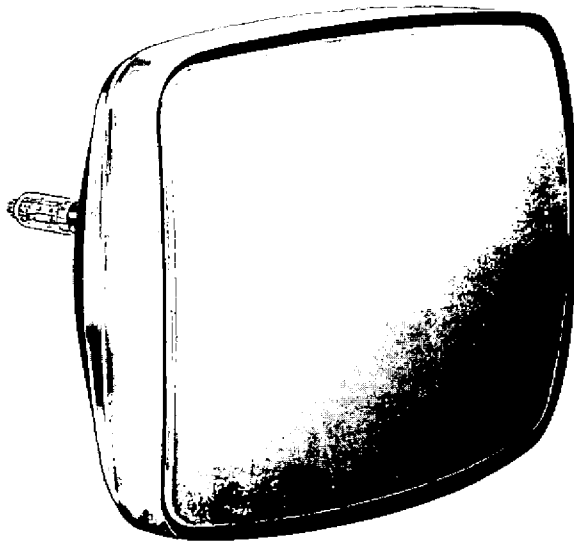




25AP22

90° RECTANGULAR COLOR PICTURE TUBE

RCA-25AP22 is a directly viewed, 25-inch rectangular glass picture tube of the triple-gun, shadow-mask type for use in color television receivers. The screen has nearly straight sides with sharply rounded corners. It is capable of producing a full color or black-and-white picture.



Features of the 25AP22 include:

- 90° Magnetic Deflection
- 295 Sq. In. (Min.) Rectangular Screen Area – 19.844" x 15.562" (Min.)
- 1.438" Neck Diameter
- 21.3" Max. Overall Length
- 6.3 Volt/800 Ma Heater
- 27.5 Kv Max. Anode Voltage
- Aluminized Tricolor Phosphor-Dot Screen
- Electrostatic Focus
- Magnetic Convergence
- Integral Filterglass Protective Window

The smaller neck diameter of the 25AP22 makes possible the use of a high sensitivity deflecting yoke. This combination permits the wide angle deflection with approximately the same power required to scan a color picture tube having 70° deflection angle and 2" neck diameter.

The 25AP22 utilizes an improved, close-spaced, triple-beam electron-gun assembly featuring a unitized cathode construction supported by glass beads. The heaters are also supported from the same glass beads. These design innovations provide a structure having high stability for all operating parameters throughout tube life. Another feature is an integral glass-button base having straight-through leads fitted with a keyed wafer.

The 25AP22 has an integral Filterglass protective window which is sealed to the faceplate of the tube with a clear resin. This construction eliminates the need for a separate safety-glass window and its companion dust seal in the receiver. Internal reflections are thereby reduced with a consequent improvement in picture contrast and color saturation. The surface of the protective window is treated to minimize specular reflection.

OPERATING PRINCIPLES

The electron-gun assembly of the 25AP22 consists of three electrostatic-focus guns. A view of the electron-gun assembly is shown in *Fig.1*.

The three guns are spaced 120° apart with their axes tilted toward the tube axis to facilitate convergence of the three beams at the phosphor-dot screen. The different angles at which the beams from the three guns reach a certain aperture in the shadow mask determines the particular phosphor dot which is energized by each beam. The phosphor dots are deposited on the screen in three separate arrays, one array for each of the primary colors. Relative orientation of shadow-mask apertures and phosphor-dot arrays is such that the beam from any one gun will energize only one of the primary colors no matter which part of the phosphor-dot screen is being scanned. Therefore, three color signals controlling the three beams produce independent pictures in the primary colors. These primary color pictures are superimposed resulting in a full-color or black-and-white picture.

Convergence is accomplished by magnetic fields generated by two external components. Radial conver-



gence displacement of each beam is provided by action of magnetic fields from a radial-converging assembly coupled into the associated internal radial-converging pole pieces. Lateral convergence displacement of the blue beam relative to the red and green beams is provided by action of the magnetic fields from a lateral-converging device.

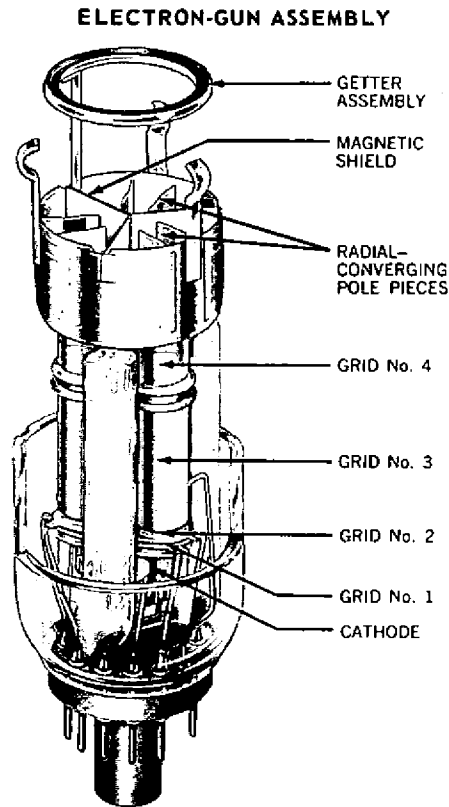


Fig. 1

Focusing of the three beams is accomplished electrostatically by adjustment of the voltage applied to the three No.3 grids which are interconnected within the tube and have a common base-pin terminal.

A deflecting yoke is required for deflecting the electron beams simultaneously after they pass between the respective radial-converging pole pieces. A magnetic-metal shield and a purifying magnet are also required to minimize the effects of extraneous magnetic fields, the earth's magnetic field and other causes which may affect register.

GENERAL DATA

Electrical:

Electron Guns, Three with Axes
Tilted Toward Tube Axis Red, Blue, Green

Heater, of Each Gun Series
Connected within Tube with
Each of the Other Two Heaters:

Current at 6.3 volts^a 800 ma

Focusing Method Electrostatic
Focus Lens Bipotential
Convergence Method Magnetic
Deflection Method Magnetic
Deflection Angles (Approx.):

Diagonal	89	deg.
Horizontal	78	deg.
Vertical	63	deg.

Direct Interelectrode Capacitances (Approx.):

Grid No.1 of any gun to all other electrodes	6	pf
All cathodes to all other electrodes	15	pf
Grid No.3 to all other electrodes	6.5	pf
External conductive coating to anode	} 2500 max. 2000 min.	pf
		pf

Optical:

Faceplate and Protective Window Filterglass
Light transmission at center (Approx.) 41%
Surface of Protective Window Treated to minimize specular reflection

Screen, on Inner Surface of Faceplate:

Type Aluminized, Tricolor, Phosphor-Dot
Phosphor (three separate phosphors,
collectively) P22-All-Sulfide Type
Fluorescence and phosphorescence
of separate phosphors, respectively Red, Blue, Green
Persistence of group phosphorescence. Medium Short
Dot Arrangement Triangular group consisting of red dot, blue dot, and green dot

Spacing between centers of adjacent
dot trios (Approx.) 0.029"

Mechanical:

Tube Dimensions:

Overall length	20.924" ± .375"
Neck length	6.693" ± .188"
Diagonal	24.566" ± .125"
Greatest width	21.500" ± .125"
Greatest height	17.263" ± .125"

Minimum Screen Dimensions (Projected):

Diagonal	23.031"
Greatest width	19.844"
Greatest height	15.562"
Area	295 sq. in.

Base Designation Small-Button Diheptar 12-pin
(JEDEC No.B12-244)

Basing Designation JEDEC No.14BE

Bulb Contact Designation Recessed Small Cavity
(JEDEC No.J1-21)

Pin Position Alignment Pin No.12 Aligns Approx.
with Anode Bulb Contact

Operating Position Anode Bulb Contact on Top
Weight (Approx.) 40 lbs.

Maximum and Minimum Ratings, Design-Maximum Values:^b

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

Anode Voltage	{ 27,500 max. volts 20,000 min. volts
Total Anode Current, Long-Term Average	1000 max. μ a
Grid-No.3 (Focusing Electrode) Voltage.	6000 max. volts
Peak Grid-No.2 Voltage, Including Video Signal Voltage	1000 max. volts
Grid No.1 Voltage:	
Negative bias value	400 max. volts
Negative operating cutoff value	200 max. volts
Positive bias value	0 max. volts
Positive peak value.	2 max. volts
Heater Voltage (ac or dc) ^a	{ 6.9 max. volts 5.7 min. volts
Peak Heater-Cathode Voltage:	
Heater negative with respect to cathode:	
During equipment warm-up period not exceeding 15 seconds	450 max. volts
After equipment warm-up period	200 max. volts
Heater positive with respect to cathode.	200 max. volts

Equipment Design Ranges:

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

For anode voltages between 20,000 and 27,500 volts

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

Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused Spot. See CUTOFF DESIGN CHART in Fig.2

Maximum Ratio of Grid-No.2 Voltages, Highest Gun to Lowest Gun in Any Tube (At grid-No.1 spot cutoff voltage of -100 volts). 1.86

Grid-No.3 Current (Total) -45 to +15 μ a

Grid-No.2 Current -5 to +5 μ a

To Produce White of 9300^o K +27 M.P.C.D. (CIE Coordinates x = 0.281, y = 0.311):

Percentage of total anode current supplied by each gun (average)	Red	Blue	Green	%
	42	28	30	

Ratio of cathode currents	Red to Blue			Red to Green		
	Min.	Avg.	Max.	Min.	Avg.	Max.
	1.00	1.50	2.00	1.00	1.40	1.80

Displacements, Measured at Center of Screen:

Raster centering displacement:

Horizontal	-0.47 to +0.47	inch
Vertical	-0.45 to +0.45	inch

Lateral convergence displacement of blue beam with respect to converged red and green beams. -0.25 to +0.25 inch

Radial convergence displacement excluding effects of dynamic convergence (each beam). -0.37 to +0.37 inch

Maximum Required Correction for Register^c (Including Effect of Earth's Magnetic Field when Using Recommended Components) as Measured at the Center of the Screen in any Direction005 max. inch

Examples of Use of Design Ranges:

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

Anode Voltage	25,000	volts
Grid-No.3 (Focusing Electrode) Voltage	4200 to 5000	volts
Grid-No.2 Voltage when circuit design utilizes grid-No.1 voltage of -150 volts for visual extinction of focused spot.	285 to 685	volts
Grid-No.1 Voltage for visual extinction of focused spot when circuit design utilizes grid-No.2 voltage of 400 volts.	-95 to -190	volts

Limiting Circuit Values:

High-Voltage Circuits

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the high-voltage power supply and the grid-No.3 power supply be of the limited-energy type.

Grid-No.3 circuit resistance 7.5 max. megohms

Low-Voltage Circuits

Effective grid-No.1-to-cathode-circuit resistance (each gun). 0.75 max. megohm

The low voltage circuits should be analyzed by assuming the color picture tube heater is connected directly to the receiver chassis ground. Under these conditions the grid-No.2-to-heater circuit, the grid-No.1-to-heater circuit, and the cathode-to-heater circuits of all other tubes operating from the same heater winding as the color picture tube and all connections of any other circuits to the heater winding should each have an impedance such that their respective power sources in combination will not supply a continuous short circuit current of more than 750 milliamperes total. Such current limitation will prevent heater burnout in case of a momentary internal arc within the color picture tube.

^a For maximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts.

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

Design-Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey 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 responsibility for 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 Design-Maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, signal variation, and environmental conditions.

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

GENERAL CONSIDERATIONS

X-Radiation Warning. Because the 25AP22 is designed to be operated at anode voltages as high as 27.5 kilovolts (design-maximum value), shielding of the 25AP22 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

CUTOFF DESIGN CHART

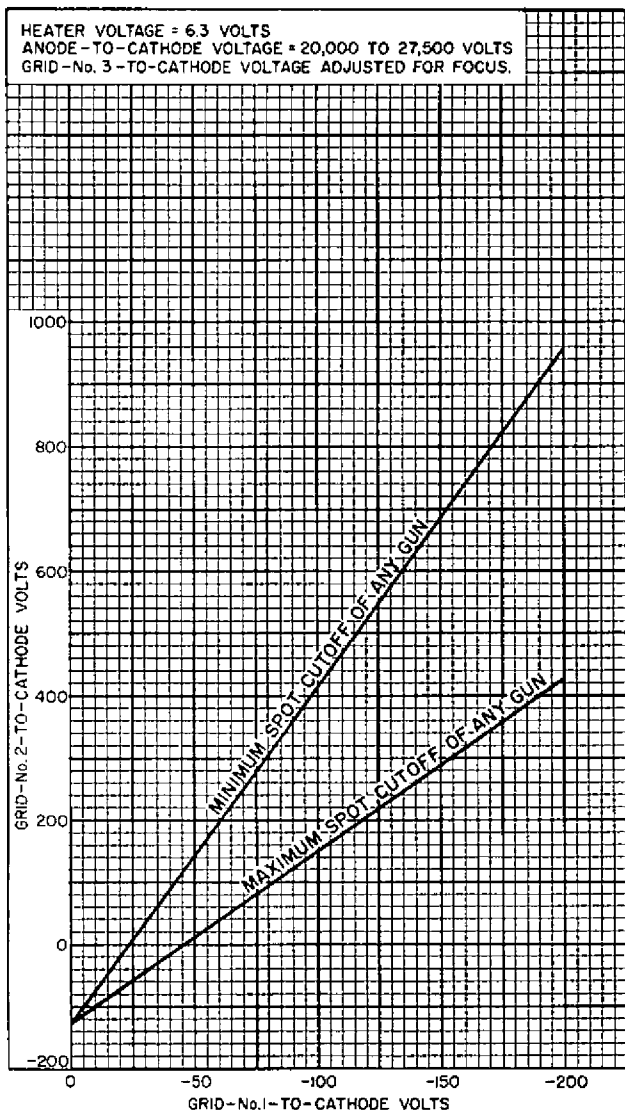


Fig. 2

Tube Handling. The 25AP22 should be handled carefully as required by any glass picture tube. Particular care should be taken to prevent damage to the seal area and the edge of the protective window.

Orientation. The 25AP22 must be operated with tube axis in a horizontal position and with the blue gun uppermost (i.e., the anode contact button on top). This is the operating position for which the beam-displacement and register correction values shown in this bulletin apply.

Support for the 25AP22 may be provided by a mounting system which supports the tube in the area in front of the seal line together with a pull-up ring or similar support on the tube funnel. The mounting system should not place mechanical stress on or cause abrasion of the

tube particularly in the seal area and the edge of the protective window.

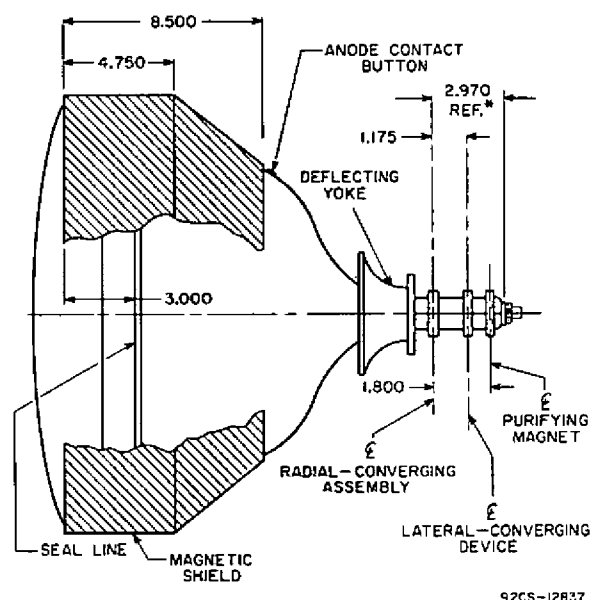
The color receiver mounting system should incorporate sufficient cushioning so that under normal conditions of shipment or handling an impact force is never applied to the 25AP22 of more than 35g parallel to the tube axis or more than 30g perpendicular to the tube axis.

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.

COMPONENT CONSIDERATIONS

The **Deflecting Yoke** should not be used for supporting the picture tube. The yoke and tube axes must coincide and the yoke must be free to move along the neck for a distance of approximately 1/2 inch from its most forward position for adjustment purposes. The yoke mount should also provide for a small amount of rotational adjustment. Centering of the raster on the screen may be accomplished by passing direct current of the required value through each pair of deflecting coils. Pincushion correction, if desired, may be accomplished by adding the necessary current waveforms to the deflecting current waveforms.

RELATIVE PLACEMENT OF TYPICAL COMPONENTS



* \mathcal{C}_r of Radial Converging Assembly Core directly over \mathcal{C}_i of internal pole pieces.

Dimensions in Inches

Fig. 3

The **Purifying Magnet** is used to compensate for the effects of uniform extraneous magnetic fields and other causes which may affect register. It should be positioned on the neck in the plane determined by the three cathodes as shown in *Fig.3*. The devices should provide a magnetic field perpendicular to the tube axis. The field should be adjustable in magnitude and direction to cause a change of register. The purifying magnet must be capable of supplying correction for register from zero to the maximum value specified.

A **Magnetic-Metal Shield** is used to provide compensation for the effect of the earth's magnetic field. The recommended shield is constructed of .030" cold-rolled steel and is mounted on the tube as shown in *Fig.3*. This shield minimizes the effect on tangential register near the edge of the screen caused by the component of the earth's field parallel to the tube axis. It also minimizes the effect of the component of the earth's field perpendicular to the tube axis. To be effective, the shield must be degaussed as described under *Adjustment Procedures*.

The **Radial-Converging Assembly** and associated circuits provide the magnetic fields necessary to converge dynamically the three electron beams as they traverse the screen of the picture tube, and together with the lateral-converging device the radial-converging assembly provides the magnetic fields necessary for static convergence. The assembly is mounted on the neck of the picture tube with the three electromagnets centered over the three pairs of internal converging pole pieces as shown in *Fig.3*. The necessary horizontal and vertical current waveforms are passed through the windings for maintaining dynamic convergence of the deflected beams. Static magnetic fields for converging the three beams at the center of the screen are produced by passing direct current through the windings or by permanent magnets variably coupled through the cores of the electromagnets to the converging pole pieces in the tube. The magnetic field strength should be adjustable to provide movements, as shown in *Fig.4*, ranging from zero to the specified maximum distance in either direction.

The **Lateral-Converging Device** supplements the correction supplied by the radial-converging assembly for statically converging the three electron beams at the center of the screen. The device is mounted on the neck of the picture tube between the purifying magnet and the radial-converging assembly as shown in *Fig.3*. The magnetic field should cause a lateral (horizontal) movement of the blue beam opposite to the movement of the converged red and green beams, as shown in *Fig.5*. The magnetic field strength should be adjustable to provide movement of the blue beam relative to the converged red and green beams ranging from zero to the specified maximum distance in either direction.

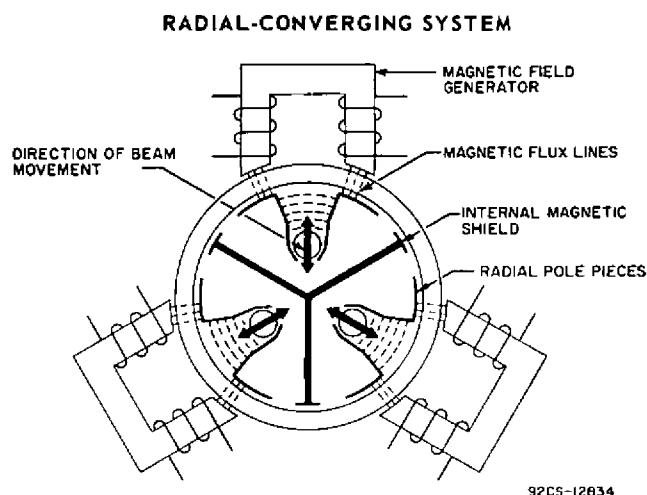


Fig.4

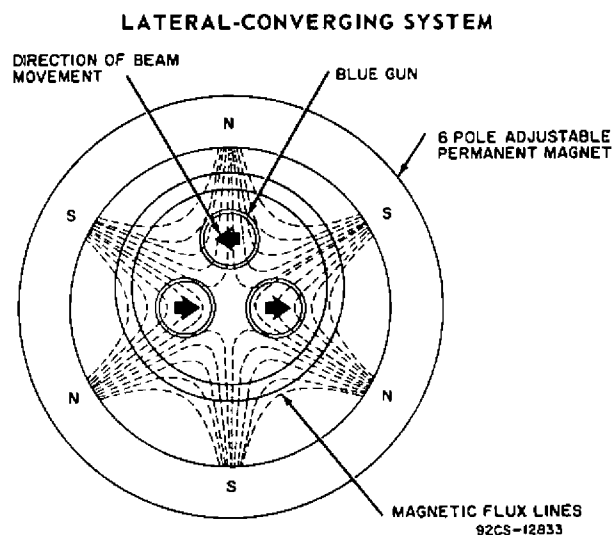


Fig.5

OPERATING CHARACTERISTICS

Cutoff Considerations. Grid-No.2 voltage in each of the guns may be used to compensate for the normal variation to be expected in the grid-No.1 cutoff voltage in each of the guns of any one tube and from tube to tube. In tracking systems utilizing equal cutoff operation and variable video drive, the grid-No.2 voltage of each gun may be adjusted for the design value of cutoff, within maximum rated values, for all three guns. In other tracking systems, the voltage applied to grid No.2 in any one gun may be adjusted, with due consideration to its maximum rated value, to fix the corresponding grid-No.1 cutoff voltage at a value to obtain the desired drive characteristics for each gun driven from a fixed-drive-ratio system.

The **Cutoff Design Chart**, shown in *Fig.2*, shows the relationship between the grid-No.1 voltage for a tube having a gun with maximum cutoff and for a tube having

TYPICAL DRIVE CHARACTERISTICS
Grid-Drive Service

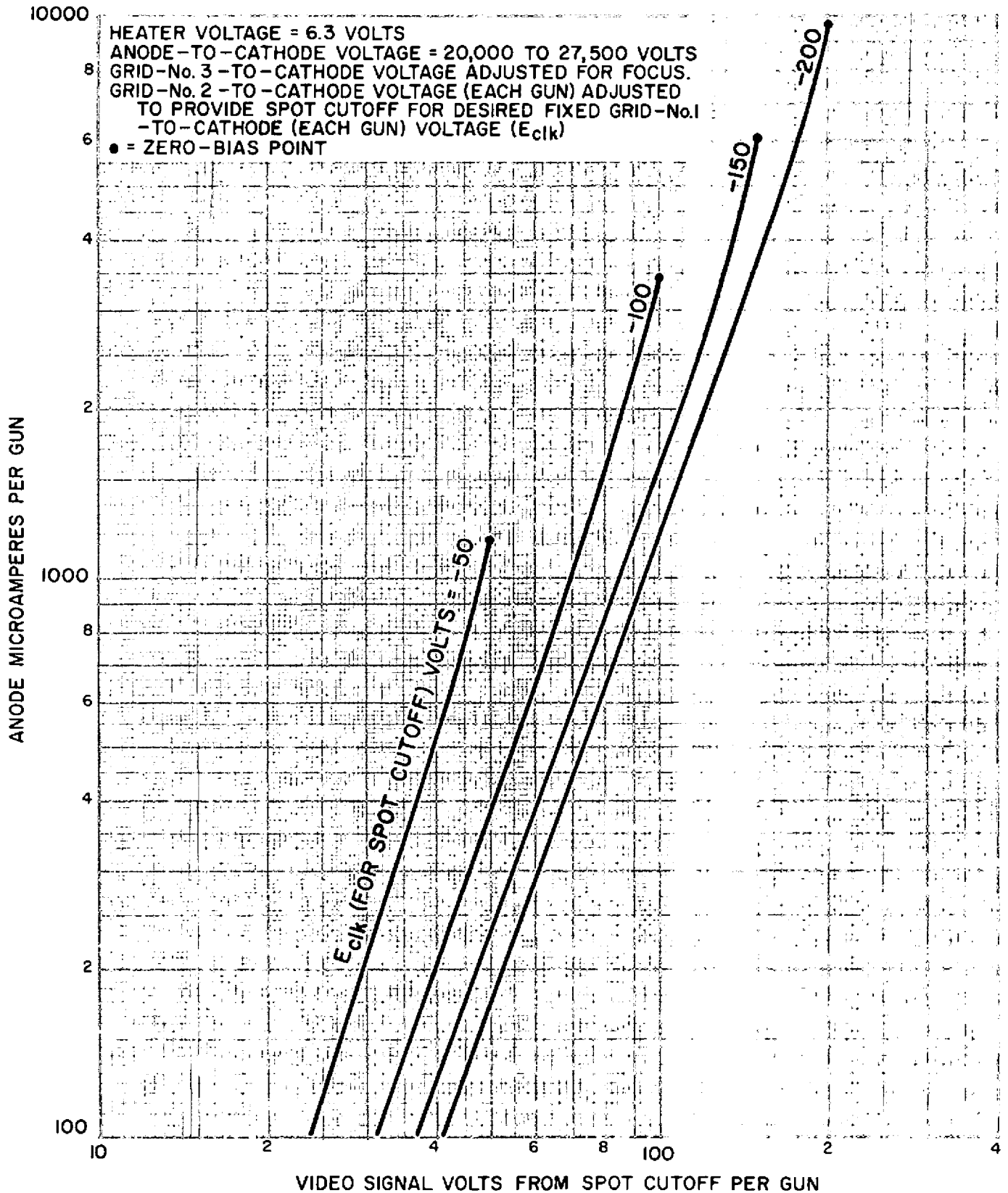
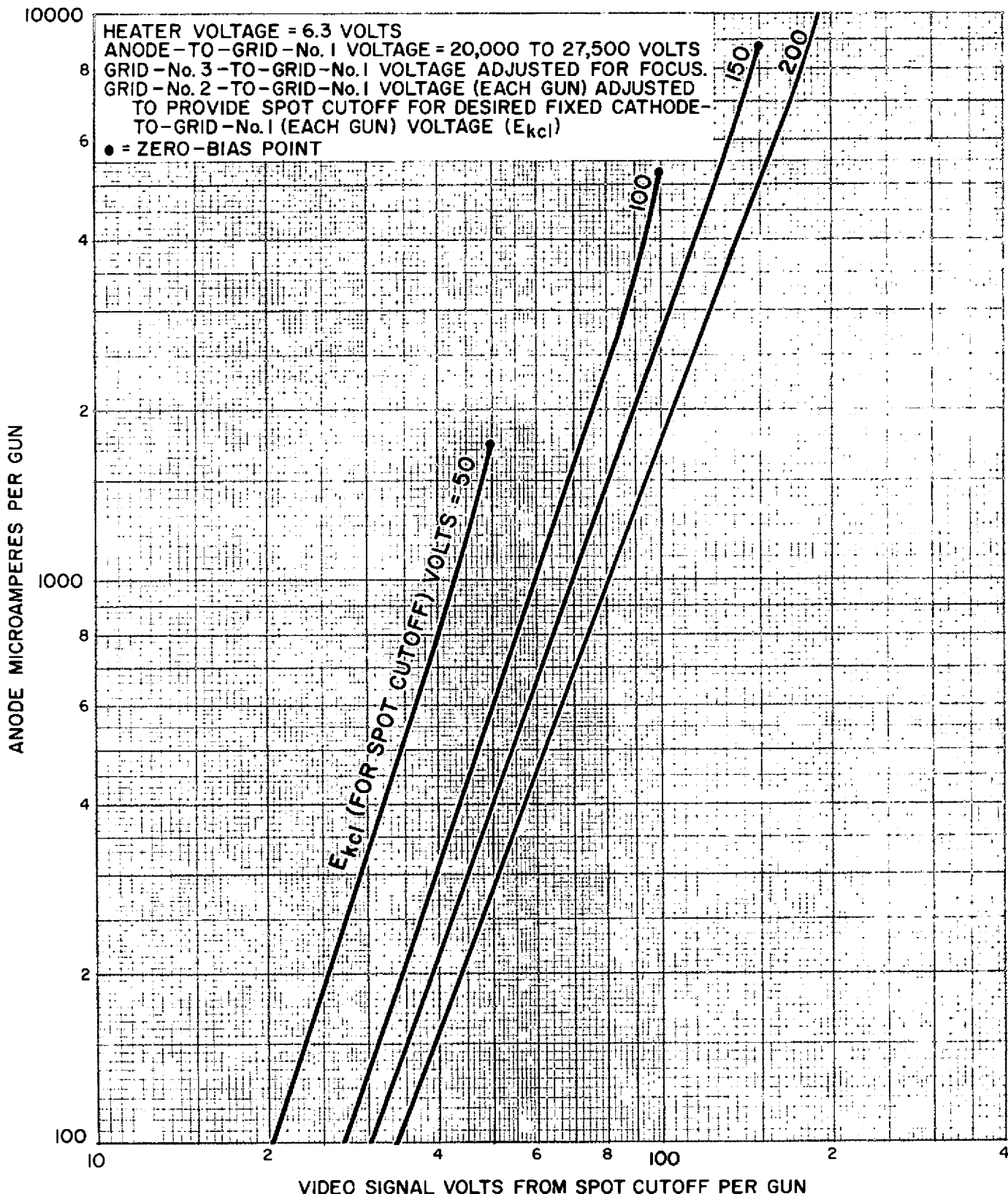


Fig.6

92CM-12807

TYPICAL DRIVE CHARACTERISTICS
Cathode-Drive Service



92CM-12806

Fig. 7

a gun with minimum cutoff versus grid-No.2 voltage. This figure illustrates characteristics of limit guns. These characteristics cannot be applied simultaneously to the three guns in any one tube because of the 1.86 value for "Maximum Ratio of Grid-No.2 Spot Cutoff Voltages" listed under *Equipment Design Ranges*. The characteristics for a particular tube can be determined and plotted on *Fig.2* by operating at a particular grid-No.2 voltage and determining the grid-No.1 voltage for spot cutoff for each of the guns. New curves can then be drawn through these points from the same origin—grid-No.2-to-cathode volts of -125 and grid-No.1-to-cathode volts of 0.

Drive requirements for the 25AP22 are more complicated than the drive requirements for a conventional black-and-white picture tube. In practice, video information (color and/or black-and-white) may be applied to both the No.1 grids and the cathodes. Typical drive characteristics of the 25AP22 are shown in *Figs.6 and 7*.

For satisfactory performance of the 25AP22 in reproducing black-and-white pictures, it is essential that there be no color shift with variation in intensity of light output. Since the phosphors show negligible current saturation in the range of current densities used, the necessary constancy of color temperature requires that the percentage of total anode current supplied by each gun be held constant over the desired brightness range to prevent color tinting of the highlights and shadows.

Equal-Cutoff-Variable-Video-Drive Tracking System. In tracking systems utilizing equal cutoff operation and variable video drive, the video drive is varied directly to obtain the necessary current ratios. The required video-drive ratios may be determined by applying the design operating cutoff voltage to the appropriate drive chart, *Fig.6 or Fig.7*, and from the "Percentage of Total Anode Current Supplied by Each Gun" listed under *Equipment Design Ranges*.

Fixed-Video-Drive Tracking System. It will be seen from *Figs.6 and 7* that a low value of grid-No.1 cutoff voltage allows a particular value of anode current to be obtained with reduced drive. For this condition, however, the maximum anode current which may be obtained at zero bias is relatively low as indicated by the upper termination of the drive-characteristic line. It is possible, therefore, to utilize a lower operating cutoff, obtained by a low grid-No.2 voltage, for use with a lower-efficiency phosphor thereby increasing the anode current and maintaining the proper current balance between guns. The opposite would be true for a high grid-No.1 voltage. This characteristic of drive adjustment may be used to compensate for phosphor-efficiency variations as listed under *Equipment Design Ranges*—"Percentage of Total Anode Current Supplied by Each Gun."

The **Typical Light-Output Characteristics** of the 25AP22 are shown in *Fig.8*. **Spectral-Energy Emission Characteristic** of the group phosphor P22—all-sulfide type is shown in *Fig.9*.

ADJUSTMENT PROCEDURES

The following procedures are suggested to provide color purity and optimum convergence of the three beams over the entire area of the screen.

A pattern of white horizontal and vertical bars is particularly suitable for convergence adjustments and can be helpful in linearity adjustments as well. Commercial dot-pattern generators, such as the RCA WR-64A Color-Bar/Dot/Crosshatch Generator, are available which are very useful for both convergence and linearity adjustments.

Proper adjustment requires that the beams be focused and that all three beams properly converge at the phosphor-dot screen. Each of the beams is brought to a focus by a separate electrostatic lens in the appropriate gun. All of these focusing lenses are adjusted by a common voltage applied to the focusing electrodes through base pin No.9. The three beams are adjusted for proper convergence by the use of magnetic fields acting on each beam. Proper convergence is established when the three color images produced by the application of the same video signal to all three guns appear superimposed upon one another.

Placement of Components. The Magnetic Shield, Deflecting Yoke, Radial-Converging Assembly, Lateral-Converging Device, and Purifying Magnet are placed on the tube as shown in *Fig.3*. It is important that proper orientation be maintained between the external components and the gun pole pieces as shown in *Figs. 3, 4, and 5*.

Degaussing Treatment. Before making the *Preliminary Adjustments*, "degauss" the tube and shield as indicated below. This treatment will correct for localized areas of color impurity resulting from any magnetization of the metal shield and internal metal tube parts. It also minimizes the effect of the earth's magnetic field on the tube.

After a receiver (with automatic degaussing) has been transported or changed in location, the 25AP22 should be "degaussed" without removing it from the receiver. Minor readjustments may be required to insure optimum white uniformity and color purity in the new location.

A suitable degaussing coil may be made by winding 425 turns of No.20 enameled wire on a 12-inch diameter form about 3/4-inch wide. The coil is connected to a 120-volt, 60-cps supply and moved over the top and sides as well as over the faceplate of the tube. After a few seconds, the voltage supplied to the coil should be

slowly reduced to zero or the coil should be slowly moved away from the faceplate to a distance of at least six feet before disconnecting from the power source.

Automatic degaussing of the color picture tube and magnetic shield may be accomplished with an appropriate

TYPICAL LIGHT-OUTPUT CHARACTERISTIC

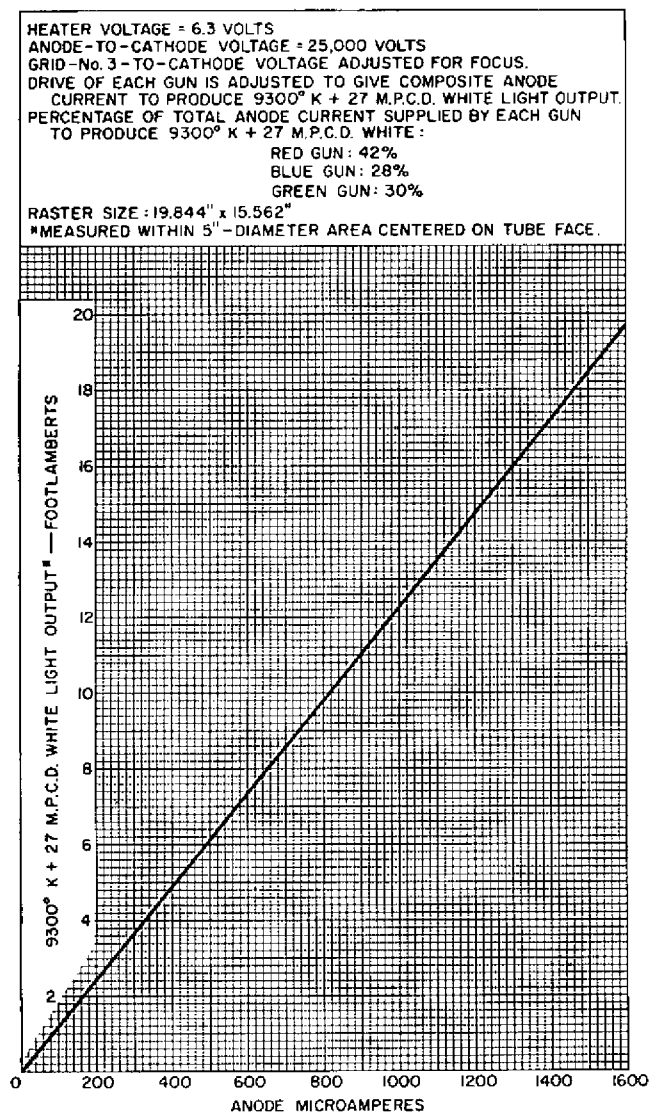


Fig. 8

component, used in conjunction with the magnetic shield, and associated circuitry. Normally the tube is "degaussed" each time the receiver is turned on to compensate for changes in instrument orientation with respect to the earth's magnetic field. Degaussing from an external source is required, when the receiver is initially set up, to degauss the chassis and other ferrous parts of the instrument. External degaussing is also required if the chassis etc. should become magnetized. This procedure is required since automatic degaussing coils

used in conjunction with the magnetic shield normally degauss the tube and shield only.

Color-Purity and Convergence Adjustments. The normal sequence involves first the dc convergence adjustment, next the purifying-magnet adjustment, and then

SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF GROUP PHOSPHOR P22 - ALL-SULFIDE TYPE

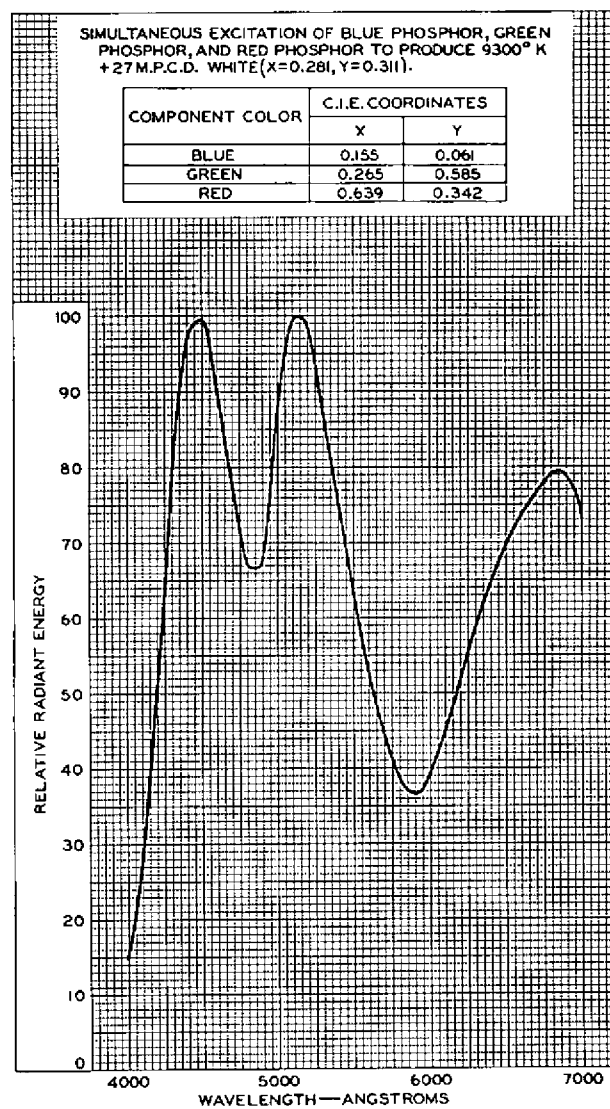


Fig. 9

adjustment of the axial position of the deflecting yoke. The procedures are described below.

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, the purifying magnet should be adjusted until a uniform red field appears at the center of the screen. Rotational adjustment of the puri-

fyng magnet affects, as illustrated in Fig.10, the direction in which the excited areas move, while adjustment of its field strength moves the beams in that direction. The purifying magnet should be adjusted in the above manner until the beam trio is centered on the phosphor-dot trio at the center of the screen.

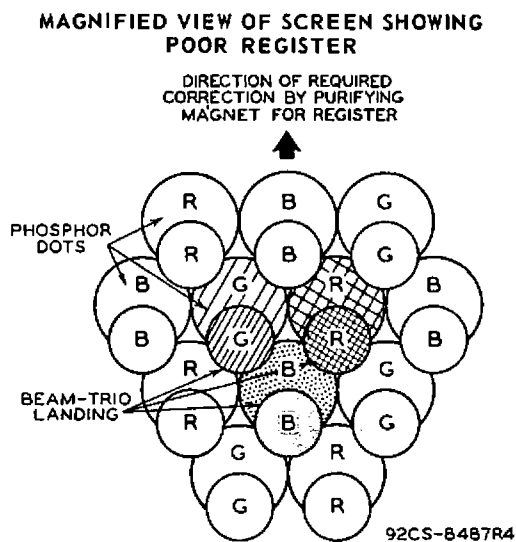
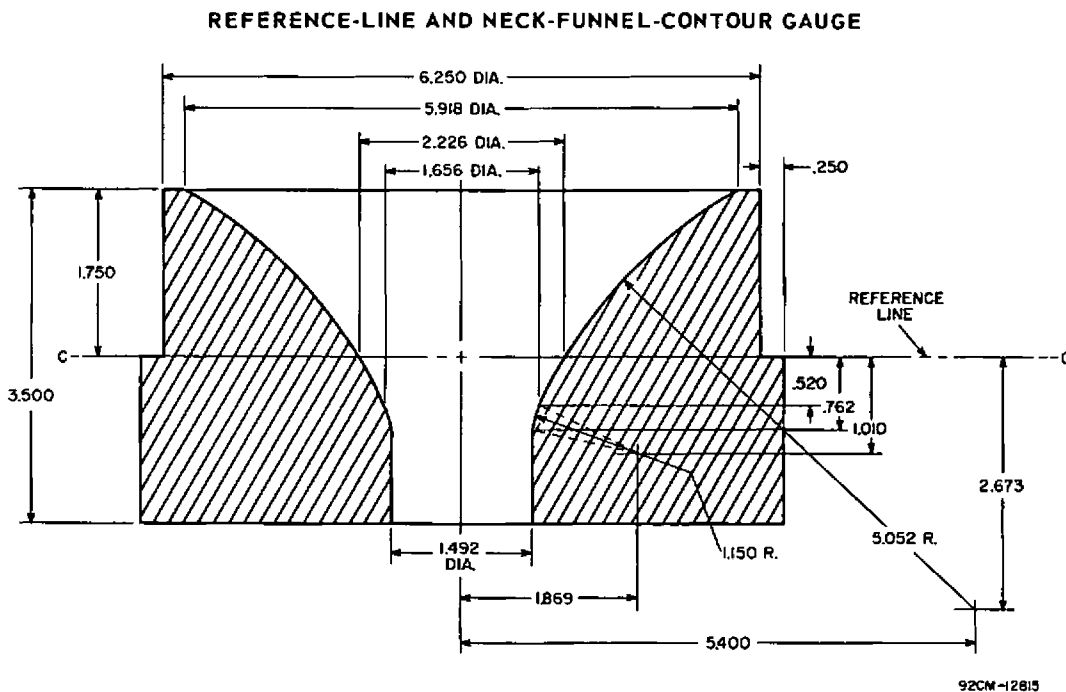


Fig.10

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 should be made if necessary to give the best red, blue, and green field purity. Center convergence should be checked before and after each purity adjustment.

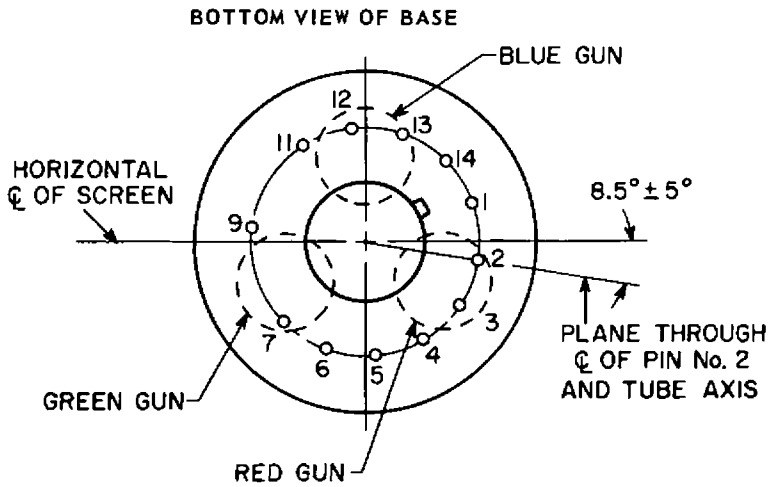
Adjustment of Dynamic Convergence. After the initial adjustments for color purity and convergence are completed, a white-bar or dot-pattern signal should be applied to the three guns and adjusted so that each color is of approximately the same intensity. The raster should then be centered by use of the horizontal and vertical centering controls. The initial adjustment of center convergence should be checked and readjusted if necessary by adjusting the three static-convergence controls and the lateral-converging control. Figs.4 and 5 show the direction of movement of each beam produced by its associated magnetic-field controls. The exact sequence of dynamic-convergence adjustments is dependent upon the convergence-circuit arrangement used.

Purity of the three fields should now be checked and the yoke as well as the purifying magnet should be readjusted as outlined under *Color-Purity and Convergence Adjustments*.



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

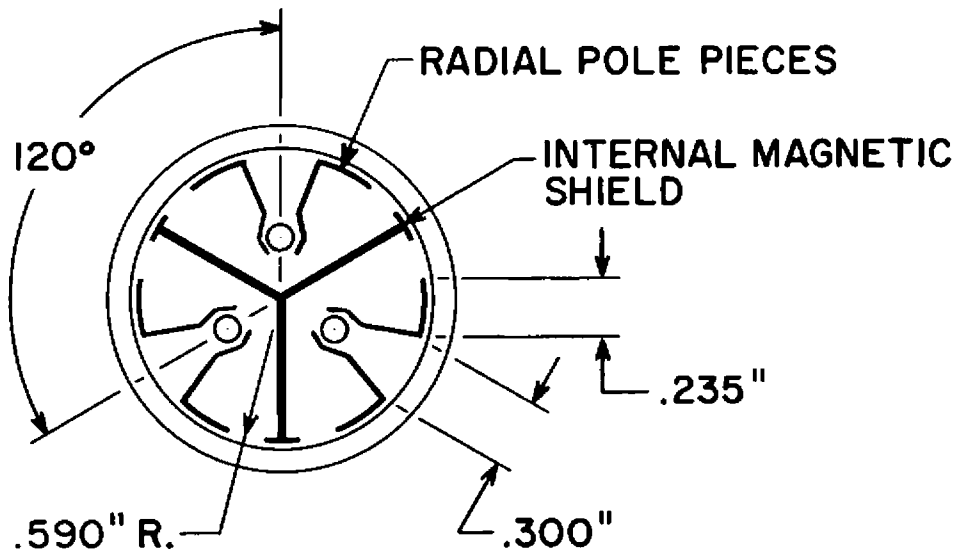
Dimensions in Inches



**BASE SPECIFICATION
14BE**

- PIN 1 - HEATER
- PIN 2 - CATHODE OF RED GUN
- PIN 3 - GRID No.1 OF RED GUN
- PIN 4 - GRID No.2 OF RED GUN
- PIN 5 - GRID No.2 OF GREEN GUN
- PIN 6 - CATHODE OF GREEN GUN
- PIN 7 - GRID No.1 OF GREEN GUN
- PIN 9 - GRID No.3
- PIN 11 - CATHODE OF BLUE GUN
- PIN 12 - GRID No.1 OF BLUE GUN
- PIN 13 - GRID No.2 OF BLUE GUN
- PIN 14 - HEATER
- CAP - ANODE (Grid No.4, Grid No.5, Screen, Collector)
- C - EXTERNAL CONDUCTIVE COATING

92CS-12816



92CS-12835

Location of radial-converging pole pieces viewed from screen end of guns

NOTES FOR DIMENSIONAL OUTLINE

NOTE 1: With tube neck inserted through flared end of reference-line and neck-funnel-contour gauge (shown on page 10) and with tube seated in gauge, the reference line is determined by the intersection of the plane CC' 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 circle concentric with bulb axis and having a diameter of 2.

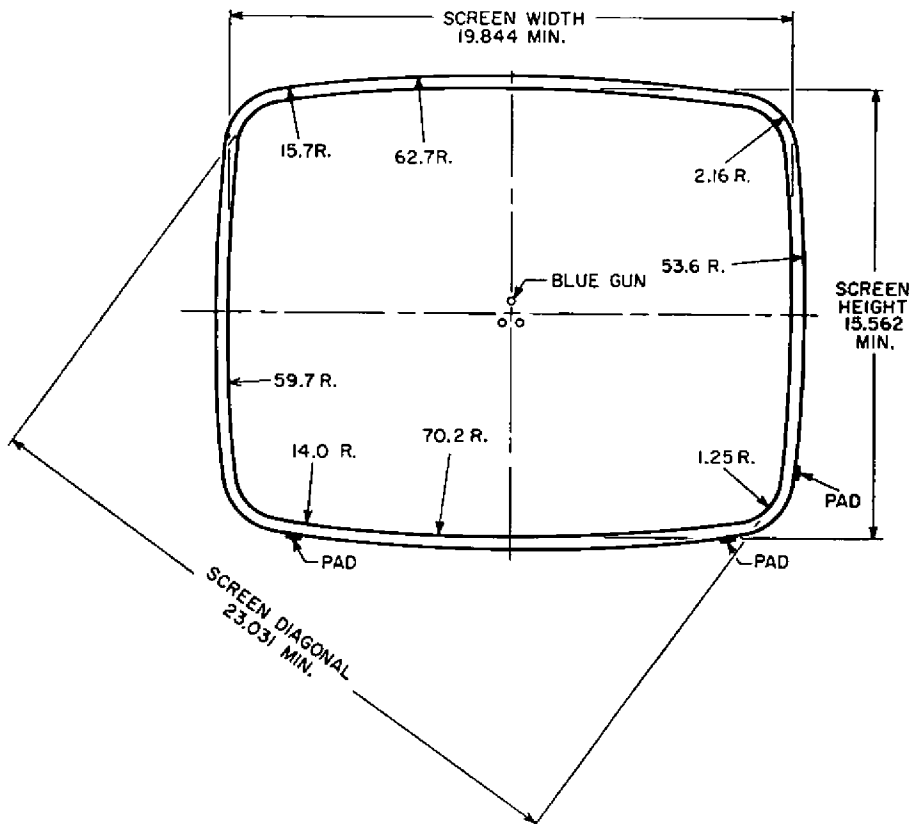
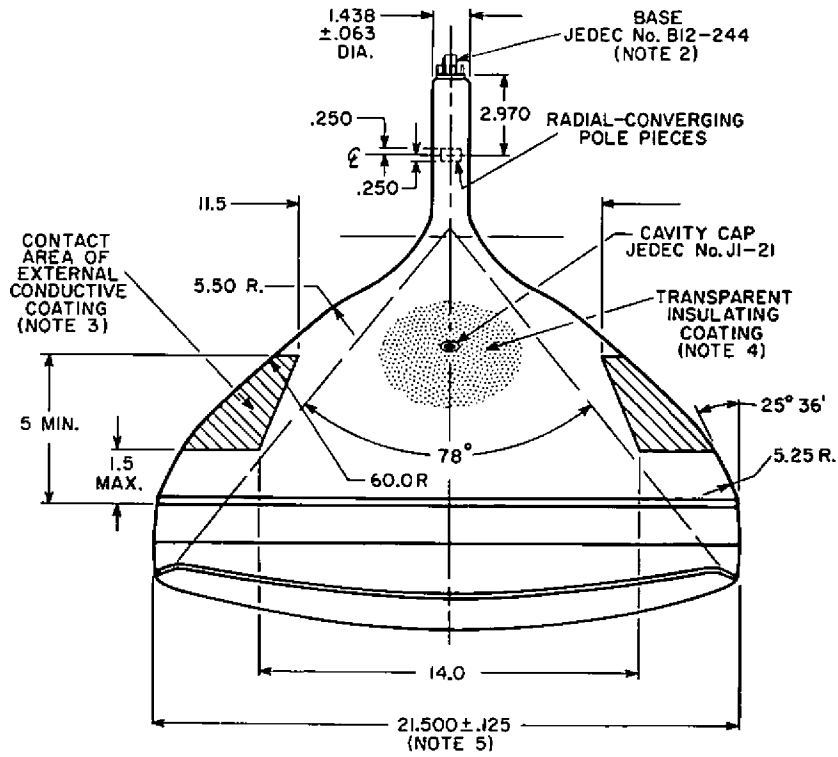
NOTE 3: The drawing shows the size and location of the contact area of the external conductive coating. The actual area of this coating will be greater than that of the contact area so as to provide the required capacitance. External conductive coating must be grounded with multiple contacts.

NOTE 4: To clean this area, wipe only with soft dry lintless cloth.

NOTE 5: Measured from the mold-match line.

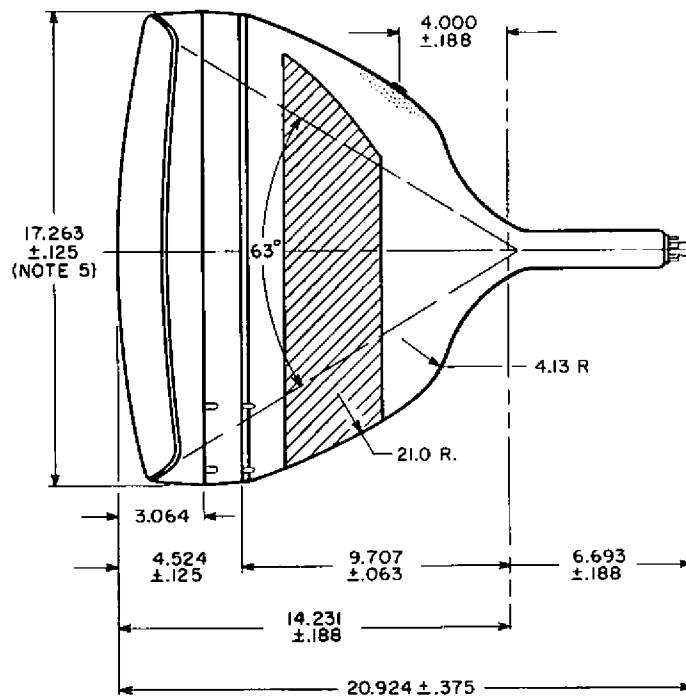
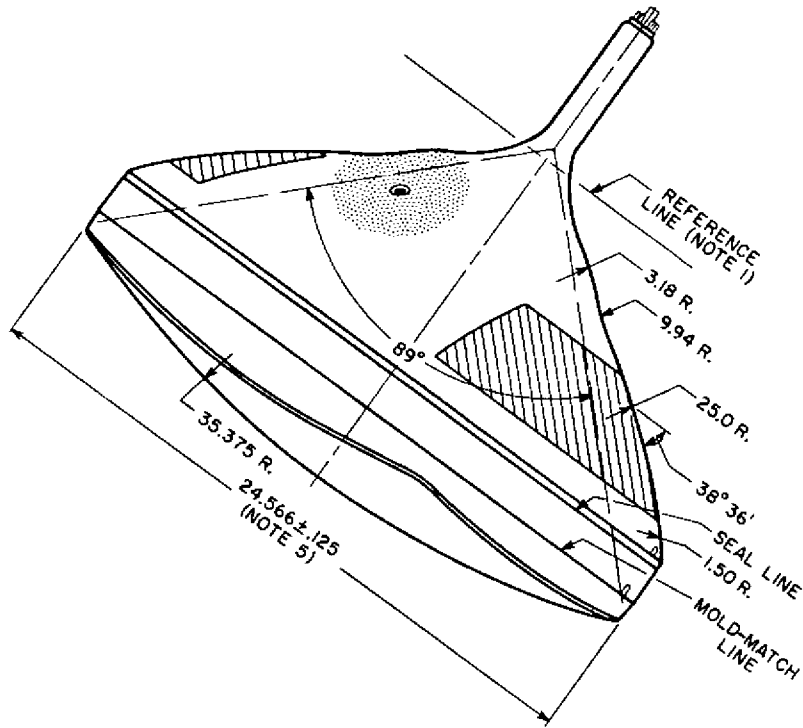
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DIMENSIONAL OUTLINE



Dimensions in Inches Unless Otherwise Shown
 For Notes, see page 11.

DIMENSIONAL OUTLINE



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Dimensions in Inches Unless Otherwise Shown
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