21CYP22-A

Color Picture Tube

THREE-GUN, GRADED-HOLE, SHADOW-MASK TYPE
ALUMINIZED TRICOLOR PHOSPHOR-DOT SCREEN

ALL-GLASS ENVELOPE — **ELECTROSTATIC FOCUS**
MAGNETIC CONVERGENCE — **MAGNETIC DEFLECTION**

Supersedes Type 21CYP22

DATA

General:

Electron Guns, Three with Axes Tilted Toward Tube Axis	Blue, Green, Red	
Heater, for Unipotential Cathode of Each Gun, Paralleled with Each of the Other Two Heaters within Tube:		
Voltage (AC or DC)▲	6.3	volts
Current at 6.3 volts	1.6	amp
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 of any gun to all other electrodes except the No.1 grids of the other two guns	7	μμf
Cathode of blue gun + cathode of green gun + cathode of red gun to all other electrodes	16	μμf
Grid No.3 (Of each gun tied within tube to No.3 grids of other two guns) to all other electrodes	9	μμf
External conductive coating to grid No.6	2500 max. 2000 min.	μμf μμf
Faceplate, Spherical	Filterglass	
Light transmission (Approx.)	72%	
Screen, on Inner Surface of Faceplate:		
Type	Aluminized, Tricolor, Phosphor-Dot	
Phosphor (Three separate phosphors, collectively)●	P22	
Fluorescence and phosphorescence of separate phosphors, respectively	Blue, Green, Red	
Persistence of group phosphorescence	Medium	
Dot arrangement	Triangular group consisting of blue dot, green dot, and red dot	
Spacing between centers of adjacent dot trios (Approx.)	0.029"	
Size (Minimum):		
Greatest width	19-1/4"	
Height	15-1/2"	
Projected area	261 sq. in.	
Focusing Method	Electrostatic	
Convergence Method	Magnetic	
Deflection Method	Magnetic	
Deflection Angles (Approx.):		
Horizontal	70°	
Vertical	55°	
Tube Dimensions:		
Overall length	25-1/32" ± 3/8"	
Diameter	20-13/16" ± 1/8"	
Weight (Approx.)	36-1/2 lbs	

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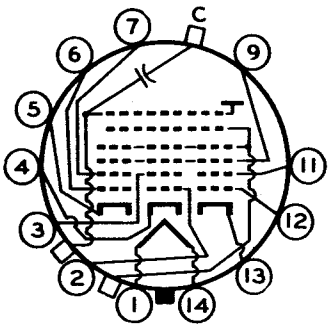
Operating Position . . . . . Tube Axis Horizontal
(Base pin 12 and V-grooved panel pad on top)
Caps (Two) . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Socket . . . . . .Alden Nos.214NMINSC (Radial leads),
214NMINC (Axial leads), or equivalent
Base . . . .Small-Shell Neodiheptal 12-Pin (JEDEC No.B12-131)
Basing Designation for BOTTOM VIEW 14AL

Pin 1 - Heater
Pin 2 - Grid No.1 of Red Gun
Pin 3 - Grid No.2 of Red Gun
Pin 4 - Cathode of Red Gun
Pin 5 - Cathode of Green Gun
Pin 6 - Grid No.1 of Green Gun
Pin 7 - Grid No.2 of Green Gun
Pin 9 - Grid No.3
Pin 11 - Grid No.2 of Blue Gun
Pin 12 - Grid No.1 of Blue Gun
Pin 13 - Cathode of Blue Gun
Pin 14 - Heater
Cap Over Pin 1 - Ultor (Grid No.4, Grid No.5)



Cap* Over Pin 2 - Grid No.6, Collector, High-Voltage-Supply Terminal
C - External Conductive Coating

Maximum Ratings, *Design-Center Values:*

ULTOR-TO-CATHODE (Of each gun) VOLTAGE . . 25000 max. volts

Between the Ultor Terminal and the High-Voltage-Supply Terminal (See *Dimensional Outline*), it is necessary to connect a resistor of 50,000 ohms as described under *Limiting Circuit Values*. The high voltage must be connected to the High-Voltage-Supply Terminal—never directly to the Ultor Terminal.

GRID-No.3-TO-CATHODE (Of each gun) VOLTAGE.	6000 max.	volts
GRID-No.2-TO-CATHODE VOLTAGE (Each gun). .	600 max.	volts
GRID-No.1-TO-CATHODE VOLTAGE (Each gun):		
Negative-bias value.	400 max.	volts
Positive-bias value.	0 max.	volts
Positive-peak value.	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE (Each gun):		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode.	180 max.	volts

Equipment Design Ranges:

With ultor voltage (E_{c_4k} each gun) between 20000♦ and 25000 volts

Grid-No.3 (Focusing Electrode)-to-Cathode (Of each gun) Voltage. .	16.8% to 20% of E_{c_4k} each gun	volts
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage (E_{c_1k}) at fixed value for raster cutoff.	See *Cutoff Design Chart*	
Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage (E_{c_2k}) at fixed value.	See *Cutoff Design Chart*	
Variation in Raster Cutoff Between Guns in Any Tube.	± 21% of average of highest and lowest cutoff values	
Grid-No.3 Current. . . .	-45 to +45	μa
Grid-No.2 Current (Each gun)	-5 to +5	μa
Percentage of Total Ultor Current Supplied by Each Gun:		
To Produce White of 8500° K + 27 M.P.C.D. (CIE Coordinates x = 0.287, y = 0.316):		
Red gun.	49	%
Blue gun	18	%
Green gun.	33	%

Ratios of Cathode Currents:

To Produce White of 8500° K + 27 M.P.C.D. (CIE Coordinates x = 0.287, y = 0.316):●

	Min.	*Typical*	*Max.*
Red cathode to green cathode. . . .	1.2	1.5	1.8
Red cathode to blue cathode	2.1	2.7	3.3

Maximum Raster Shift in Any Direction from Screen Center♦	7/8	inch

Maximum Required Displacements
of Beam Trios with Respect to
Associated Phosphor-Dot Trios:
Uniform in any direction over
entire screen area . . . . . .0.005"♠

Adjustment to be Provided by
the Following Components:
Lateral-Converging Magnet:♣,⊕
Maximum lateral shift of blue beam . . . . . ±1/4"
Maximum lateral shift of red beam and
green beam . . . . . ±1/8" to ±3/8"
Average of maximum lateral shift
of red beam and green beam . . . . . ±7/32" to ±9/32"
Radial-Converging Magnet Assembly:♣
For static convergence including
compensation for dc component
of dynamic convergence
(Each beam). . . . . Shift of ±5/8"
For dynamic convergence#—
Effected by magnetomotive force
of parabolic and/or sawtooth
waveshape synchronized with
scanning.

Horizontal:

Blue pattern—
Parabola amplitude to
provide* . . . . . Shift of 3/16" to 1/2"
Sawtooth amplitude to
provide* . . . . . Shift of ±50% of the
shift caused by pa-
rabola amplitude

Red pattern & green pattern—
Parabola:
Amplitude to provide*. . . .Shift of 1/16" to 5/16"
Ratio of red-pattern shift
to green-pattern shift . . . . . 2/3 to 3/2
Sawtooth:
Amplitude to provide*. . . . .Shift of -60% to +60%
of the shift caused by
parabola amplitude

Difference between red-
pattern shift and green-
pattern shift ($Shift_R$ -
$Shift_G$). . . . . -75% to +75%

Vertical:

Blue pattern—
Parabola amplitude to
provide* . . . . . Shift of -1/8" to +1/16"
Sawtooth amplitude to
provide* . . . . . .Shift of -1/16" to +3/16"

Red pattern & green pattern—
Parabola:
Amplitude to provide*. . . . Shift of 1/8" to 5/16"
Ratio of red-pattern shift to green-pattern shift . . . . . 2/3 to 3/2
Sawtooth:
Amplitude to provide*. . . Shift of −1/8" to +3/16"
Difference between red-pattern shift and green-pattern shift ($Shift_R - Shift_G$). . . . . −100% to +100%

Examples of Use of Design Ranges:

For ultor voltage of	*20000*	*25000*	*volts*
Grid-No.3 (Focusing Electrode)-to-Cathode (Of each gun) Voltage. .	3360 to 4000	4200 to 5000	volts
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage of −70 volts for raster cutoff. . . .	130 to 370	130 to 370	volts
Grid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit design utilizes grid-No.2-to-cathode voltage of 200 volts . .	−45 to −100	−45 to −100	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 with inherent regulation to limit the continous short-circuit current to 50 milliamperes. In addition, to prevent cathode damage with resultant decrease in tube life, an external resistor having a value of 50,000 ohms must be connected between the two bulb terminals and the effective resistance between the grid-No.3 power-supply output capacitor and the grid-No.3 electrode should not be less than 50,000 ohms. These resistances should be capable of withstanding the maximum instantaneous currents and voltages in their respective circuits. It is to be noted that the high voltage must be connected only to the High-Voltage-Supply Terminal—*never directly to the Ultor Terminal*. A resistor of 50,000 ohms must be connected between the Ultor Terminal and the High-Voltage-Supply Terminal.

In equipment utilizing a well-regulated high-voltage power supply, the *grid-No.3-circuit resistance* should be limited to 7.5 megohms.

The maximum dc current capability of the high-voltage power supply should be limited to a value of 1100 μa as measured by a dc ammeter in the lead from the high-voltage power supply to the high-voltage terminal of the tube. The product of the maximum current capability and the maximum dc voltage between the high-voltage terminal and any cathode of the tube, as measured by an electrostatic voltmeter, should not exceed 25 watts.

Low-Voltage Circuits:

Effective Grid-No.1-to-Cathode-Circuit Resistance (Each gun). . . . . 0.75 max. megohm

When the cathode of each gun is not connected directly to the heater, the grid-No.2-to-heater circuit, the grid-No.1-to-heater circuit, and the cathode-to-heater circuit should each have an impedance such that their respective power sources in combination will not supply an instantaneous or continuous short-circuit current of more than 300 milliamperes total. Such current limitation will prevent heater burnout in case of a momentary internal arc within the tube.

When the cathode is connected directly to the heater, the grid-No.2-to-heater circuit, and the grid-No.1-to-heater circuit should each have an impedance such that their respective power sources in combination will not supply an instantaneous or continuous short-circuit current of more than 300 milliamperes total. Such current limitation will prevent heater burnout in case of a momentary internal arc within the tube.

▲ For maximum cathode life, it is recommended that the heater supply be regulated. When current regulation is employed, the regulator should be designed to provide a heater current of 1.5 amperes with variations not exceeding ± 3% under normal line-voltage variations. When voltage regulation is employed, the regulator should be designed to provide a heater voltage of 5.5 volts with variations not exceeding ± 6% under normal line-voltage variations.

● For Curves, see front of this Section.

★ Connect high-voltage supply to this cap and also connect 50,000-ohm resistor between this cap and cap over pin 1 (Ultor cap).

⧫ Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 20,000 volts.

Centering of the raster on the screen may be accomplished by passing direct current of the required value through each pair of deflecting coils to compensate for raster shift resulting from adjustments for optimum convergence and color purity.

♠ If this displacement is accomplished by means of a purifying magnet located on the neck of the tube, the equivalent raster movement is about 3/4".

♣ Shift is the movement of the regions of dot/crosshatch-generator pattern indicated in notes (*) and (✠).

⊕ The direction of movement of the red and green beam is opposite to that of the blue beam.

Indicated values apply when RCA test yoke is used with this color picture tube.

* The parabola amplitude is determined by the average value of the shifts at the extremities of the respective horizontal and vertical axes of the screen with convergence of the three beams maintained at the center of the screen. An increase in amplitude should move the blue beam toward the top of the screen; the red beam toward the lower left of the screen; and the green beam toward the lower right of the screen.

✠ The sawtooth amplitude is determined by the difference between the shifts at the extremities of the respective horizontal and vertical axes of the screen. Positive amplitude indicates that the shift at the right or bottom of the screen is greater than the shift at the left or top of the screen.

DEFINITIONS

Beam Trio. The red beam, green beam, and blue beam passing through a common hole in the shadow mask.

Register. Exact correspondence in position of the centers of beam trios with respect to the centers of the associated phosphor-dot trios.

Misregister. Lack of correspondence in position of the centers of the beam trios with respect to the centers of the center of the associated phosphor-dot trios.

Displacement. Shift of the position of the beams with respect to the phosphor dots.

GENERAL CONSIDERATIONS

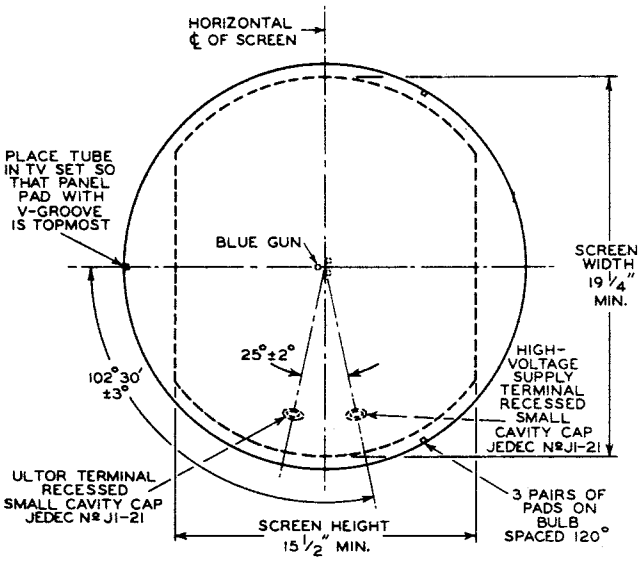
X-Ray-Warning. Because this color picture tube is designed to be operated at ultor voltages as high as 25 kilovolts (Design-center maximum value), shielding of this color picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range.

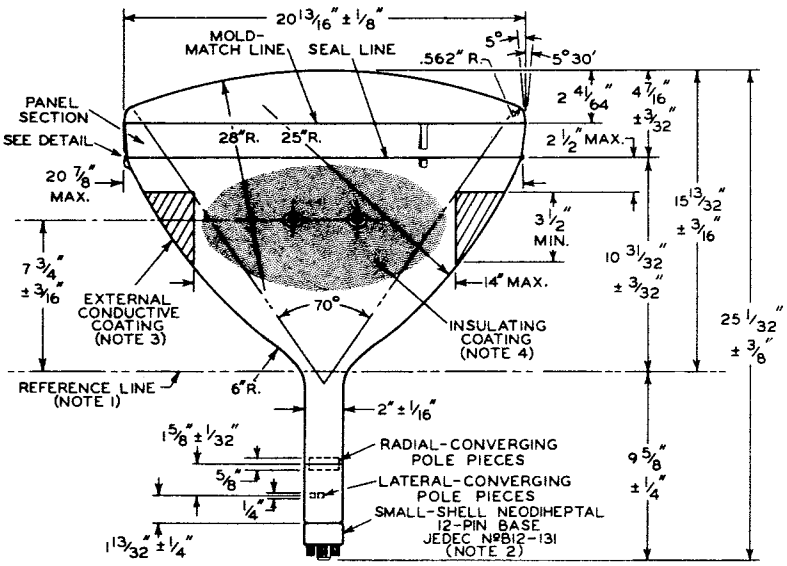
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of this color picture tube to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

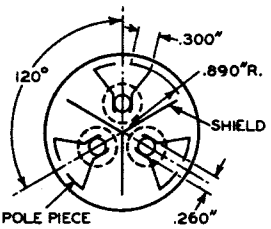
High Voltages. The high voltages at which cathode-ray tubes are operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Precautions include the inclosing of high-potential terminals and the use of interlocking switches to break the primary circuit of the power supply when access to the equipment is required.

REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE for Type 21CYP22-A is the same as that shown for Type 21AXP22-A

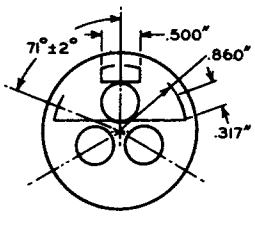
21CYP22-A


HORIZONTAL ℄ OF SCREEN
PLACE TUBE IN TV SET SO THAT PANEL PAD WITH V-GROOVE IS TOPMOST
BLUE GUN
SCREEN WIDTH 19 1/4" MIN.
25° ±2°
102°30' ±3°
HIGH-VOLTAGE SUPPLY TERMINAL RECESSED SMALL CAVITY CAP JEDEC NO. J1-21
ULTOR TERMINAL RECESSED SMALL CAVITY CAP JEDEC NO. J1-21
3 PAIRS OF PADS ON BULB SPACED 120°
SCREEN HEIGHT 15 1/2" MIN.

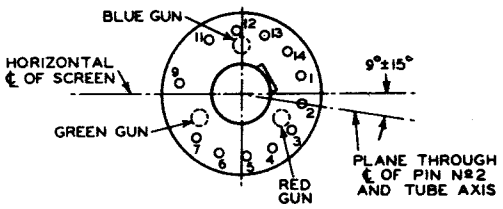

20 13/16" ± 1/8"
MOLD-MATCH LINE
SEAL LINE
5°
.562" R.
5°30'
PANEL SECTION SEE DETAIL
28"R.
25"R.
2 4 1/64"
4 7/16" ±3/32"
2 1/2" MAX.
20 7/8" MAX.
3 1/2" MIN.
15 13/32" ±3/16"
10 31/32" ±3/32"
7 3/4" ±3/16"
14" MAX.
70°
EXTERNAL CONDUCTIVE COATING (NOTE 3)
INSULATING COATING (NOTE 4)
25 1/32" ±3/8"
REFERENCE LINE (NOTE 1)
6"R.
2" ±1/16"
1 5/8" ±1/32"
RADIAL-CONVERGING POLE PIECES
5/8"
LATERAL-CONVERGING POLE PIECES
1/4"
9 5/8" ±1/4"
SMALL-SHELL NEODIHEPTAL 12-PIN BASE JEDEC NO. B12-131 (NOTE 2)
1 13/32" ±1/4"



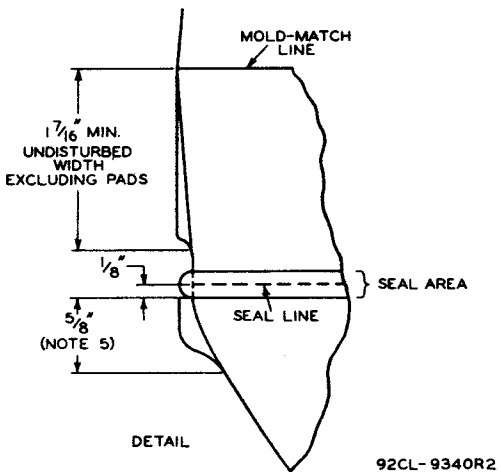
LOCATION OF RADIAL-CONVERGING POLE PIECES VIEWED FROM SCREEN END OF GUNS



LOCATION OF LATERAL-CONVERGING POLE PIECES WITH RESPECT TO GUNS



BASE
BOTTOM VIEW



NOTE 1: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE 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.

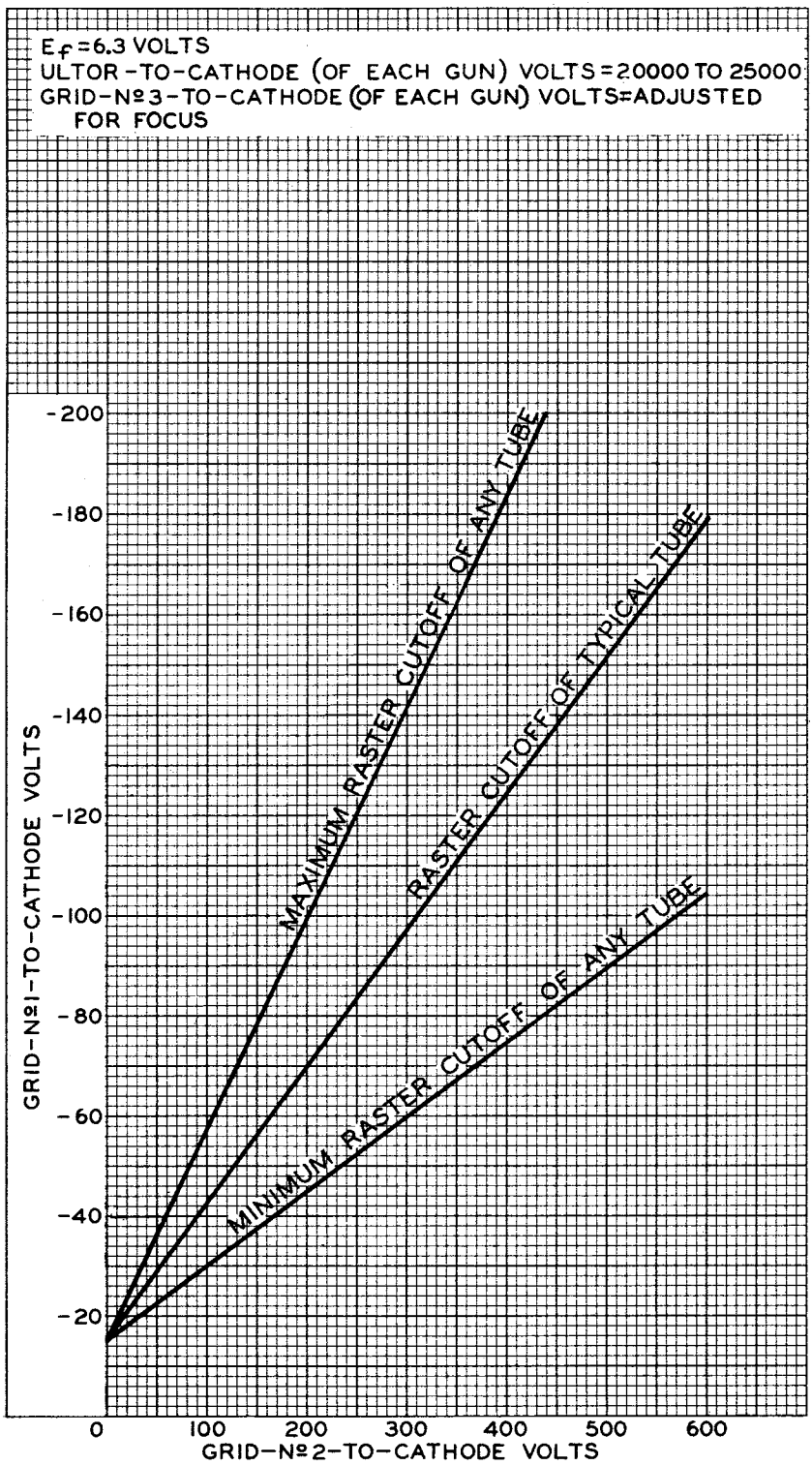
NOTE 2: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

NOTE 3: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT BAND OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THAT OF THE CONTACT BAND SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 4: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 5: THE MAXIMUM EFFECTIVE WIDTH OF A FUNNEL PAD IS 5/8".

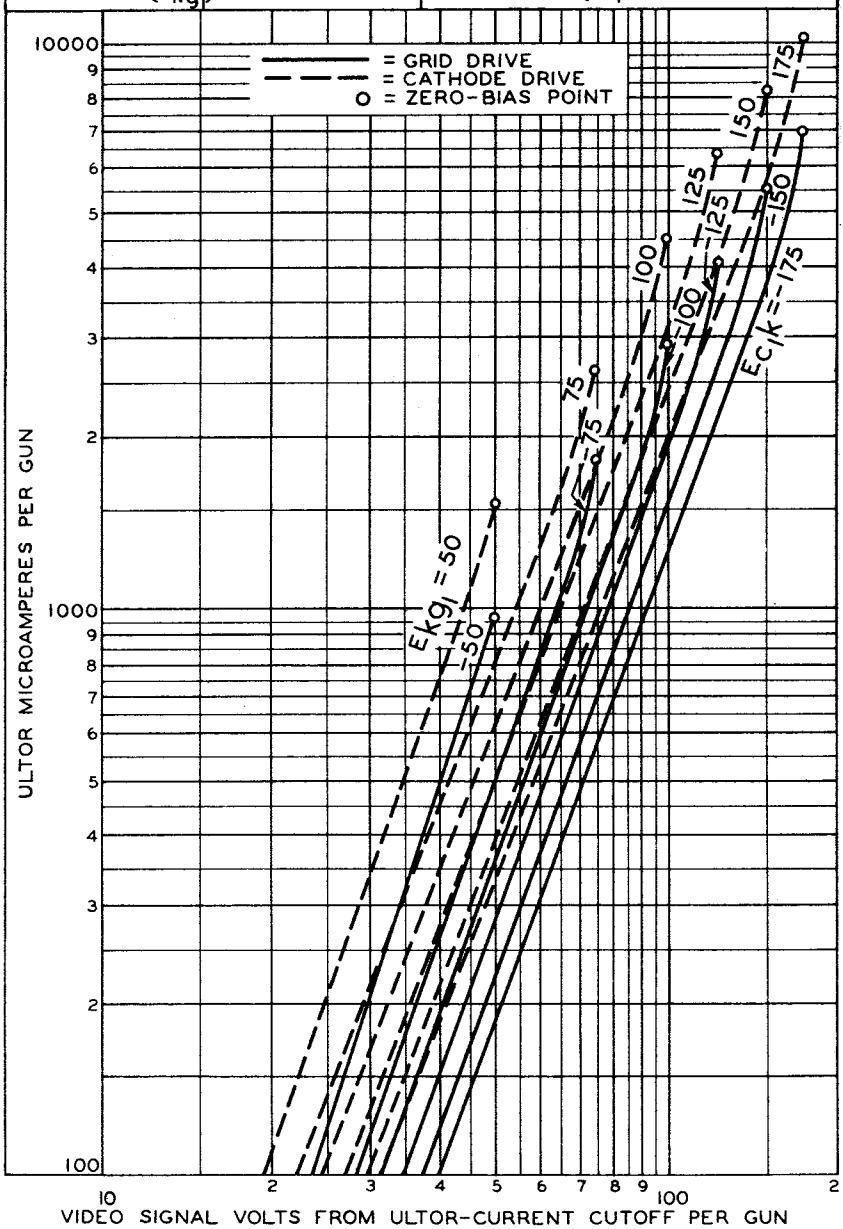
CUTOFF DESIGN CHART



92CM-8565R1

TYPICAL DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
E_f = 6.3 VOLTS	E_f = 6.3 VOLTS
ULTOR-TO-GRID-№1 (OF EACH GUN) VOLTS = 20000 TO 25000	ULTOR-TO-CATHODE (OF EACH GUN) VOLTS = 20000 TO 25000
GRID-№3-TO-GRID-№1 (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS	GRID-№3-TO-CATHODE (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS
GRID-№2-TO-GRID-№1 VOLTS (EACH GUN) = ADJUSTED TO PROVIDE ULTOR-CURRENT CUT-OFF FOR DESIRED FIXED CATHODE-TO-GRID-№1 (EACH GUN) VOLTAGE (E_{kg_1})	GRID-№2-TO-CATHODE VOLTS (EACH GUN) = ADJUSTED TO PROVIDE ULTOR-CURRENT CUT-OFF FOR DESIRED FIXED GRID-№1-TO-CATHODE (EACH GUN) VOLTAGE (E_{c_1k})



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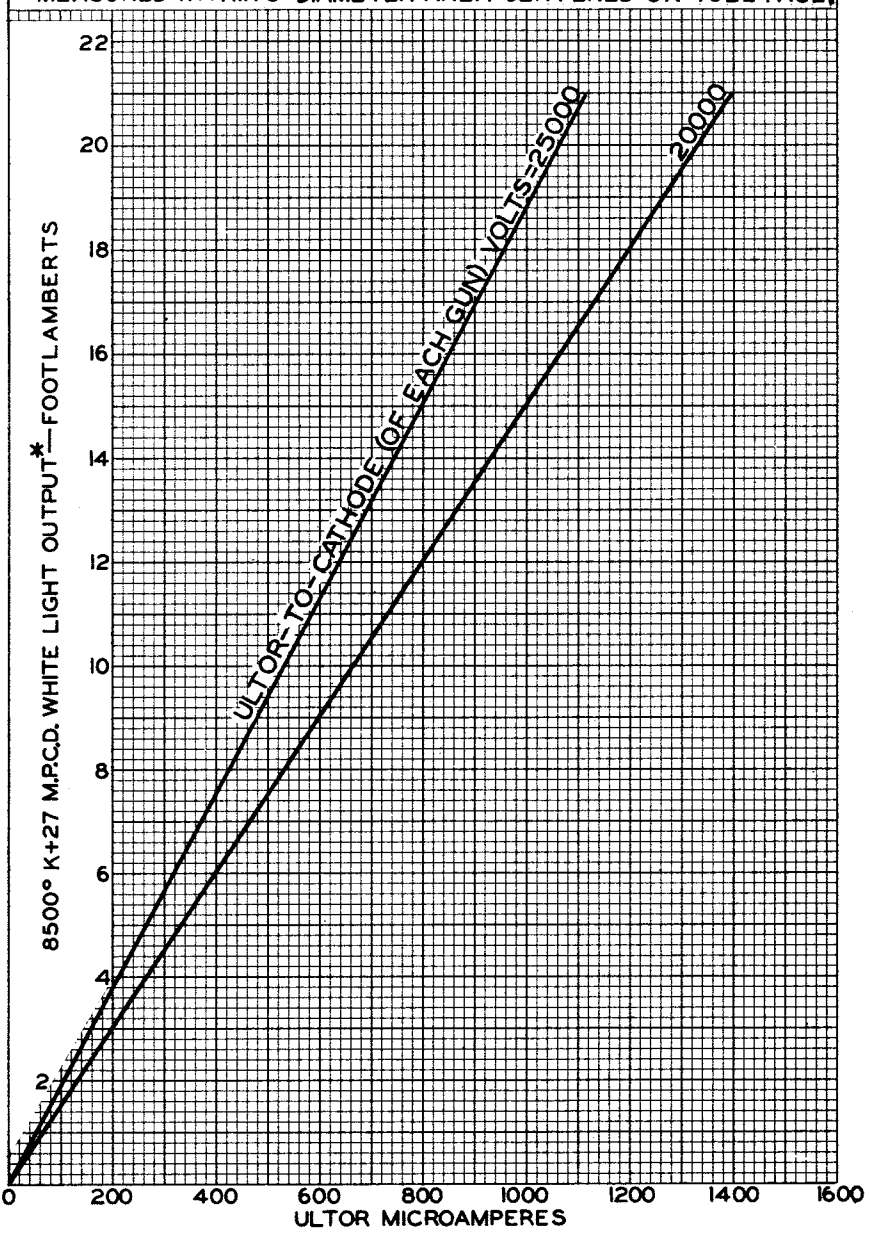
TYPICAL LIGHT-OUTPUT CHARACTERISTICS

E_f = 6.3 VOLTS
GRID-No 3-TO-CATHODE (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS
DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ULTOR CURRENT TO PRODUCE 8500° K+27 M.P.C.D. WHITE LIGHT OUTPUT.
PERCENTAGE OF TOTAL ULTOR CURRENT SUPPLIED BY EACH GUN TO PRODUCE 8500° K+27 M.P.C.D. WHITE:

RED GUN:	50 %
BLUE GUN:	19 %
GREEN GUN:	31 %

RASTER SIZE: 19¼" x 14½" CENTERED ON TUBE FACE.
*MEASURED WITHIN 5" DIAMETER AREA CENTERED ON TUBE FACE.



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