ^e 5.5 msx. Heater Cathode Voltage: 5.5 msx. Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds 450 max. After equipment warm-up period: 275 max. Dc component value 330 mex. Heater positive with respect to cathode: 0 mex.		2	max.	V
Under operating conditions 5.7 min. Under standby conditions ^e 5.5 max. Heater degative with respect to cathode: 5.5 max. During equipment warm-up period 6.7 min. not exceeding 15 seconds 450 max. After equipment warm-up period: 275 max. Dc component value 330 max. Heater positive with respect to cathode: 0 max.	Heater Voltage (ac or dc):d			
Under standby conditions ^e 5.5 max. Heater-Cathode Voltage: 5.5 max. Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds 450 max. After equipment warm-up period: 275 max. DC component value 330 mex. Heater positive with respect to cathode: 0 max.	Linder operation conditions		max.	V
Heater -Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period 450 max. After equipment warm-up period: 275 max. DC component value 330 mex. Heater positive with respect to cathode: 0 max.	onour openaning contentions	15.7	min.	V
Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds 450 max. After equipment warm-up period: 275 max. DC component value 330 mex. Heater positive with respect to cathode: 0 mex.	Under standby conditions ^e	5.5	max.	V
After equipment warm-up period: DC component value	Heater negative with respect to cathode: During equipment warm-up period			
DC component value	After equipment warm-up period:	450	max.	V
Peak value		275	max,	V
Heater positive with respect to cathode: DC component value	Peak value	330	max.	V
DC component value 0 max.	Heater positive with respect to cathode:			
		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.2 Voltage for Visual Extinction of Undeflected Focused Spot See	CUTOFF DESIGN CHAR	T
At grid-No.1 voltage of75 V At grid-No.1 voltage of125 V At grid-No.1 voltage of125 V	95 to 295 \ 205 to 535 \ 205 to 780 \	2
Maximum Ratio of Grid-No.2 Voltage, H Gun to Lowest Gun in Any Tube (At grid spot cutoff voltage of ~100 V)	1-No.1	6
Heater Voltage:d Under operating conditions: When standby operation is not util Whan 5.0-V standby operation is u	itilized ^e 6.0 V	VVV
Under standby conditions ^e Grid-No.3 Current (Total)		-
Grid-No.2 Current		
Grid-No.1 Current		
	Hiera, D Color	
	6550° K + 9300° K + 7 M.P.C.D. 27 M.P.C.D.	
CIE Coordinates:	0.313 0.281	
Y	0.329 0.311	
Percentage of total anode current supplied by each beam (average):		
Red		%
Blue Green		No.
Ratio of cathode currents: Red/blue:		
Minimum	1.05 0.50	•
Typical	1.22 0.67 1.55 0.90	
Red/green: Minimum	0.75 0.40	
Typical	0.88 0.56	
Maximum	1.05 0.70	
Minimum	0.50 0.60	
Typical Maximum	0.72 0.83	
Displacements, Measured at Center of Sor		
Raster centering displacement: Horizontai		**
Vertical	±12 mc	
Lateral distance between the blue bea and the converged red and green beam	m ns	'n
Radial convergence displacement		
excluding effects of dynamic convergence (each beam)	±8 mr	n
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 Ur	'n
Automatic Degaussing Field (See Magnet		
Shield under General Considerations): Initial peak-to-peak value Quiescent peak-to-peak value	1500 min. A	t
Limiting Circuit Values		
High-Voltage Circuits: Grid-No.3 circuit resistance	7.5 max. MS	2
Low-Voltage Circuits: Effective grid-No.1-to-cathode-		
circuit resistance (each gun)	0.75 max. MS	2

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.

ANNEX ML-TE <u>CRT75/02-03</u>

A67-155X

Absolute-Maximum ratings are finiting 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.

921 4 371282

3

Figure 1 - Cutoff Design Chart

- 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 biesing circuit for the heater should be between 100 kilohos 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.

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.

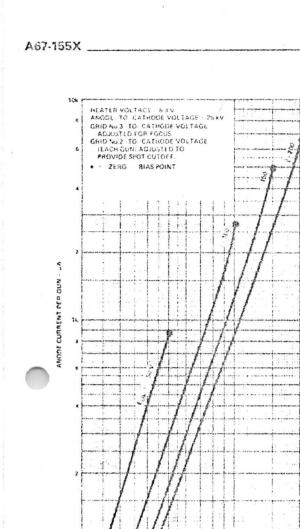
This color picture tube incorporates integral x-radiation shielding and must be replaced with a tube of the same type number or an RCA recommended replacement to assure continued safety.

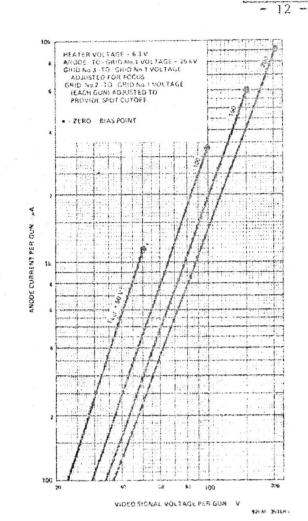
Implosion Protection:

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.





ANNEX ML-TE

CRT75/02-03

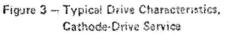
Figure 2 – Typical Drive Characteristics, Grid-Drive Service

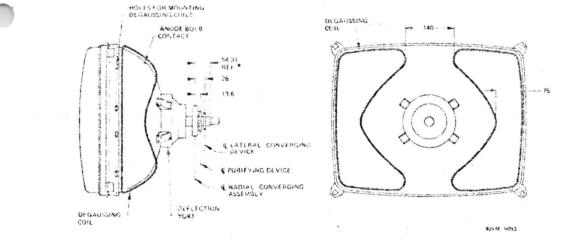
40

so 8-3 100

VIDEO SIGNAL VOLTAGE PER GUN - V

100





4

1

204

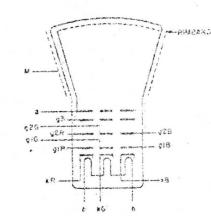
971.M 1518R1

*Center line of Radial Converging Assembly Core directly over center line of internal pole pieces. Dimensions in mm unless otherwise noted.

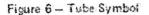
Figure 4 - Relative Placement of Typical Components

ANNEX ML-TE . A67-155X

 $\frac{CRT75/02-03}{-13}$



921.5-345421



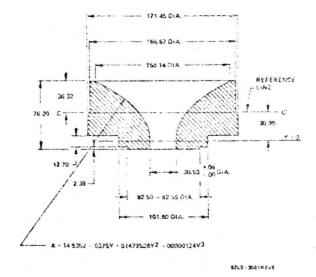
Basing Spacification JEDEC No. 13C

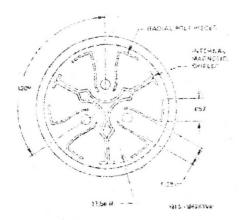
- Pin 1: Grid No.3
- Pin 3: Cathode of Blue Gun
- Pin 4: Grid No.1 of Blue Gun
- Pin 5: Grid No.2 of Blue Gun
- Pin 6: Heater
- Pin 7: Heater
- Pin 8: Cathode of Red Gun Pin 9: Grid No.1 of Red Gun
- Pin 10: Grid No.2 of Red Gun
- Pin 11: Grid No.2 of Green Gun

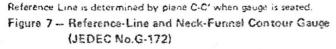
Pin 12: Cathode of Green Gun

Pin 13: Grid No.1 of Green Gun

Bulb Contact: Anode (Grid No.4, screen, collector) M: External Conductive Coating







Dimensions in mm unless otherwise noted.

15.24 1 0.08 DIA

178:008

2.54 : 0.08 -

0.38 A MAX.

3 30 2 0.13 -

22.85 10.13

Figure 5 - Base

1.27 : 0.13

1.27 : 0 0

٩

0 38

25.114

14 10-0.25 DIA -

SECTION A-A

PLANE THROUGH

0.35 19.05 ± 0.08 DHA HORIZONTAL

0.76 R. MAX.

FIN 1.02 1 0.5

DIA

: 0.89

38120.13

4

12L8 - 118564VE

260 . 60

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

ANNEX ML-TE A67-155X CRT75/02-03 - 14 -BASE JEDEC No.B12-260 (NOTE 2) 29.11 - 1.50 DIA YOKE ALIGNMENT INTERNAL ŧ 1100 7 1 28 TING PAD RADIAL CONVERGING 54.31 CONTACT . * AREA OF EXTERNAL CONDUCTIVE COATING (NOTE 3) C 1 74.42 ANODE CONTACT 4.32 Ø.12 JEDEC No.31 21 IEC 67-10 -2 TRANSPARENT INSULATING COATING (NOTE 4) TE BO MIN. TEFERENCE LINE 584.81 MAX ŧ 35 MAX. ----SEAL LINE 1 -75-225 230 MOLOSE 67 10 10 12 2 30 10 10 10 10 LINE MATCH O.O. OF TENSION EAND 571.78 ± 2.36 CTS. TH ARA.K. 579.83 MAX. OF TENSION BAND 0.0 590.09 MAX 557.83 (NOTE E) LOCUS OF SAGITTAL HEIGHT STATIONS WHICH DEFINE THE PANEL CONTOUR NEAR THE SCREEN EDGE (SEE PANEL CONTOUR TABLE) CLEARANCE FOR TENSION BAND CLIP 6.35 MAX 453.97 MAX. .90. MIN + 83.69 : 4.78 448.00 MAX D.D. OF TENSION 37.26 R $\overline{\mathbb{O}}$ (12) 216.00 ± 3.18 2499.23 R BANDS & CRIMP SEALS 154 19:0.97 1 NOTE 71 20 BLUE GUN 460.32 MAX O.D. OF TENSION BAND 464.26 MAX. 432.00 (NOTE 6) 39 2534.92 A Ţ 442.47 ± 2.36 MOLD-MATCH LINE 172.16 182.12 P.4 74 1380 46 A. INOTE B MINIMUM SCREEN 57.15 DIAGONAL HORIZONTAL VERTICAL 625.31 527.71 395.78 CLEARANCE FOR TENSION BAND CLIP 280.44 151.50 + 4 78 432.03 ± 9.53 Dimensions in mm unless otherwise shown 1211-171167



- 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).

ANNEX ML-TE CRT75/02-03

Panel Contour

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

	Coord	linates	Sagittal
Station No.	Y Axis	X Axis	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
3	266.52	50.80	35.05
19	266.90	25.40	34.16
20 (Major)	267.03	0	33.86

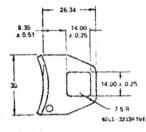


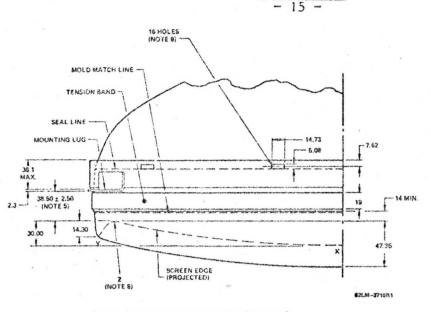
Figure 10 - Detail of Mounting Lug

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 isembly 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 ampereturns) or less the degaussing current may be turned off.



Dimensions in mm unless otherwise noted.

Figure 11 - Detail of Panel

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

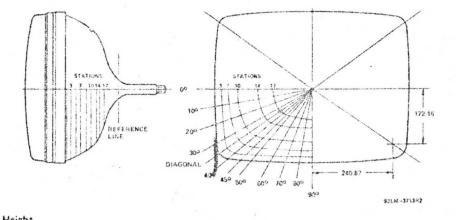
Integral mounting lugs are provided to facilitate mounting the A67-155X in the receiver. If the integral mounting system is accessible in the receiver it is recommended that it be connected to the receiver chassis through one of the mounting lugs. If the chassis is not at earth potential the connection should be made through a current limiting resistor (1 M Ω).

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.

ANNEX ML-TE CRT75/02-03 - 16 -



Station	Height Above Ref. Line	Major Anis Go	109	200	300	Diag. Axis 35°33'17''	400	450	500	600	700	800	Minor Axis 900
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
BLine	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
	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	197.68	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.

e 12 - Bogie Bulb Contour Dimensions

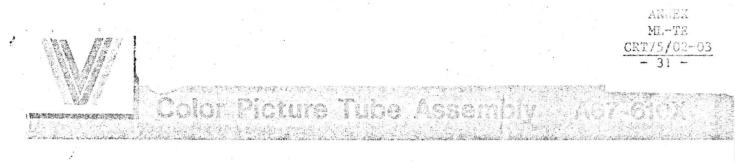
Color Purity and Convergence Adjustments

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.

RCA Picture Tude Division | Harrison, NJ 07029



2 5 JUIN 1975

110° Deflection-23mm 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	Elect	trostatic
Focus Lens	Bip	otential
Convergence Method	Magnetic	(Preset)
Deflection Method	N	Aagnetic
Deflection Angles (Approx.): Diagonal Horizontal Vertical	110 97 77	deg deg deg

A67-610X

Picture Tube Data (Cont'd)		
Direct Interelectrode Capacitance (Appro Grid No.1 to all other electrodes Grid No.3 to all other electrodes Green cathode to all other electrodes Red or blue cathode to all other	5.6 6.7	рF pF pF
electrodes	5.5	pF
Capacitance Between Anode and External Conductive Coating	2500 max. 2000 min.	рF pF
Resistance Between Metal Hardware and External Conductive Coating	50	MΩ
Optical: Faceplate: Light transmission at center (Approx. Surface		51% lished
Screen:	0	000
Phosphor, rare-earth (red) sulfide (blu Persistence Array	e & green) Medium Vertical Line	
Spacing between corresponding points on line trios (Approx.)	0.82	?6 mm
Mechanical:		
Tube Dimensions: Overall length	400.84 ± 6.3	35 mm
At mold-match line:		
Diagonal	666.67 ± 2.3	
Horizontal	571.78 ± 2.3	
Vertical	442.47 ± 2.3	36 mm
Minimum Screen Dimensions (Projected) Diagonal Horizontal Vertical	626.3 527.7 395.7	31 mm 71 mm 78 mm
Area		sq cm
Buib Funnel Designation	JEDEC No.	
Bulb Panel Designation	JEDEC No.I	
Cap (IEC 67-111-2		J1-21)
Base Bearging room	JEDEC No.B	
	Aligns Approx Anode Bulb C	ontact
Operating Position, Preferred Anode B		
Gun Configuration	Horizontal I	
Weight (Approx.)	2	20.5 kg
Implosion Protection:		
Type Rim Bands	and Tension	Bands
Maximum and Minimum Ratings, Absolute-Maximum Values;b Unless otherwise specified, voltage valu	es are positiv	ve with
respect to grid No.1. Anode Voltage	27.5 max.	kV
	20 min.	kV
Anode Current, Long-Term Average ^C	1000 max.	1
Grid-No.3 (Focusing electrode) Voltage		
Peak Grid-No.2 Voltage	1000 max.	. v
Cathode Voltage: Positive bias value	400 max.	v
Positive operating outoff value	200 max	Ň

Unless otherwise specified, voltage values are positive with respect to grid No.1. For anode voltage of 25 kV 16.8% to 20% of Grid-No.3 (Focusing electrode) Voltage Anode voltage Grid-No.2 Voltage for Visual Extinction See CUTOFF DESIGN of Undeflected Focused Spot **CHART** in Figure 2 335 to 670 V At cathode voltage of 125 V 425 to 820 V At cathode voltage of 150 V 510 to 975 V At cathode voltage of 175 V Maximum Ratio of Cathode Voltages, Highest Gun to Lowest Gun with Cathode Voltage Adjusted for 1.50 Spot Cutoff 6.3 V Heater Voltaged.e ± 15 µA Grid-No.3 Current ±5µA Grid-No.2 Current ±5µA Grid-No.1 Current Illum. D Color 9300º K + 65500 K + To Produce White Light of 7 M.P.C.D. 27 M.P.C.D. **CIE Coordinates:** 0.313 0.281 Х Y 0.329 0.311 Percentage of total anode current supplied by each beam (average): 23 % 34 Red 28 35 % Blue 42 % 39 Green Ratio of cathode currents: Red/blue: 0.50 1.05 Minimum 0.67 1.22 Typical 1.55 0.90 Maximum Red/green: 0.75 0.40 Minimum 0.56 Typical 0.88 0.70 1.05 Maximum Blue/green: 0.60 Minimum 0.50 0.72 0.83 Typical 1.00 0.90 Maximum Raster Centering Displacement, Measured at Center of Screen: ±8.0 mm Horizontal ±8.0 mm Vertical Limiting Circuit Values: High-Voltage Circuits: 7.5 max. MΩ Grid-No.3 circuit resistance Low-Voltage Circuits: Effective grid-No.1-to-cathode-0.75 max. $M\Omega$ circuit resistance

Heater-Cathode Voltage:

Peak value

In service mode

Peak value Typical Design Values:

DC component value

Heater negative with respect to cathode: During equipment warm-up period

Heater positive with respect to cathode:

not exceeding 15 seconds After equipment warm-up period:

DC component value

ARIALY ML-TE

 $\frac{CRT75/02-03}{-32}$

V

V

V

V

V

V

450 max.

200 max.

200 max.

300 max.

0 max. 200 max.

Positive operating cutoff value

Nerative bias value

N: sative peak value

i leater Voltage (AC or DC)d,e

200 max.

0 max.

2 max.

6.9 max.

5.7 min.

V

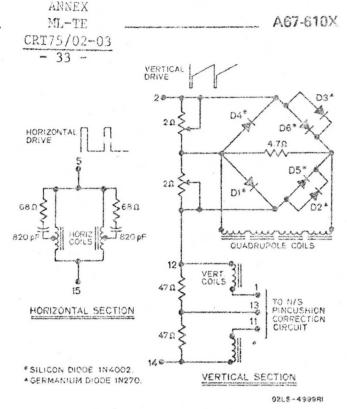
V

V

V

V

Deflection Yoke Data		
Horizontal Section:f		
Inductance at 1 V rms and 1 kHz	$0.28 \pm 5\%$	mH
Resistance at 25 ^o C	$0.36 \pm 7\%$	Ω
Typical operation with edge-to ed		
scan at 25 kV:		
Peak-to-peak deflection curren	t 12.0	A
Stored energy	5.1	mJ
51	0.1	1110
Vertical Section, Including		
Guadrupole Coil Circuit:9	0.0 . 50	
Inductance at 1 V rms and 1 kHz	$3.2 \pm 5\%$	mH
Resistance at 25° C:	10.1000	0
At vertical current = 0 A dc	$4.8 \pm 10\%$	Ω
At vertical current = 1.55 A do		Ω
Typical operation with edge-to-ed	ge	
scan at 25 kV:		
Peak-to-peak deflection curren	t 3.1	A
Raster Pincushion Distortion:h		
East/West	9.0%	
North/South	8.5%	
Maximum Ratings, Absolute-Maximu	ım Values: b	
Peak Pulse Voltage Across		
Horizontal Coils at 15,625 Hz		
for a Maximum Pulse Duration of 12	.5 μs 700 m	ax. V
Peak Pulse Voltage Between Horizon	ital	
and Vertical or Quadrupole Coils		
at 15,625 Hz for a Maximum		
Pulse Duration of 12.5 μ s	700 m	ax V
tores a starter of this po	100 111	





- 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.
- 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 do 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.
- 9 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 alaments. Therefore, the vertical deflection circuit should employ suitable circuit rechniques such as current feedback to ensure that the small non-linear 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.

2

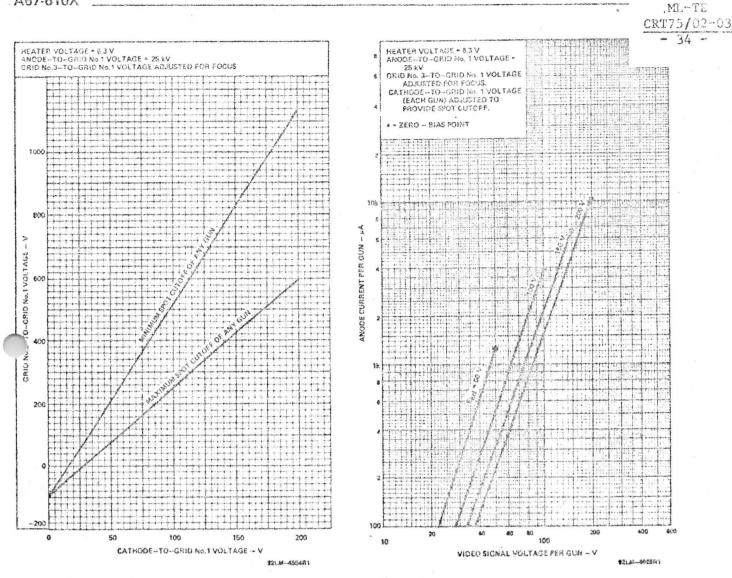
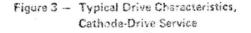


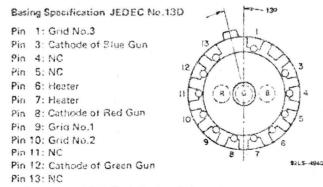
Figure 2 - Cutoff Design Chart

motes for Dimensional Outline

- Lote 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 5 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.
- The 8 Mounting holes for degaussing coils 14.73 mm x 5.09 mm.

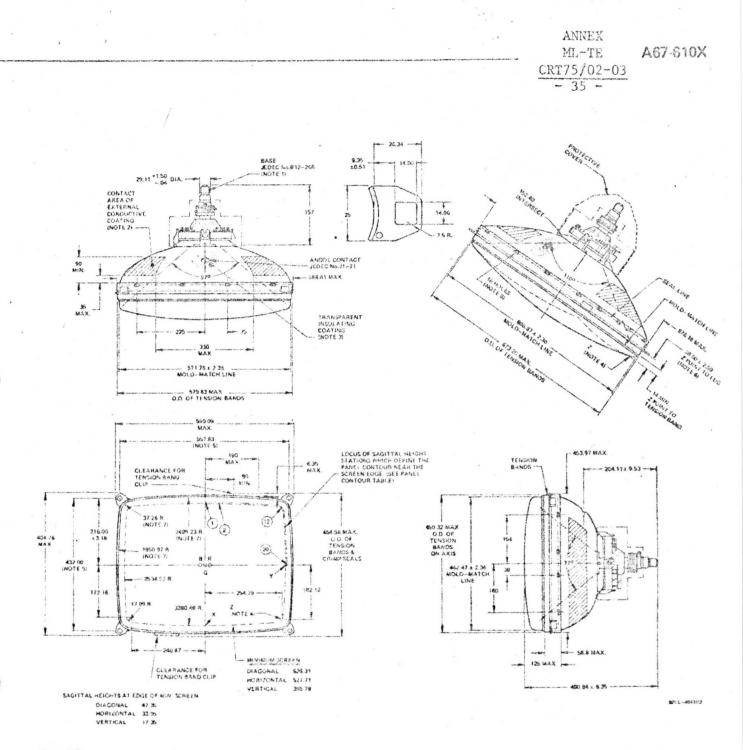


ANNEX



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

	Coord	inatos		Coordinates				
	Continuita		Sagittal					
Station No.	Y Axis	X Axis	Height	Station No.	Y Axis	X Axis	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	50.60	35.05	
9	203.20	194,87	37.74	19	268.90	25.40	34.16	
10	228.60	193.34	43.00	20 (Major)	267.03	0	33.86	

Dimensions in mm unless otherwise noted

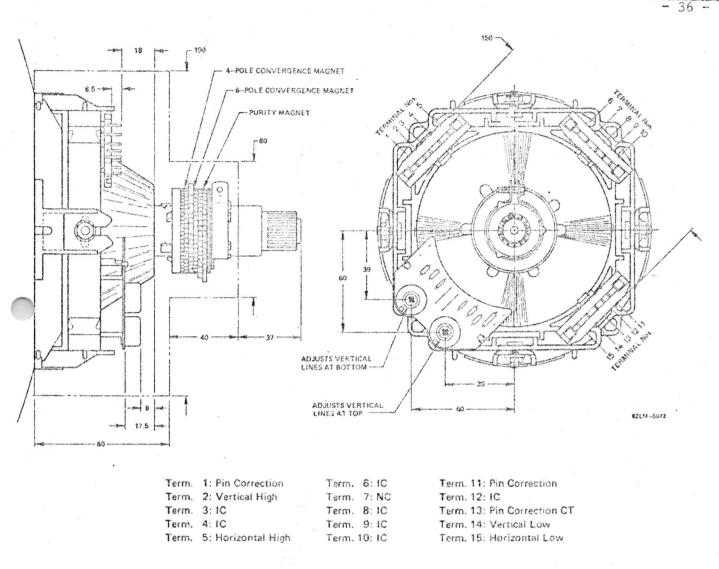


Figure 6 - Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

bnvergence 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.

ANNEX ML-TE

CRT75/02-03

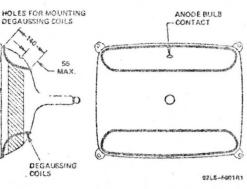
Convergence of the three beams over the entire screen is accomplished by (1) positioning of the yoke with respect to the beams and (2) application of vertical-frequency correction current through a quadrupole winding on the yoke. The yoke is adjusted and secured in its optimum position in the tube factory. 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.

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55 MAX



Dimensions in mm

Figure 10 - Relative Placement of Typical Degaussing Coil

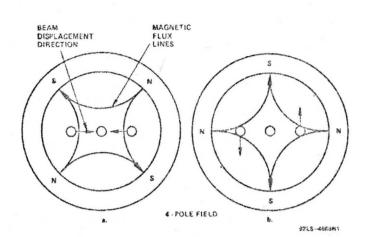


Figure 7 - Beam Motion Produced by the Four-Pole **Convergence** Magnet

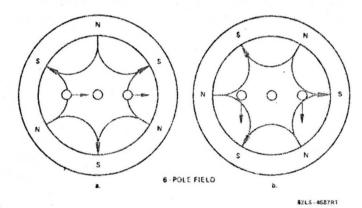


Figure 8 - Beam Motion Produced by the Six-Pole **Convergence** Magnet

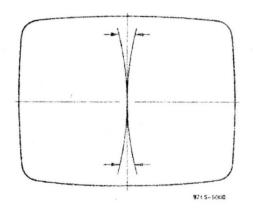


Figure 9 - Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

Magnetic Shield and Degaussing

The A67-610X 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.

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A67-610X

WARNING

X-Fadiation:

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 serng 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

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metal parts such as cabinets and control brackets may produce a shock hazard.

ANNEX ML-TE

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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.

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Color Picture Tube Assembly

B Picture Tube Division

A67-611X

110^o 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

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^o precision in-line color picture tube assembly features a low deflection power requirement. It

intains 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.

- 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

Picture Tube Data

Electrical: Heater: Voltage 6.3 700 mA Current Focusing Method Electrostatic Focus Lens..... Bipotential Convergence Method Magnetic (Preset) Deflection Method Magnetic Deflection Angles (Approx.): 110 deg 97 dea 78 deg Vertical Direct Interelectrode Capacitance (Approx.): pF 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 Red or blue cathode to all other electrodes . 6.5 pF Capacitance Between Anode and 2500 max. pF External Conductive Coating 2000 min. DF Capacitance Between Anode DF and Metal Hardware 400 Resistance Between Metal Hardware 50 min. $M\Omega$ and External Conductive Coating

Optical:

Faceplate: Light transmission at center (approx.) Po Surface	71% lished
Screen: Phosphor, rare-earth (red) sulfide (blue & green) Type	rbent
Array Vertical Line Spacing between corresponding points on line trios at center (approx.) 0.82	Trios

Information furnished by RCA is believed to be accurate and reliable. However, no responsibility is assumed by RCA for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of RCA.

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

A67-611X .

Mechanical:

-

Tube Dimensions:	
Overall length	400.84 ± 6.35 mm
At mold-match line:	
Diagonal	666.67 ± 2.00 mm
	571.78 ± 2.00 mm
Horizontal	
Vertical	442.47 ± 2.00 mm
Minimum Screen Dimensions (Projected):	
Diagonal	626.31 mm
Horizontal	
Vertical	
Area	
Bulb Funnel Designation	
Bulb Panel Designation	JEDEC No. F667A
Anode Bulb Contact Designation R	ecessed Small Cavity
Cap (IEC 67-11)	2, JEDEC No. J1-21)
Base Designation ^a	JEDEC NO.812-200
Pin Position Alignment Pin No.1	Alians Approx, with
	Anode Bulb Contact
Operating Position, And	ode Bulb Contact Up
Gun Configuration	Horizontal In-Line
Weight (Approx.)	20.5 kg

Implosion Protection

Туре	. Rim Bands and Tension Bands
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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
Anoue Foldge	1 20	min.	kV
Anode Current, Long-Term Average ^C	1000	max.	μΑ
Grid-No.3 (Focusing electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage:			
	400	max.	V
	200	max.	V
	0	max.	V
Negative peak value	2	max.	V
	[6.9	max.	V
Heater Voltage (AC or DC) ^o	15.7	min.	V
Heater-Cathode Voltage: ⁰			
Heater negative with respect to cathode:			
During equipment warm-up period			
	450	max.	V
	CONTRACTOR OF	max.	V
	. 300	max.	V
			V
Peak value	200	max.	V
	Grid-No.3 (Focusing electrode) Voltage Peak Grid-No.2 Voltage Cathode Voltage: Positive bias value . Positive operating cutoff value Negative bias value . Negative peak value . Heater Voltage (AC or DC) ^d Heater -Cathode Voltage: ⁶ Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds . After equipment warm-up period: DC component value .	Anode Voltage 20 Anode Current, Long-Term Average ^C 1000 Grid-No.3 (Focusing electrode) Voltage 6000 Peak Grid-No.2 Voltage 1000 Cathode Voltage: 400 Positive bias value 400 Positive operating cutoff value 200 Negative peak value 0 Negative peak value 2 Heater Voltage (AC or DC)d {6.9 Heater negative with respect to cathode: 5.7 Heater negative with respect to cathode: 450 After equipment warm-up period 450 After equipment value 200 Peak value 300 Heater positive with respect to cathode: 0 DC component value 300 Heater positive with respect to cathode: 0 DC component value 0	Anode Voltage 1 20 min. Anode Current, Long-Term Average ^C 1000 max. Grid-No.3 (Focusing electrode) Voltage 6000 max. Peak Grid-No.2 Voltage 1000 max. Cathode Voltage: 400 max. Positive bias value 400 max. Negative operating cutoff value 200 max. Negative peak value 0 max. Negative peak value 0 max. Negative peak value 2 max. Heater Voltage (AC or DC)d {6.9 max. Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds 450 max. After equipment warm-up period: DC component value 200 max. Heater positive with respect to cathode: DC component value 300 max. Heater positive with respect to cathode: 0 max.

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	Anode voltage
Grid-No.2 Voltage for Visual Extinction of Undeflected Focused Spot	
At cathode voltage of 125 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 Voltage Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot Heater Voltaged Grid-No.3 Current [†] Grid-No.2 Current	Cutoff	£ 15 μA
Grid-No.1 Current		$\dots \pm 5 \mu A$
To Produce White Light of	6550 K + 7 M.P.C.D. (Illum. D)	9300 K + 27 M.P.C.D.
CIE Coordinates: X Y Percentage of total anode current supplied by each	0.313 0.329	0.281 0.311
beam (average): Red Blue Green Ratio of cathode currents: Red/blue:	34 28 38	23 % 35 % 42 %
Minimum Typical Maximum Red/green:	1.05 1.22 1.55	0.50 0.67 0.90
Minimum Typical Maximum Blue/green:	0.75 0.88 1.05	0.40 0.56 0.70
Minimum Tγpical Maximum	0.50 0.72 0.90	0.60 0.83 1.00
Raster Centering Displacement, Measured at Center of Screen: Horizontal Vertical		

Deflection Yoke Data

Horizontal Section:9	
Inductance at 1 V rms and 1 kHz 0.28 ± 5% Resistance at 25° C 0.36 ± 7%	mΗ
Typical operation with edge-to-	
edge scan at 25 kV: Peak-to-peak deflection current	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 = $1.55 \text{ A dc} \dots 3.9 \pm 10\%$	Ω
Typical operation with edge-to- edge scan at 25 kV:	
Peak-to-peak deflection current	Α
Typical Raster Pincushion Distortion:	
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 μ s	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 intercon-

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

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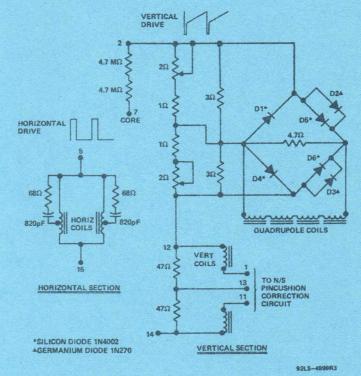
A67-611X

- ^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.
- 9 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.





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

A67-611X



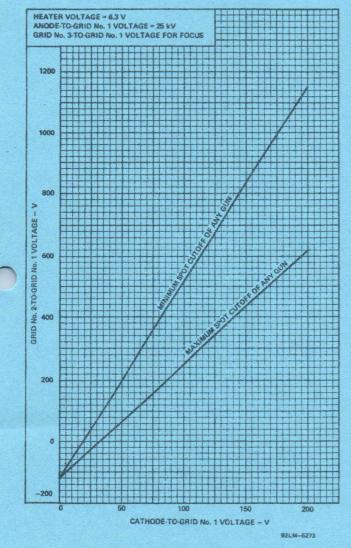


Figure 3 - Cutoff Design Chart

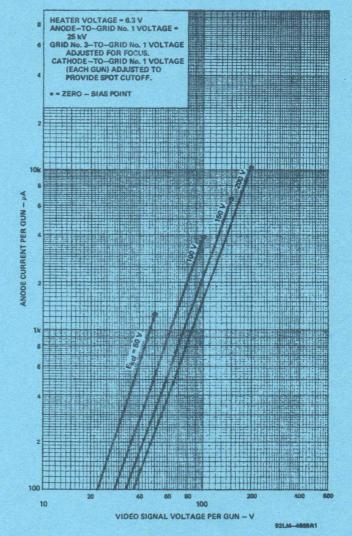


Figure 4 – Typical Drive Characteristics, Cathode-Drive Service

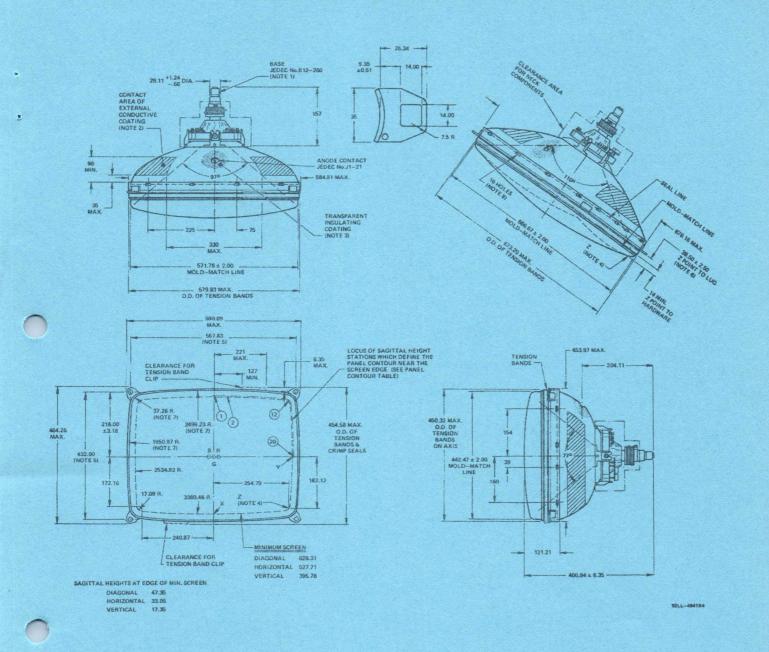
Notes for Dimensional Outline

- 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 $\mathbf{3}$ 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.

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Panel Contour

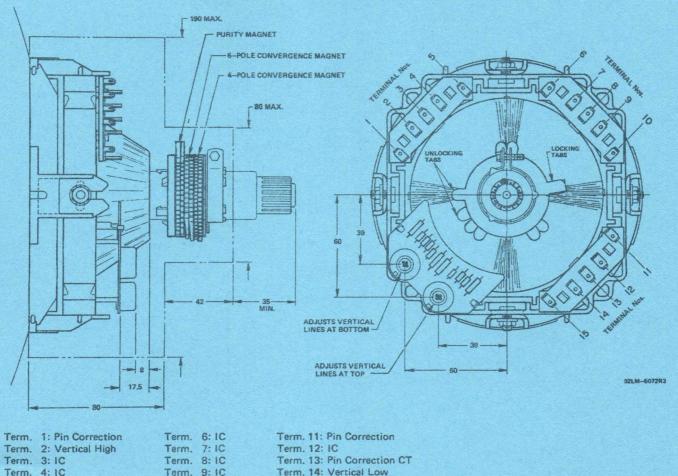
Sagittal Heights with reference to centerface at Points 3.18 beyond edge of min. screen.

	Coon	dinates	Sagittal		Coor	dinates	Sagittal
Station No.	Y Axis	X Axis	Height	Station No.	Y Axis	X Axis	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

A67-611X



Term. 5: Horizontal High Term. 10: IC Term. 14: Vertical 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.

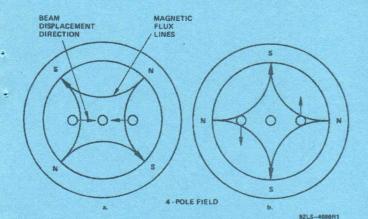
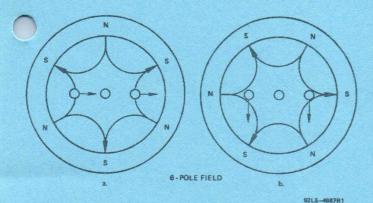


Figure 7 — Beam Motion Produced by the Four-Pole Convergence Magnet





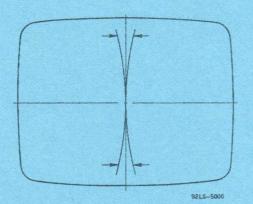
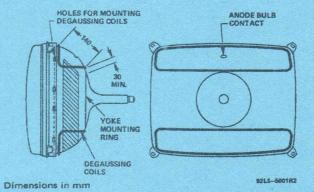


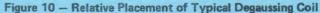
Figure 9 – Convergence Action Accomplished by Adjustment of Quadrupole Coil Current

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.



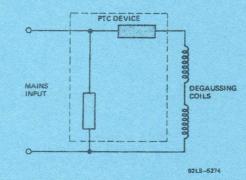


Degaussing Coils

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.







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 ternationally accepted isoexposure rate of 0.5 mR/h if it 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 andling 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 M Ω).

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. B/II Picture Tube Division

Color Picture Tube Assembly

2 7 JUL 1978

A67-613X

AL/1978/2

68 -

110° Deflection - 29mm Neck - 67 cm Diagonal Annex CRT **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

RCA A67-613X is a 110º 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.

- 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

Picture Tube Data

Electrical:

Heater:			
Voltage	6.3		V
Current			mA
Focusing Method	El	ectros	tatic
Focus Lens	E	Sipote	ntial
Convergence Method	Magnet	tic (Pr	esøt)
Deflection Method		Magr	netic
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	2500	max.	oF
External Conductive Coating	2000	min.	pF
	2000		PI
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.) Surface	
Screen: Phosphor, rare-earth (red) sulfide (blue & green) Type Selectivel Persistence Me Array Vertica Spacing between corresponding points on line trios at center (approx.)	y absorbent dium-Short I Line Trios

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Printed in U.S.A./5.78 A67-613X

A67-613X _

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	
Area	2032 sq cm
Bulb Funnel Designation	JEDEC No.J663C
Bulb Panel Designation	JEDEC No.F667A
Anode Bulb Contact Designation Re Cap (IEC 67-III-2	cessed Small Cavity 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.)	

mp			

Туре	. Rim Bands and Tension Bands
------	-------------------------------

Maximum and Minimum Ratings,

Absolute-Maximum Valuesb

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.	μΑ
	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.	۷
	un and the book	[6.9	max.	V
	Heater Voltage (AC or DC)d	15.7	min.	V
	Heater-Cathode Voltage: ⁰			
ľ	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 Ext of Undeflected Focused Spot	
	CHART in Figure 3
At cathode voltage of 125 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 Voltage Highest Gun to Lowest Gun With Cathode Voltage Adjusted for Spot			.50
Heater Voltaged			CREAT
Grid-No.3 Current ^f			
Grid-No.2 Current			Sec. State
Grid-No.1 Current		±9	μΑ
To Produce White Light of	6550 K + 7 M.P.C.D. (Illum, D)	9300 K + 27 M.P.C.	D.
CIE Coordinates:			
X		0.281	
Υ	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:	0.75	0.40	
Minimum	0.75 0.88	0.40	
Maximum	1.05	0.70	
Blue/green:	1.00	0.00	
Minimum	0.50	0.60	
Typical		0.83	
Maximum	0.90	1.00	
Raster Centering Displacement,			
Measured at Center of Screen:			
Horizontal			
Vertical		I 0.01	29229

Deflection Yoke Data

Horizontal Section:9	
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 $3.2 \pm 5\%$	mH
Resistance at 25° C:	11101
At vertical current = $0 \text{ A dc} \dots 4.8 \pm 10\%$	Ω
At vertical current = $1.55 \text{ A dc} \dots 3.9 \pm 10\%$	Ω
Typical operation with edge-to-	
edge scan at 25 kV:	
Peak-to-peak deflection current	A
Typical Raster Pincushion Distortion:	
East/west 9.0%	
North/south	

Maximum Ratings, Absolute-Maximum Values:b Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz For a Maximum Pulse Duration 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 intercon-nected so that the Absolute-Maximum peak pulse voltage between the horizontal and vertical coils is not exceeded.

- 8 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.
- 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.
- 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.
- 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**

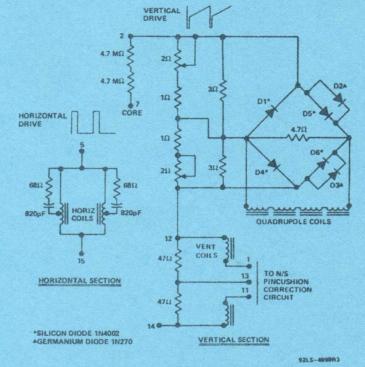
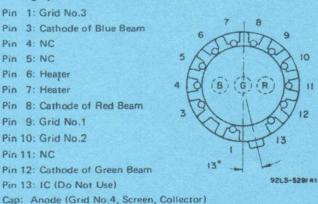


Figure 1 - Circuit of the Deflection Yoke

Basing Specification JEDEC No. 13G

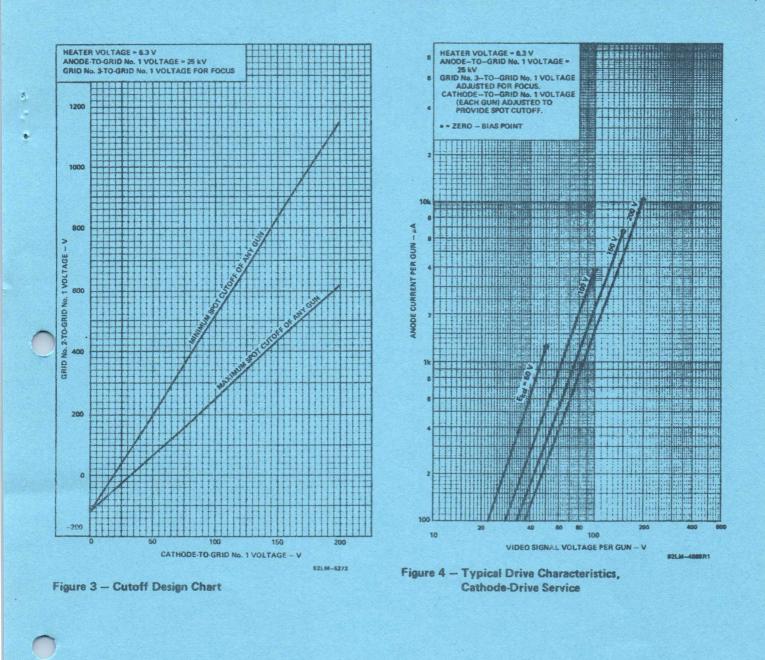


11

C: External Conductive Coating

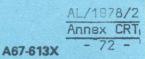
Figure 2 - Bottom View of Base

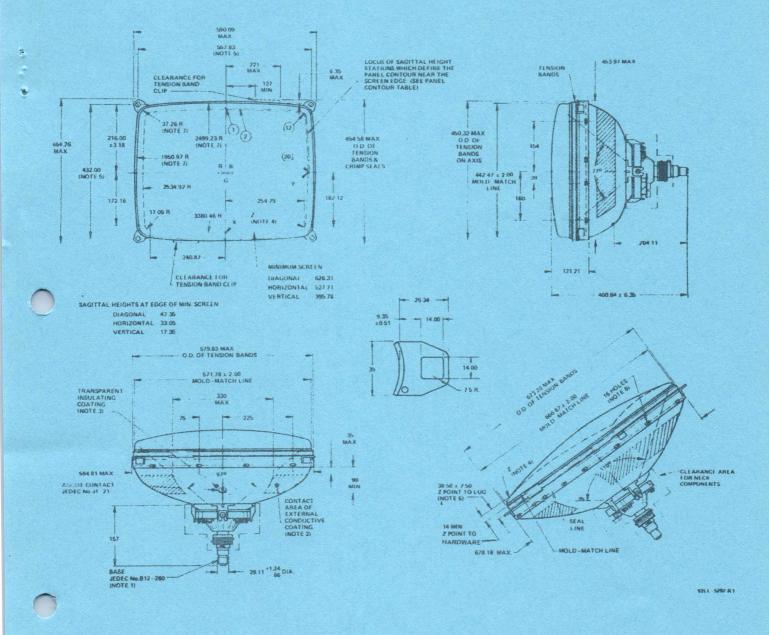
A67-613X



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.

	Coon	dinates	Sagittal		Coon	dinates	Sagittal
Station No.	Y Axis	X Axis	Height	Station No.	Y Axis	X Axis	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



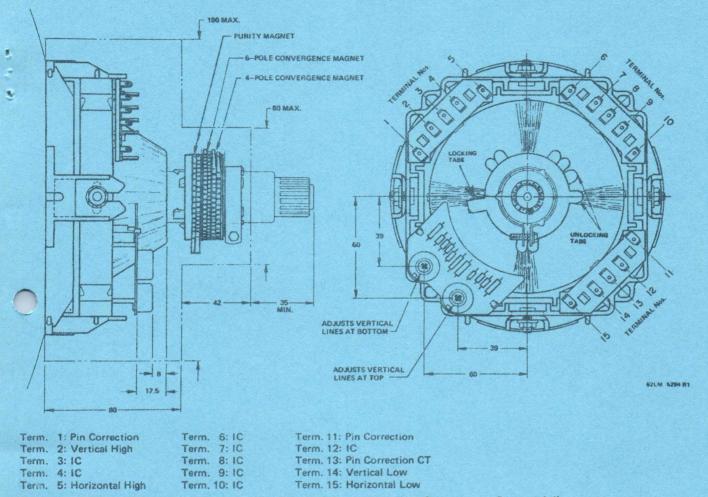


Figure 6 - Yoke and Mounting Detail Showing Terminal Connections and Convergence Control Adjustments

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

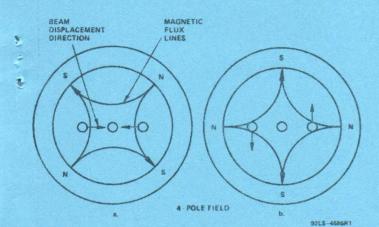
punted on the tube and preset at the factory for optimum performance. Barium-ferrite magnets with a permeability of approximately 1 are used to avoid interaction between the devices and the deflection yoke. With the line screen structure, only a horizontal purity shift is required. This is accomplished 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.

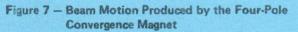
- These devices are used to converge any orientation of the outside beams to the center beam at the center of the
- screen with substantially no motion of the center beam and without the use of magnetic pieces in the gun. Thus, the beams are converged with practically no interaction and a

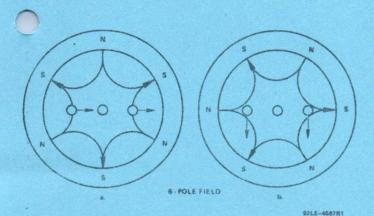
minimum amount of bending the beams; therefore, there is very little distortion in the shape of the individual beams.

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 voke. 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.

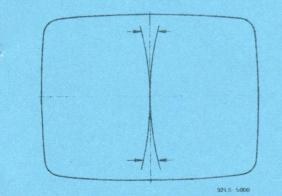
AL/1978/2 Annex CRT A67-613X - 74 -

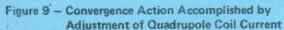








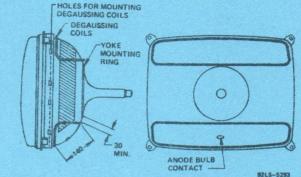




Magnetic Shield and Degaussing

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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.





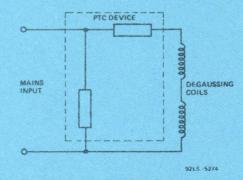


Degaussing Coils

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.





5



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 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 indling the tube. Discharging the high voltage to isolated ...etal 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 M Ω).

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. RBA 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

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.

- Line Screen With Tinted Phosphor — Enchanced Color and Contrast
- AL/197 Annex
- 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

Picture Tube Data

Electri			
	Itage 6.		V
200	rrent		
Focusi	ng Method	Electros	tatic
Focus	Lens	Bipote	ntial
Conver	rgence Method Mag	netic (Pre	eset)
Deflect	tion Method	Magr	netic
Deflect	tion Angles (Approx.):		
	gorial	0	deg
Ho	rizontal	8	deg
Ver	rtical	0	deg
Direct	Interelectrode Capacitance (Approx.):		
and the second se	d No.1 to all other electrodes 11.4	4	pF
Gri	d No.3 to all other electrodes 5.	8	pF
Rec	d cathode to all other electrodes 7.	1	pF
and the second sec	en or blue cathode to all other electrodes . 6.	5	pF
Capaci	tance Between Anode and al Conductive Coating	0 max.	DE
Extern	al Conductive Coating 75	0 min.	pF
Canaci	tance Between Anode and Hardware (Approx.)	5	DF
	ance Between Metal Hardware		MΩ
and Ex	cternal Conductive Coating 50	0 min.	IVIS C

Optical

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

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8.4	ech	20	ica	1
			1.4.0	

Tube Dimensions: 360.60 ± 6.35 mm Overall length 360.60 ± 2.00 mm At mold-match line: 417.20 ± 2.00 mm Diagonal 359.00 ± 2.00 mm Vertical 280.19 ± 2.00 mm
Minimum Screen Dimensions (Projected): 382.30 mm Diagonal 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
Base Designation ⁸ JEDEC No.B12-260
Basing Designation JEDEC No.13G
Pin Position Alignment Pin No.1 Aligns Approx. with Anode Bulb Contect
Operating Position Anode Bulb Contact Up
Gun Configuration Horizontal In-Line
Weight (Approx.)

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. min.	kV kV
Anode Current, Long-Term Average ^C	1000	max.	μΑ
Grid-No.3 (Focusing Electrode) Voltage	6000	max.	v
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage: Positive bias value Positive operating cutoff value Negative bias value Negative peak value Heater Voltage (AC or DC)d.e	400 200 0 2 (6.9 5.7	max. max. max. max. max. min.	>>>> >>>
Heater-Cathode Voltage: [†] Heater negative with respect to cathode: During equipment warm-up period			
not exceeding 15 seconds	450	max.	V
After aquipment warm-up period: DC component value Peak value Heater positive with respect to cathode:	200 200	max. max.	v v
DC component value	0 200	max. max.	vv

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 (Focu	using Electrode)	Voltage	 16.8% to 20% of
			Anode voltage

Grid-No.2 Voltage for Visual

	ancoon or a																
-	cused Spot		See	CL	ITC	DF	F	DI	ES	GI	V	CH	AF	RT in	Figure	2	
	At cathode	voltage o	f 75	V			:.							165	to 360	V	
	At cathode	voltage o	f 12	5 V					1					335	to 670	V	
	At cathode	voltage o	f 17	5 V										510	to 975	V	

Maximum Ratio of Cathode Voltag Highest Gun to Lowest Gun With C Voltage Adjusted for Spot Cutoff	athode		1.5
Heater Voltaged,e		61	
Grid-No.3 Current9			
Grid-No.2 Current			μA
Grid-No.1 Current			μΑ
To Produce White Light of	6550 K + 7 M.P.C.D. (Illum, D)	9300 K + 27 M.P.C	
CIE coordinates:			
X Y		0.281 0.311	
Percentage of total anode currer supplied by each beam (average)			
Red	34	23	%
Blue		35 42	%
Green Ratio of cathode currents:	38	42	70
Red/blue:			
Minimum		0.50	
Typical		0.67	
Red/green:	1.90	0.90	
Minimum	0.75	0.40	
Typical		0.56	
Maximum	1.05	0.70	
Blue/green: Minimum	0.50	0.60	
Typical		0.83	
Maximum		1.00	
Raster Centering Displacement,			
Measured at Center of Screen: Horizontal			
Vertical		Contraction of the second designed	
* UI LIWOI		·· T 0.0	444143

AL/197 Annex

Deflection Yoke Data

Electrical:

Horizontal Deflection Coils: Parallel-connected:
Inductance at 1 V rms and 1 kHz $0.158 \pm 5\%$ mH Resistance at 25° C $0.40 \pm 7\%$ Ω
Peak-to-peak deflection current at 25 kV edge-to-edge scan, typical
Inductance at 1 V rms and 1 kHz $0.632 \pm 5\%$ mH Resistance at 25° C $1.60 \pm 7\%$ Ω
Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical
Vertical Deflection Coils, Series-Connected: Inductance at 1 V rms and 1 kHz Resistance at 25° C, coils only Peak-to-peak deflection current at
25 kV, edge-to-edge scan, typical 3.5 A
Typical Raster Pincushion Distortion:h 4.0% East/west 4.0% North/south 2.8%

Maximum Ratings, Absolute-Maximum Values:b

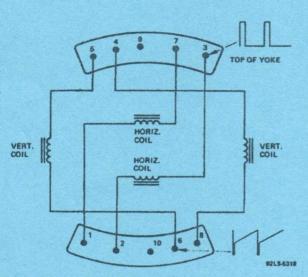
Peak Pulse Voltage Across Horizontal Coils at 15,625 Hz for a Maximum Pulse Duration of 12 µs	700	max.	v
Peak Pulse Voltage Between Horizontal and Vertical Coils at 15,625 Hz for a Maximum Pulse Duration of 12 μ s	625	max.	v

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.

2

A42-163X

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- 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.
- 9 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.

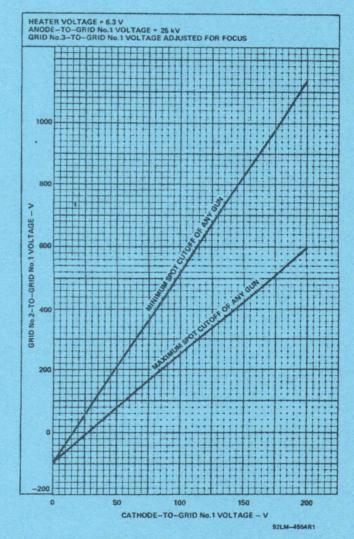
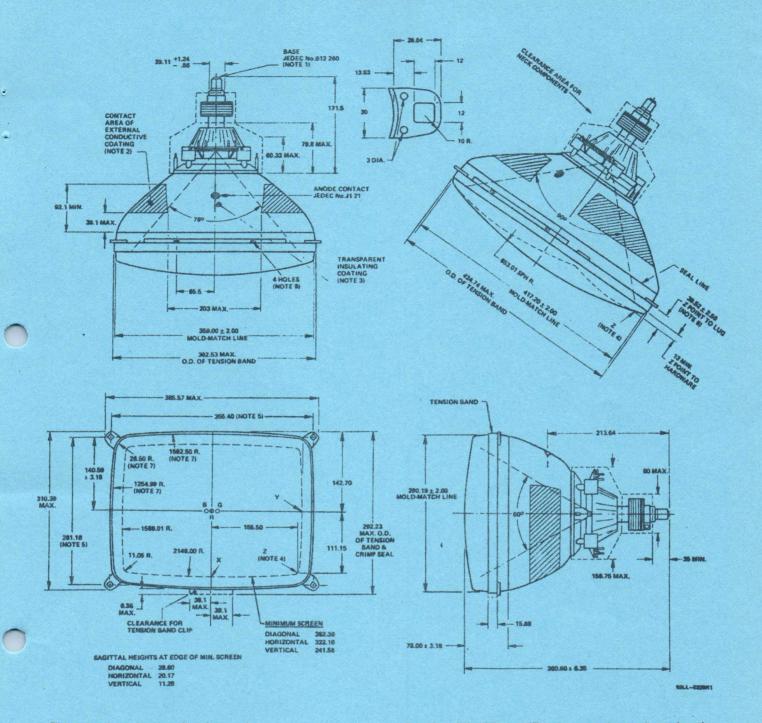


Figure 2 — Cutoff Design Chart



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.

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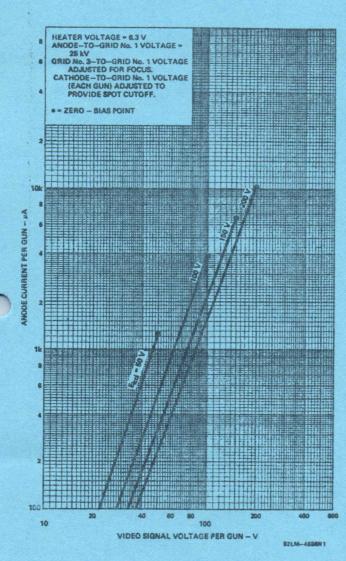


Figure 4 - Typical Drive Characteristics, **Cathode-Drive Service**

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 voke 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

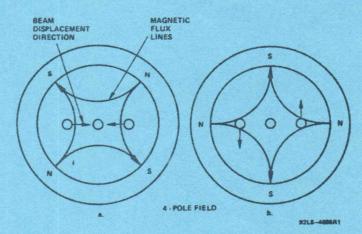
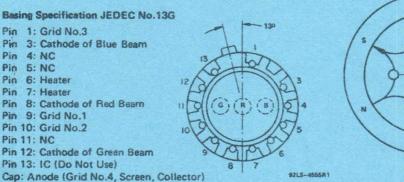


Figure 6 - Beam Motion Produced by the Four-Pole **Convergence Magnet**



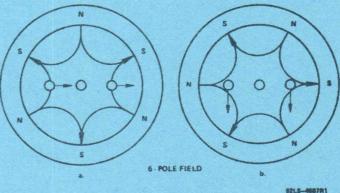


Figure 7 - Beam Motion Produced by the Six-Pole **Convergence Magnet**

Figure 5 - Bottom View of Base

C: External Conductive Coating

Pin

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.

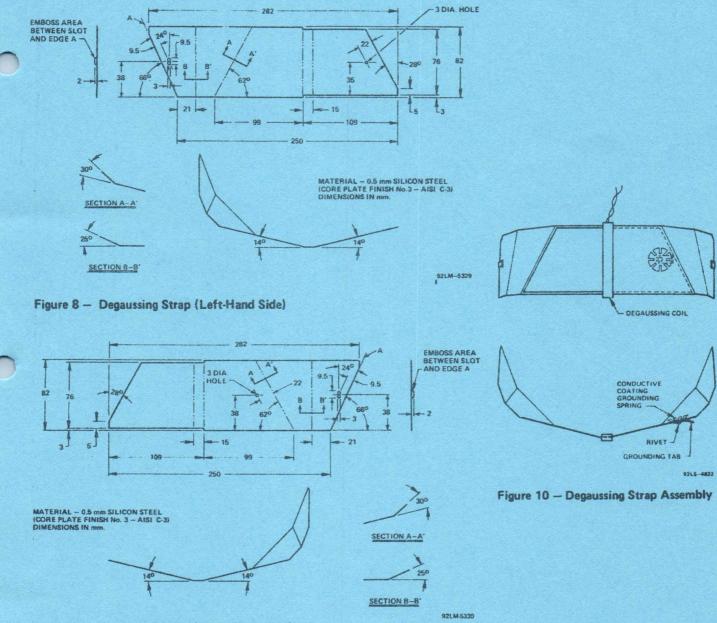
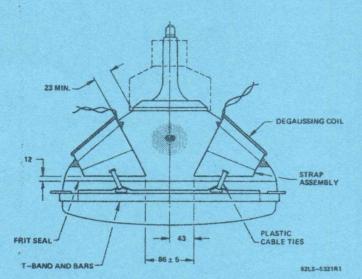
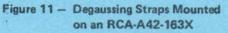
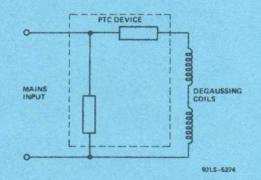


Figure 9 - Degaussing Strap (Right-Hand Side)



Dimensions in mm.







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 M Ω).

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.

RB/I Picture Tube Division

Color Picture Tube Assembly

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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**
- 222 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

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.

- 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

Picture Tube Data

Electrical: Heater 6.3 Voltage Current...... 900 mA Focusing Method Electrostatic Focus Lens Bipotential Convergence Method Magnetic (Preset) Deflection Method Magnetic Deflection Angles (Approx.): 90 deg 78 deg 60 deg Vertical Direct Interelectrode Capacitance (Approx.): Grid No.1 to all other electrodes 11.4 pF Grid No.3 to all other electrodes 5.6 pF DF Green cathode to all other electrodes 7.1 6.5 DF Red or blue cathode to all other electrodes ... Capacitance Between Anode and pF 2300 max. External Conductive Coating pF 11300 min. Capacitance Between Anode and pF Metal Hardware (Approx.) . . . 250 Resistance Between Metal Hardware 50 min. $M\Omega$ and External Conductive Coating

Ontical

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

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	0.01			

Tube Dimensions: 416.99 ± 6.35 mm Overall length 416.99 ± 6.35 mm At mold-match line: 513.46 ± 2.00 mm Diagonal 440.46 ± 2.00 mm Horizontal 440.46 ± 2.00 mm
Minimum Screen Dimensions (Projected): Diagonal Horizontal Vertical 303.30 mm Area
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 Valuesb

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

	[27.5	max.	kV
Anode Voltage	1 20	min.	kV
Anode Current, Long-Term Average ^c	1000	max.	μΑ
Grid-No.3 (Focusing Electrode) Voltage	6000	max.	V
Peak Grid-No.2 Voltage	1000	max.	V
Cathode Voltage: Positive bias value Positive operating cutoff value Negative bias value Negative peak value	400 200 0 2	max. max. max. max.	>>>>
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			
After equipment warm-up period:	450	max.	V
DC component value	200	max.	V
Peak value	200	max.	V
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
					Anoda voltana

Grid-No.2 Voltage for Visual

Extinction of				and the second		
Focused Spot		See CUT	OFF	DESIGN	CHART i	n Figure 2
At cathode	voltage of	75 V .			165	to 360 V
At cathode	voltage of	125 V			336	5 to 670 V
At cathode	voltage of	175 V			510) to 975 V

Aaximum Ratio of Cathode Voltage lighest Gun to Lowest Gun With Car			
oltage Adjusted for Spot Cutoff		1.	5
leater Voltaged			
arid-No.3 Current ^f		± 15 μ	A
Grid-No.2 Current		±5µ	A
Grid-No.1 Current			A
1	6550 K + 7 M.P.C.D. (Illum. D)	9300 K +	
CIE coordinates:			
X Y		0.281	
Percentage of total anode	0.020	0.077	
current supplied by each			
beam (average): Red	34	23	%
Blue	28		%
Green Ratio of cathode currents:	38	42	%
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum	1.55	0.90	
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green:	0.50	0.60	
Minimum	0.50 0.72	0.83	
Maximum	0.90	1.00	
Raster Centering Displacement,			
Measured at Center of Screen: Horizontal		+ 9.0 m	~
Vertical			

Deflection Yoke Data

RN

Electrical:

MHV H G G G

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

Peak-to-peak deflection current at 25 kV edge-to-edge scan, typical Series-connected:	11.8	v
Inductance at 1 V rms and 1 kHz Resistance at 25° C	0.664 ± 5% 1.452 ± 7%	mΗ 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 Resistance at 25° C, coils only Peak-to-peak deflection current at 25 kV, edge-to-edge scan, typical	1.14 ± 5% 1.87 ± 7% 3.6	mH Ω A
Typical Raster Pincushion Distortion:9 East/west	4.2% 3.5%	

Maximum Ratings, Absolute-Maximum Valuesb

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 $12 \mu s$	625	max.	v
and the second s			had

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.
- 9 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.

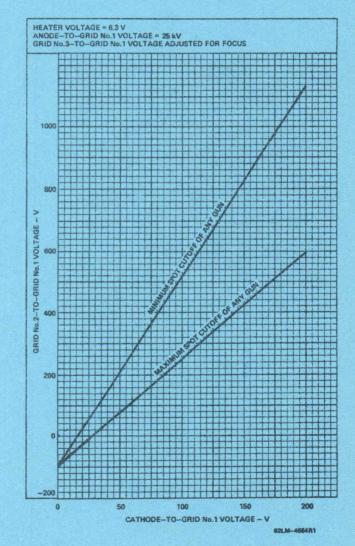
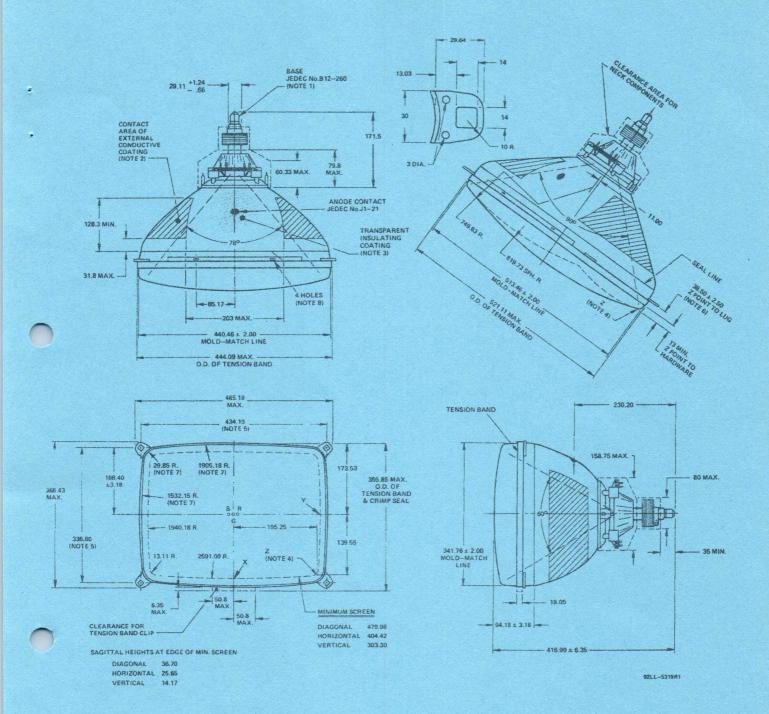


Figure 2 - Cutoff Design Chart

A51-163X





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.

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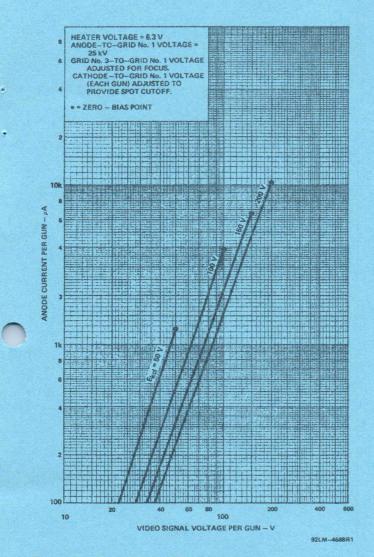
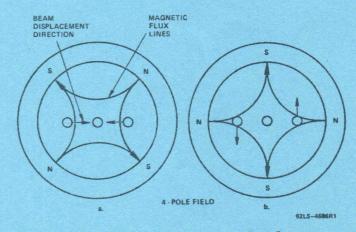


Figure 4 – Typical Drive Characteristics, Cathode-Drive Service

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





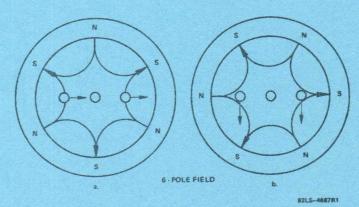


Figure 7 — Beam Motion Produced by the Six-Pole Convergence Magnet

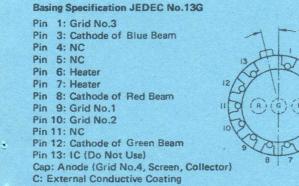


Figure 5 - Bottom View of Base

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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

A51-163X

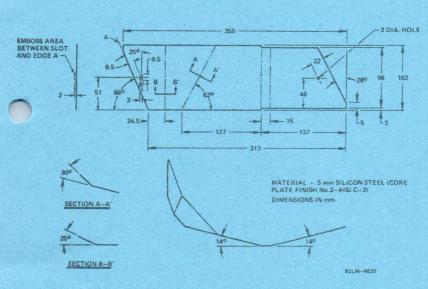
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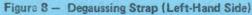
degaussing coils by more than 20%, the inherent source impedance offered by the PTC and associated circuitry is indicated to be too high to provide satisfactory performance. Therefore a capacitor should be added across the degaussing coil to satisfy this requirement.

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.





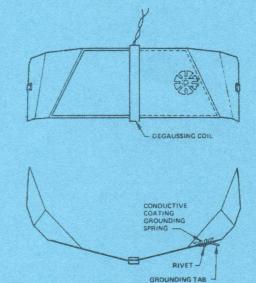


Figure 10 - Degaussing Strap Assembly

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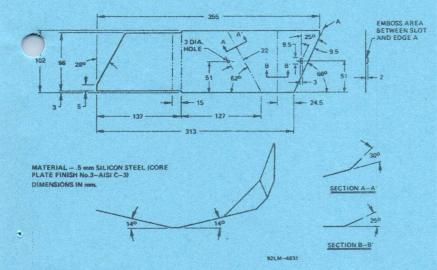
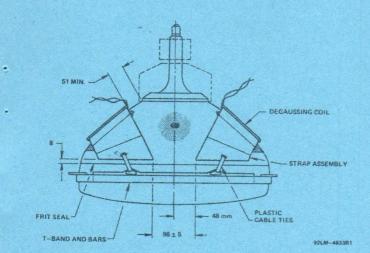
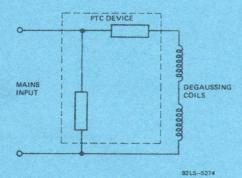


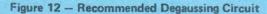
Figure 9 - Degaussing Strap (Right-Hand Side)



Dimenisons in mm







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.

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

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 M Ω).

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.

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Color Picture Tube

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Annex CRT

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90° Precision In-Line HI-LITE MATRIX Color Picture Tube AL/1978/1

- 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
- a 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

RCA 13VAUP22 is a ,900 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

~76465

Focus performance has been improved in the SWAUP22 through the use of a redesigned potential precision in-line electron gup. This is achieved by providing a wider space between the beams thus allow-

Sing a larger electron lens. Extremely accurate beam alignment is obtained through the use of uniincud, triple-aperture electrodes making the inherent self-

convergence feature of the precision in-line system practical.

The 1940022, 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 elactron beams it produces the inherent self-converging 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, linevoltage 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:

Hester: Voltage Current			V mA
Focusing Method	E	lectros	static
Focus Lens		Bipote	ential
Convergence Method		Mag	netic
Deflection Angles (Approx.): Diagonel Morizontal Vertical	. 78		deg deg deg
Direct Interelectrode Capacitance (Approx.): Grid No.1 to all other electrodes Grid No.3 to all other electrodes Each cathode to all other electrodes All cathodes to all other electrodes	4.6		PF PF PF
Capacitance Between Anode and External Conductive Coating (Including Metal Hardware)	{1250 650	max. min.	pF pF
Resistance Between Metal Herdware and External Conductive Coating	50	min.	мΩ

Developmental-type devices or materials are intended for engineering evaluation. The type designation and data are subject to change, unless otherwise arrenged. No obligations are assumed for notice of change or future manufacture of tisosa devices or materials. Information furnished by RCA is believed to be accurate and reliable. However, no responsibility is assumed by RCA for its use, nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of RCA.

Trademark(s) Registered ® Marcals) Registeridatet Printed in U.S.A./11-77 13 VAUP22

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dan se an	
Optical:	
Faceplate:	
	(Approx.)
Surface	
Screen:	
Matrix	Black Opaque Material
Туре	Negative Guard Band
Phosphor, rare-earth (Red) s	ulfide (Blue & green) P22
	Medium-Short
Array	Vertical Line Trios
Consider borning and second	Contoured to Screen Edge
Spacing between correspond on line trios at center (Appre	ox.) 0.026 in (0.66 mm)
Mechanical:	
Tube Dimensions:	
	•763 ± .250 in (349.58 ± 6.35 mm)
Reference line to	
	8.013 ± .188 in (203.53 ± 4.78 mm)
	•759 ± .188 in (146.05± 4.78 mm)
At O.D. of tension band Diagonal	4.500 ± .093 in (368.30 ± 2.36 mm)
	2.488 ± .093 in (317.20 ± 2.36 mm)
Vertical (including	0.005 + 002 in (052 11 + 0.26 mm)
tension band clip) 1	9.965 ± .093 in (253.11 ± 2.36 mm)
Minimum screen dimensions	
Diagonal	
Vertical	
Area	
Buih Funnel Designation	
	JEDEC No. F387A
	Recessed Small Cavity Cap
	(JEDEC No.J1-21)
	JEDEC No.B12-260
Basing Designation	JEDEC No.13M
Pin Pusition Alignment	Pin No. 11 Aligns Approx.
	with Anode Bulb Contact
	Horizontal In-Line
Weight (Approx.)	12 lb (5.5 kg)
Implosion Protection	
Туре	Tension Band
· · · · · · · · · · · · · · · · · · ·	
Maximum and Minimum Rati	ngs, Absolute-Maximum Values
	GS ARE SPECIFIED FOR RELI-
	CE PURPOSES, X-RADIATION
CHARACTERISTICS SHOULD	ALSO BE TAKEN INTO CON-
SIGERATION IN THE APPLICA	
Unless otherwise specified, volta	ge values are positive with respect
to grid No.1.	
	1 30 max. kV
Carola Mariana	

Anode Voltage	{ 30 20	max. min.	kV kV
Anode Current, Long Term Average	1000	max.	MA
Grid No 3 /1 musing electrode) Voltage	7000	max.	v
Peak Grid No.2 Voltage	1500	mex.	v
Cathode Voltage Positive bias value Positive operating cutoff value Negative bias value Negative peak value	400 200 0 2	max. max. max.	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
Huster Voltage (AC or DC) ^b	{6.9 5.7	max. min.	v v

anan wa a di ki		Annex
		- 2
Heater-Cathode Voltage: Heater negative with respect to During equipment warm-up not exceeding 15 seconds	period	
After equipment warm-up p DC component value Peak value		
Heater positive with respect to DC component value Peak value		
Typical Design Values		
Unless otherwise specified, voltag	je values	are positive with respect
. For anode voltage of 25 kV		
Grid-No.3 (Focusing electrode) Vo	oltage	18.8 to 22 % at
Grid-No.2 Voltage for Visual Extin of Undeflected Focused Spot	See CU	ITOFF DESIGN CHART
At cathode voltage of 75 V At cathode voltage of 125 V . At cathode voltage of 175 V .		170 to 370 v
Maximum Ratio of Cathode Voltag Gas to Lowest Gun (With grid No.2 having highest cathode voltage adjust size 150 volts spot cutoff)	es, Higher 2 of gun	1
		6.3 V
Grid-No.2 Current		toto a secondaria and
Grid-No.1 Current		±5 µA
	6550 K	0000 11 .
To Product White Light of	(Illum.	
CIE Coordinates:	•	
X Y	0.313 0.329	0.281
Percentage of total anode current supplied by each beam (Average):	0.020	
Red	34	23 %
Blue	28	35 %
Green Ratio of cathode currents: Red/blue:	38	42 %
Minimum Typical	1.05	0.50 0.67
Maximum	1.22 1.55	0.90
Minimum	0.75	0.40
Typical	0.88	0.56
Maximum	1.05	0.70
Blue/green: Minimum	0.50	0.60
Typical Maximum	0.72 0.90	0.83 1.00
Raster Centering Displacement, Measured at Center of Screen		e en
Horizontal		± 0.30 m (± 7.5 mm)
Center Convergence Displacement in Direction of the Blue and Red Beam	Any	0.21 in (5.3 mm)
Center Convergence Displacement in Direction Between Green Beam and Converged Blue and Red Beams	Any	

AUP22 AL/ 1978/

3 -

Maximum Required Correction for Registe	1 ^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	
	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 panent 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 μ A 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 mB/b at an Anode Current of 300 µA.

	Anode Current of 300 µA:
	be*31 kV
For tube face	only 33 kV
	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.

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.

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.

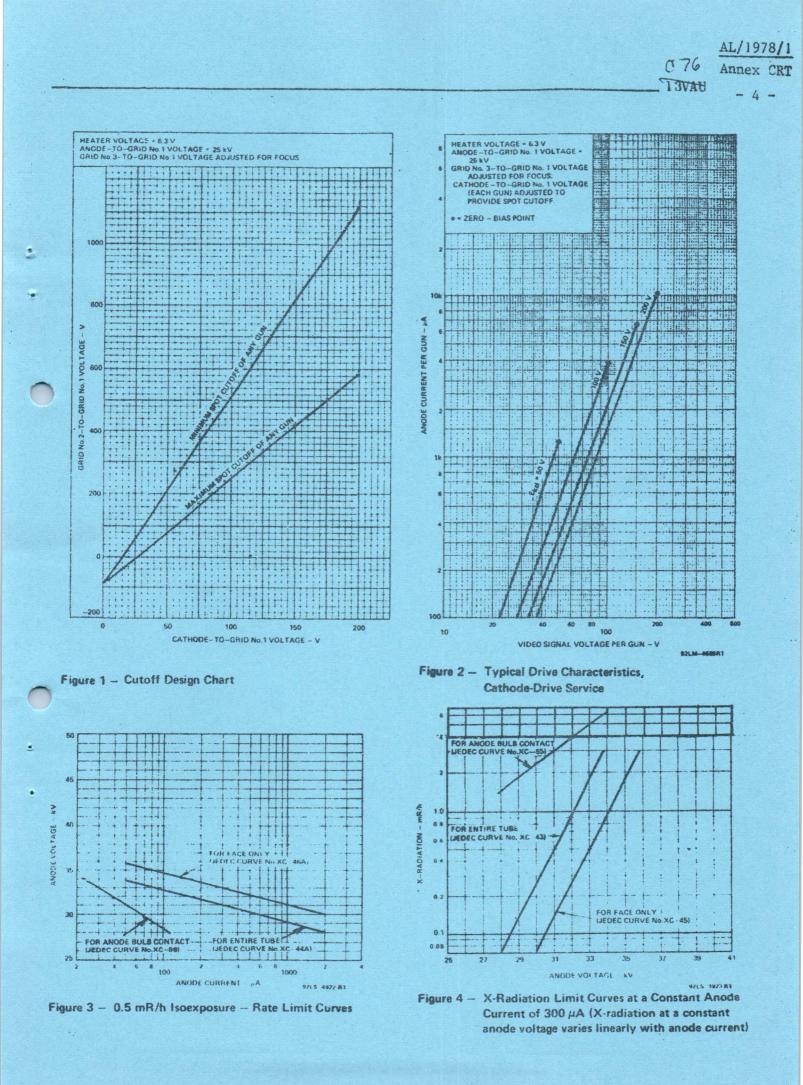
Tube Handling

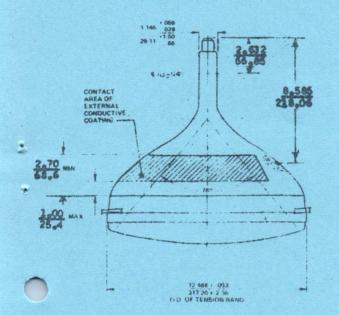
Picture tubes should be kept in the shipping box or similar protective container until just prior to installation. Wear heavy protective clothing, including gloves and safety goggles with side shields, in areas containing unpacked and unprotected tubes to prevent possible injury from flying glass in 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.

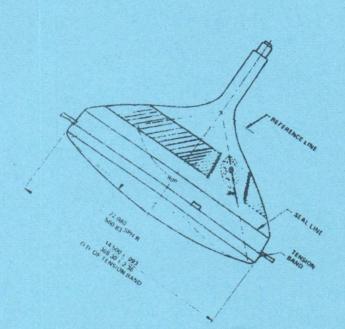
It is the sole responsibility of the manufacturer of television receivers and other equipment utilizing this color picture tube to provide protective circuitry and design in the event of failure of this color picture tube.

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

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



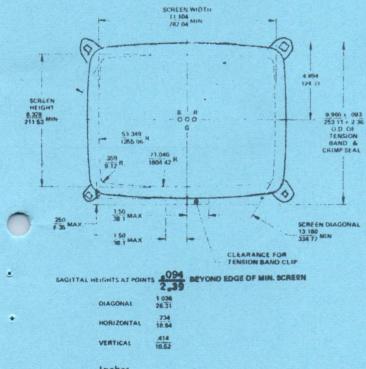


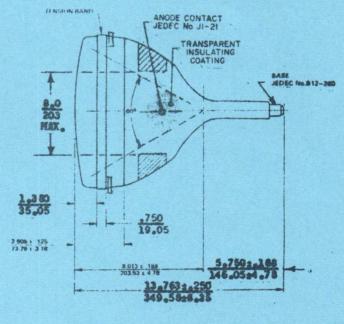


AL/1978/1 Annex CRT

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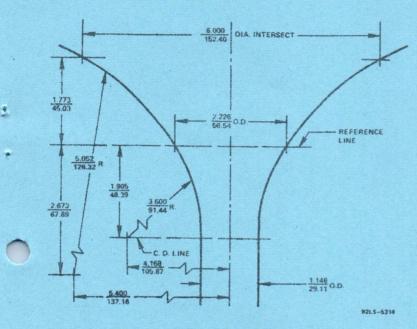
Dimensions in Inches unless otherwise noted

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

Figure 5 - Dimensional Outline

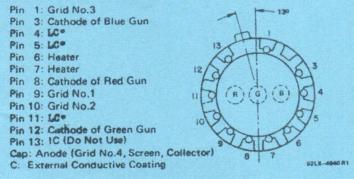
C76 AL/1978/1 H3VAU Annex CRT

- 6 -





Basing Specification JEDEC No. 13M



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

RBA Licture Tube

23 JU.N. 1977

Color Picture Tube

AL/1978/1 Developmental Type

J20141

90^o 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
- Integral Tube Components All Neck Components Included and Preset at Factory – No Setup Adjustments Required Yolic Permenently Affired to Tube

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 saddletoroidal 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 pical 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, linevoltage fluctuations, or circuit changes through aging. Simple permanent-magnet devices are used to accomplish Tinted Phosphor --Enhanced Color & Contrast

Annex CRT

- 7 -

- Line Screen Minimizes Vertical Register Sensitivity
- Quick-Heat Cathodes
- Internal Magnetic Shield
- Moire Minimized in 625 TV-Line Systems
- Banded-Type Implosion Protection For "Push-Through" Cabinet Designs
- Integral Mounting Lugs

static convergence and purity which are factory preset for optimum performance.

Picture Tube Data

Electrical:

United	
Heater: Voltage	v
	nA
Focusing Method Electrosta	atic
Focus Lens Bipoten	tial
Convergence Method Magnetic (Pres	et)
Deflection Method	
Deflection Angles (Approx.):	
	deg
Horizontal	deg
Vertical	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	pF
Consultance Returnen Annde and	
External Conductive Coating	pF
750 min.	pF
Capacitance Between Anode and	
Metal Hardware (Approx.) 185	PF
Resistance Between Metal Hardware	-
and External Conductive Coating	VZS
Optical:	
Faceplate:	
Light transmission at center (Approx.)	
Surface Polish	red
Screen:	
Phosphor, rare-earth (Red) sulfide (Blue & green)	22
Type Selectively absorbe	nt
Persistence Medium-Sh	on
Array Vertical Line To	105
Spacing between corresponding points on line trios (Approx.)	nm
points on mile thus (Approx.1	

Developmental-type devices or materials are intended for engineering evaluation. The type designation and data are subject to change, unless otherwise arranged. No obligations are assumed for notice of change or future manufacture of these devices or materials. Information furnished by RCA is believed to be accurate and reliable. However, no responsibility is assumed by RCA for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of RCA.

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	Tube Dimensions:		
	Overall length	360.60 ± 6.35	mm
	At mold-match line:	417.20 ± 2.36	
	Diagonal	359.00 ± 2.36	
	Vertical	280.19 ± 2.36	
	Minimum Screen Dimensions (Projected):		
	Diagonal	382.30	mm
	Horizontal	322.10	mm
2	Vertical	241.58	mm
8	Area	755	sq cm
	Bulb Funnel Designation	. JEDEC No.	1415D
	Bulb Panel Designation	. JEDEC No.F	417A
e	Anode Bulb Contact Designation R Cap (IEC 67-III		
	Base Designation ^a	JEDEC No.B1	2-260
	Basing Designation	JEDEC N	0.13G
-	Pin Position Alignment Pin No.1	Aligns Approx Anode Bulb C	
	Operating Position An	ode Bulb Conta	act Up
	Gun Configuration	Horizontal I	n-Line
	Weight (Approx.)		8.5 kg

Implosion Protection

Type Reinforcing Bar	is and Tension B	land
----------------------	------------------	------

Maximum and Minimum Ratings,

Absolute-Maximum Valuesb:

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

Anode Voltage	27.5	max.	kV
Anoue vonage	20	min.	kV
Anode Current, Long-Term Average ^C	1000	max.	μΑ
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
Treater Voltage (AC of DC)	5.7	min.	V
Heater-Cathode Voltage:			
Heater negative with respect to cathode:			
During equipment warm-up period			
not exceeding 15 seconds After equipment warm-up period:	450	max.	V
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

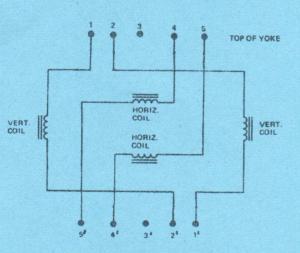
Grid-No.2 Voltage for Visual Extinction of Undeflected			
Focused Spot See CUTOF			
At cathode voltage of 75 V At cathode voltage of 1/25 V			
At cathode voltage of 175 V		. 510 to 97	75 V
Maximum Ratio of Cathode Voltage Highest Gun to Lowest Gun With Cathode Voltage Adjusted for	s, .		
Spot Cutoff			1.5
Heater Voltaged			
Grid-No.3 Current			
Grid-No.2 Current			
Grid-No.1 Current		±5	μΑ
	Illum. D.	Color	
To Produce White Light of \$	6550 K + 7 M.P.C.D.	9300 K 27 M.P.C	
CIE coordinates:			
X	0.313	0.281	
Percentage of total anode	0.329	0.311	
current supplied by each			
beam (Average):			
Red	34	23	%
Blue	28 38	35 42	%
Green	38	41	70
Red/blue:			
Minimum	1.05	0.50	
Typical	1.22	0.67	
Maximum Red/green:	1.55	0.90	
Minimum	0.75	0.40	
Typical	0.88	0.56	
Maximum	1.05	0.70	
Blue/green: Minimum	0.50	0.60	
Typical	0.50 0.72	0.83	
Maximum	0.90	1.00	
Raster Centering Displacement, Measured at Center of Screen:			
Horizontal		Contraction of the Contraction of the	
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.	M77
Deflection Yoke Data			
Electrical:			
Horizontal Deflection Coils:			
Parallel-connected:			
Inductance at 1 V rms and 1			
Resistance at 25° C			
Peak-to-peak deflection curre 25 kV edge-to-edge scan, typi		7.2	A
Series-connected:	-	1	
Inductance at 1 V rms and 1 Resistance at 25° C		$1.7 \pm 5\%$ $2.0 \pm 7\%$	mΗ Ω
Peak-to-peak deflection curre 25 kV, edge-to-edge scan, typ		3.6	A
zo ky, cuge to cuge scan, typ		0.0	

Annex CRT

- 9 -

	Vertical Deflection Coils, Parallel-connected:		
	Inductance at 1 V rms and 1 kHz		
	Resistance at 25° C, coils only	2.0 ± 7%	2
	Peak-to-peak deflection current at		and a start
	25 kV, edge-to-edge scan, typical	2.24	F
	Verticel 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 Valu	ies ^b :	
	Paak Pulse Voltage Across		
	Horizontal Coils at 15,625 Hz		
	for a Maximum Pulse Duration		
	of 12 µs	1500 max.	V
	Peak Pulse Voltage Between		
1	Horizontal and Vertical Coils		
	at 15,625 Hz for a Maximum		
	Pulse Duration of 12 lie	1500	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^{\dagger} .
- 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).
- 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 manufacturar 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.
- Measured in accordance with IEC Recommendation Publication 107-1960 – Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.

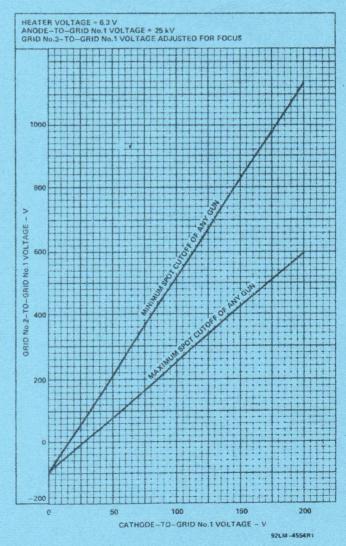
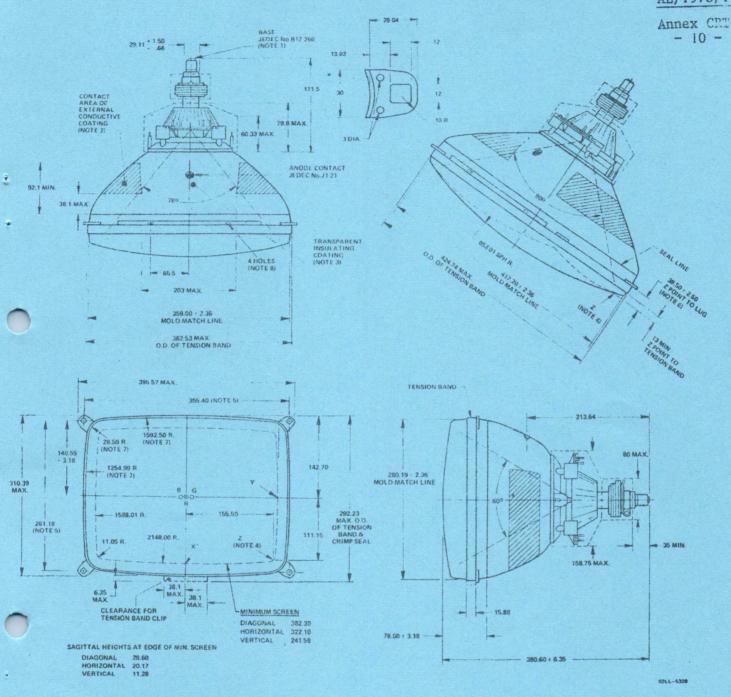


Figure 2 - Cutoff Design Chart



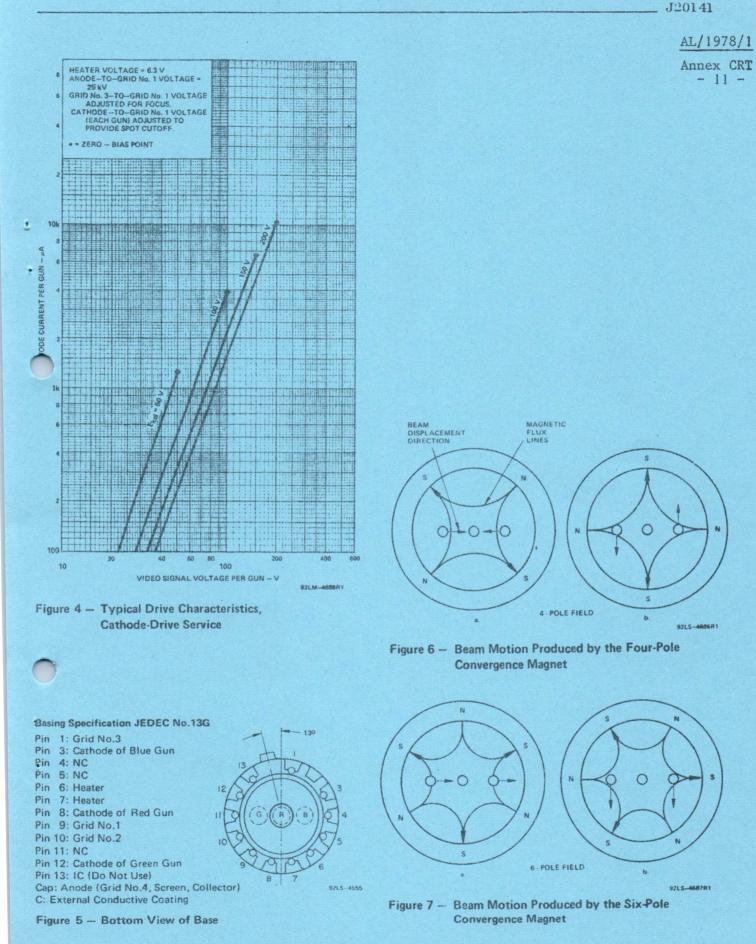
Dimensions in mm unless otherwise noted

- 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 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 plans 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.



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

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23 JUIN 1977

Color Picture Tube

Developmental Type

AL/1978/1 Annex CRT J20140

90^o 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
- Integral Tube Components All Neck Components Included and Preset at Factory — No Setup Adjustments Required Yoke Permanently Affixed to Tube

RCA J20140 is a 90° Color Picture Tube Assembly consisting of a precision in-line color picture tube with a sciectively 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 bermanently 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, linevoltage fluctuations, or circuit changes through aging. Simple permanent-magnet devices are used to accomplish

- Tinted Phosphor ---Enhanced Color & Contrast
- Line Screen Minimizes Vertical Register Sensitivity
- Quick-Heat Cathodes
- Internal Magnetic Shield
- Moire Minimized in 625 TV-Line Systems
- Banded-Type Implosion Protection --For "Push-Through" Cabinet Designs
- Integral Mounting Lugs

static convergence and purity which are factory preset for optimum performance.

Picture Tube Data

Electrical:		
Heater:		
Voltage	6.3	V
Current		mA
Focusing Method	El	ectrostatic
Focus Lens	1	Bipotential
Convergence Method	Magne	tic (Preset)
Deflection Method		Magnetic
Deflection Angles (Approx.):		
Diagonal	90	deg
Horizontal	78	deg
Vertical	60	deg
Direct Interelectrode Capacitance (Approx.):	11 4	.F
Grid No.1 to all other electrodes Grid No.3 to all other electrodes	11.4	PF PF
Green cathode to all other electrodes	6.7	DF
Red or blue cathode to		
all other electrodes	5.5	pF
Capacitance Between Anode and	2300	max.
External Conductive Coating	1300	
Conscious Desuse Andread	1300	mm. Þi
Capacitance Between Anode and Metal Hardware (Approx.)	250	pF
Resistance Between Metal Hardware	200	
and External Conductive Coating	50	min. MΩ
Optical:		
Faceplate:		
Light transmission at center (Approx.)		
Surface		Polished
Screen:		
Phosphor, rare-earth (Red) sulfide (Blue & green		
Type Selectively		
Persistence	. Med	lium-Short
Spacing between corresponding	ertical	cine inos
points on line trios (Approx.)		0.826 mm

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J20140

AL/1978/1

Mechanical:

Tube Dimensions:	
Overall length	5 mm
'At mold-match line:	
Diagonal 513.46 ± 2.3	6 mm
Horizontal 440.46 ± 2.3	6 mm
Vertical	6 mm
Minimum Screen Dimensions (Projected):	
Diagonal 479.98	mm l
Horizontal 404.42	? mm
Vertical) 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	
Base Designation ^a JEDEC No.B	12-260
Basing Designation JEDEC N	10.13G
Pin Position Alignment Pin No.1 Aligns Appro Anode Bulb 0	
Operating Position Anode Bulb Con	act Up
Configuration Horizontal	In-Line
	12.9 kg

G

N H (S 4

6

F

E

VV

Implosion Protection

Type Reinforc	ing Bars and Tension Bands
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Maximum and Minimum Ratings,

Absolute-Maximum Valuesb:

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.	μΑ
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
ter Voltage (AC or DC)d	16.9	max.	V
And the voltage (AC of DC/	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 compon	1.1.		0	max.
TO STATE OF A CONSTRUCTION OF A CONSTRUCT				
Peak value		 	200	max.

Typical Design Values

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

For anode voltage of 25 kV

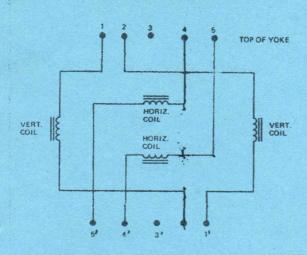
Grid-No.3 (Focusing Electrode) Voltage 16.8% to 20% of Anode voltage

			Anne	x CRT
Grid-No.2 Voltage for Visual			-	13 -
Extinction of Undeflected Focused Spot	E DESIGN	WART In Ein	1100 2	
At cathode voltage of 75 V				
At cathode voltage of 125 V		335 to 6	70 V	
At cathode voltage of 175 V		510 to 9	75 V	
Maximum Ratio of Cathode Voltages				
lighest Gun to Lowest Gun With				
Cathode Voltage Adjusted for				
Spot Cutoff			1.5	
leater Voltaged				
Grid-No.3 Current				
Grid-No.2 Current		±:	AμA	
Grid-No.1 Current		± !	5 µ.A	
	Illum. D.	Color		
Fo Produce White Light of	6550 K +	9300 K		
	7 M.P.C.D.	27 M.P.C	C.D.	
CIE coordinates:	0.212	0.281		
Y	0.313 0.329	0.311		
Percentage of total anode	0.525	0.511		
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 Red/green:	1.55	0.50		
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				
Vertical		± 10.5	mm	
Limiting Circuit Values				
High-Voltage Circuits:				
Grid-No.3 circuit resistance		7.5 max.	MΩ	
.ow-Voltage Circuits:				
Effective grid-No.1-to-cathode-				
circuit resistance		0.75 max.	MΩ	
Deflection Yoke Data				
Electrical:				
Horizontal Deflection Coils:				
Parallel-connected:		0 40		
Inductance at 1 V rms and 1 k				
Resistance at 25° C		0.52±7%	Ω	
Peak-to-peak deflection currer		7.2	A	
25 kV edge-to-edge scan, typic Series-connected:		1.2	~	
Inductance at 1 V rms and 1 k	Hz	$1.7 \pm 5\%$	mH	
Resistance at 25° C		$2.0 \pm 7\%$	Ω	
Peak-to-peak deflection currer	nt at			
25 kV, edge-to-edge scan, typi	cal	3.6	A	

Vertical Deflection Coils, Parallel-connected:		
Inductance at 1 V rms and 1 kHz	5.() ± 5%	mH
Resistance at 25° C, coils only	2. () + 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	$8.0 \pm 7\%$	Ω
Peak-to-peak deflection current at		
25 kV, edge-to-edge scan, typical	1.12	A
Raster Pincushion Distortion:		
East/west	%	
North/south	%	
	/0	
Maximum Ratings, Absolute-Maximum Valu	esb:	
Peak Pulse Voltage Across		
Horizontal Coils at 15,625 Hz		
for a Maximum Pulse Duration		
	1.500	

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

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 harizontal windings, connect impers between terminals 4 and 5 and between terminals 4^{+} and 5^{+} .
- Note $Z = For \frac{1}{2}$ series operation of the horizontal windings, connect a jumper between terminals $4 \text{ and } 4^{\dagger}$.
- Note 3 For parallel operation of the vertical windings, connect jumpers between terminals 1 and 2 and 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 21.
- Figure 1 Connection Diagram for Yoke (As viewed from rear of yoke).

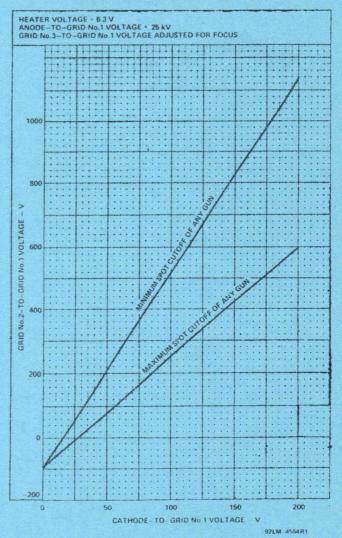
^a The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one-half kilogram.

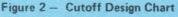
b The maximum ratings in the tabulated data are established in accordance with the following definition of the Absolute-Maximum Rating System for rating electron devices. Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron device of a specified type as defined by its published data, and should not be expeeded 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.

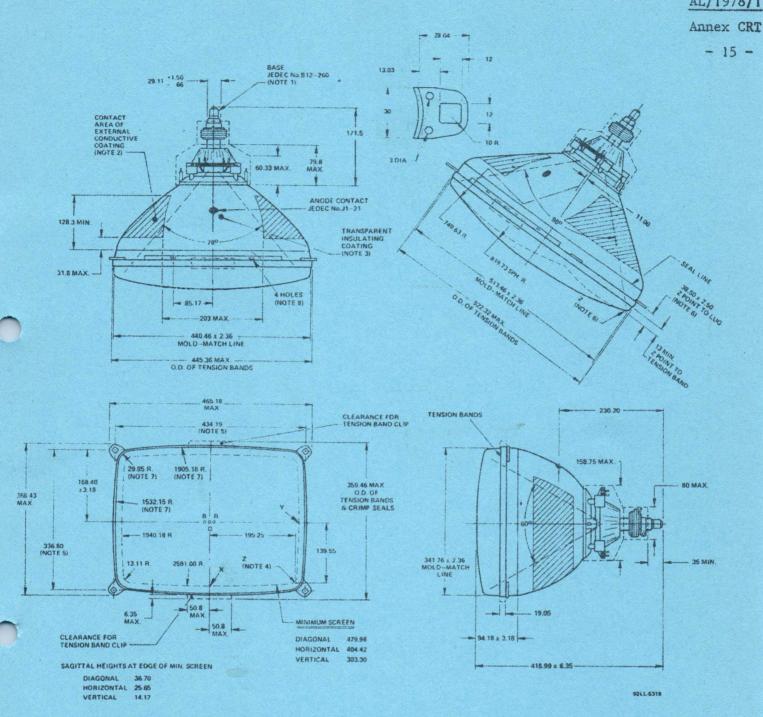
- C The short-term average anode current should be limited by circuitry of 1500 microamperes.
- d For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.
- Measured in accordance with IEC Recommendation -- Publication 107-1960 -- Recommended Methods of Measurement on Receivers for Television Broadcast Transmissions.





J20140

AL/1978/1

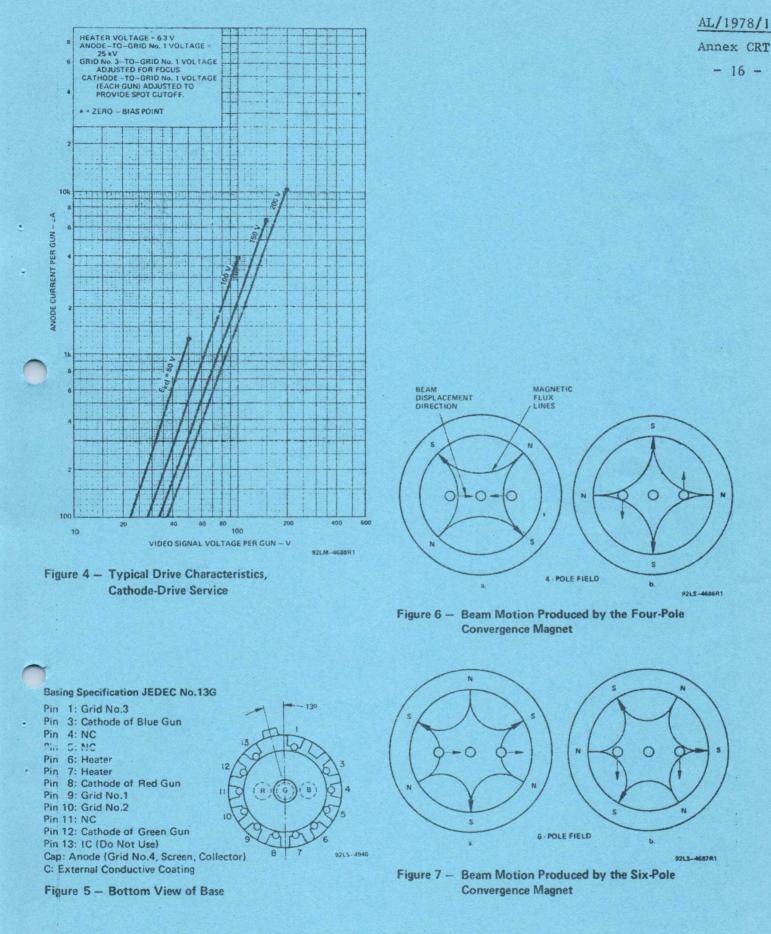


Dimensions in mm unless otherwise noted

- 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.



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