

## Color Picture Tube

## INTEGRAL PROTECTIVE WINDOW

THREE-GUN, GRADED-HOLE SHADOW-MASK TYPE  
ALUMINIZED TRICOLOR PHOSPHOR-DOT SCREENALL-GLASS ENVELOPE  
MAGNETIC CONVERGENCEELECTROSTATIC FOCUS  
MAGNETIC DEFLECTION

## 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: Current at 6.3 volts. . . . .	1.8	amp
Focusing Method . . . . .	Electrostatic	
Convergence Method. . . . .	Magnetic	
Deflection Method . . . . .	Magnetic	
Deflection Angles (Approx.):		
Horizontal. . . . .	70°	
Vertical. . . . .	55°	
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 of any gun to all other electrodes. . . . .	10	μf
Cathode of blue gun + cathode of green gun + cathode of red gun to all other electrodes. . . . .	16	μf
Grid No.3 to all other electrodes . . . . .	12	μf
External conductive Coating to ultor. . . . .	{ 2500 max. 2000 min.	{ μf μf

## Optical:

Faceplate and Protective Window . . . . .	Filterglass
Light transmission (Approx.):	
Combined faceplate and protective window . . . . .	43%
Faceplate . . . . .	72%
Protective window . . . . .	61%
Screen, on Inner Surface of Faceplate:	
Type. . . . .	Aluminized, Tricolor, Phosphor-Dot
Phosphor (Three separate phosphors, collectively) <sup>a</sup> . . . . .	P22—All-Sulfide Type
Fluorescence and phosphorescence of separate phosphors, respectively. . . . .	Blue, Green, Red
Persistence of group phosphorescence. . . . .	Medium Short
Dot arrangement . . . . .	Triangular group consisting of blue dot, green dot, and red dot
Spacing between centers of adjacent dot trios (Approx.) . . . . .	0.029"



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## Mechanical:

### Tube Dimensions:

Overall length. . . . . 25-9/32" ± 3/8"  
 Maximum diameter. . . . . 21"

### Screen Dimensions (Minimum):

Greatest width. . . . . 19-1/4"  
 Greatest height . . . . . 15-1/2"  
 Projected area. . . . . 261 sq. in.  
 Weight (Approx.). . . . . 43 lbs

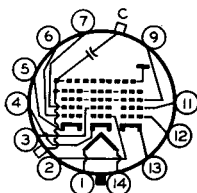
Operating Position. . . . . Tube Axis Horizontal  
 (Base pin 12 and V-grooved panel pad on top)

Cap . . . . . Recessed Small Cavity (JEDEC No. J1-21)

Socket. . . . . Alden Nos. 214NMINS (Radial leads),  
 214NMINC (Axial leads), or equivalent

Base. . . . Small-Shell Neodiheptal 12-Pin (JEDEC No. B12-131)  
 Basing Designation for BOTTOM VIEW. . . . . 14AU

- 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-Ultor (Grid No.4,  
Grid No.5, Collector)
- C-External Conductive  
Coating

## Maximum and Minimum Ratings, Design-Maximum Values:

ULTOR-TO-CATHODE (Of each gun) VOLTAGE. . . 27500 max. volts  
 GRID-No.3-TO-CATHODE (Of each gun) VOLTAGE. 6000 max. volts  
 PEAK GRID-No.2-TO-CATHODE VOLTAGE, INCLUDING  
 VIDEO SIGNAL VOLTAGE (Each gun) . . . . . 650 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  
 HEATER VOLTAGE (AC or DC)<sup>b</sup>. . . . . { 6.9 max. volts  
 { 5.7 min. volts  
 PEAK HEATER-CATHODE VOLTAGE (Each gun):  
 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:

With ultor voltage ( $E_{c4k}$  each gun) between 20000<sup>c</sup> and 27500 volts

Grid-No.3 (Focusing Electrode)-to-Cathode (Of each gun) Voltage.	16.8% to 20% of $E_{c4k}$ each gun	volts
Grid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes grid-No.1-to-cathode voltage ( $E_{c1k}$ ) 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 ( $E_{c2k}$ ) at fixed value.	. . . . . See Cutoff Design Chart	
Variation in Raster Cutoff Between Guns in Any Tube.	$\pm 21\%$ of average of highest and lowest cutoff values	
Grid-No.3 Current.	-45 to +45	$\mu a$
Grid-No.2 Current (Each gun).	-5 to +5	$\mu a$
Percentage of Total Ultor Current Supplied by Each Gun (Average):		

Red Gun    Blue Gun    Green Gun

To Produce White of 9300 <sup>o</sup> K + 27 M.P.C.D. (CIE Coordinates $x = 0.281, y = 0.311$ ) . . . . .	42	28	30	%
Ratios of Cathode Currents:				

	Red to Green			Red to Blue		
	Min.	Av.	Max.	Min.	Av.	Max.

To Produce White of 9300 <sup>o</sup> K + 27 M.P.C.D. . . . . .	0.85	1.4	1.95	0.8	1.5	2.2
Maximum Raster Centering Correction in Any Direction <sup>d</sup> .	. . . . . 7/8 inch					

Adjustment to be Provided by the Following Components:

Purifying Magnet:

Maximum Required Displacements of Beam Trios in Any direction with Respect to Associated Phosphor-Dot Trios . . . . .	0.005" <sup>e</sup>
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Lateral-Converging Magnet:<sup>f</sup>

Maximum lateral shift of blue beam . . . . .	$\pm 1/4"$
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## Radial-Converging Magnet Assembly:

For static convergence  
including compensation  
for dc component of  
dynamic convergence  
(Each beam). . . . . Shift of  $\pm 5/8$ "

### 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	1200 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.

Grid-No.3 Circuit Resistance (Each gun). . . . . 7.5 max. megohms

#### Low-Voltage Circuits:

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

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 a 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.

- <sup>a</sup> For Curves, see front of this Section.
- <sup>b</sup> For maximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts.
- <sup>c</sup> Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 20,000 volts.
- <sup>d</sup> Centering of the raster on the screen may be accomplished by passing direct current of the required value through each pair of deflecting coils. With all components properly adjusted, the raster centering correction is the distance from the undeflected focused beams to the center of the screen.



- <sup>e</sup> The equivalent raster movement is about  $3/4''$ .
- <sup>f</sup> Lateral converging magnet must shift the red beam and the green beam in opposite direction to the shift of the blue beam. Under conditions where the blue beam has been shifted  $1/4''$ , the shift of the red beam and green beam should be in the range of  $1/8''$  to  $3/8''$ .

## 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 associated phosphor-dot trios.

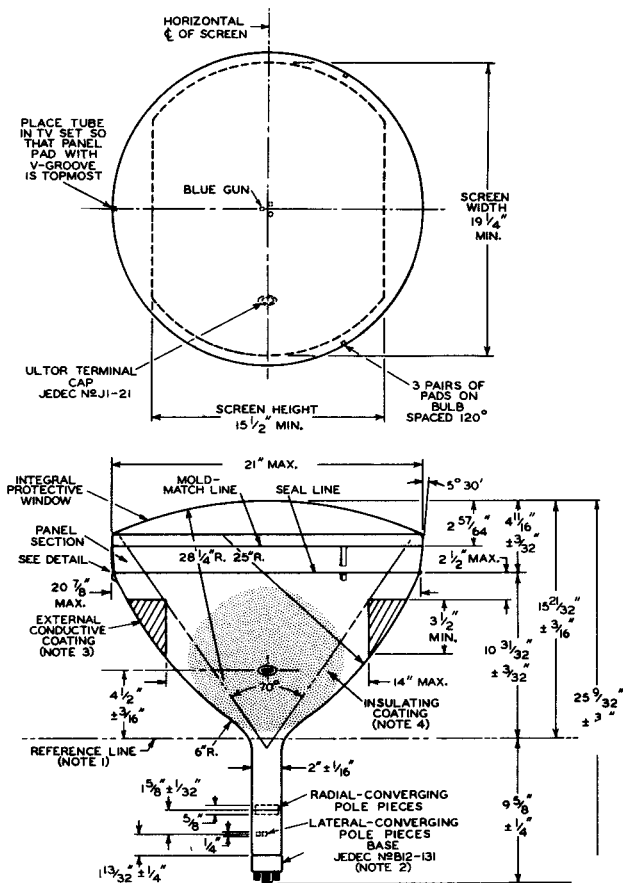
*Displacement.* Shift of the position of the beams with respect to the phosphor dots.

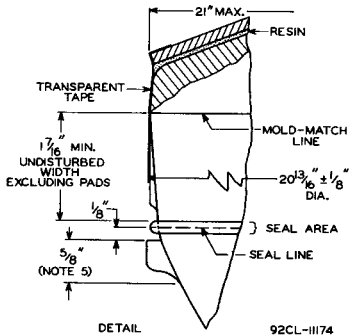
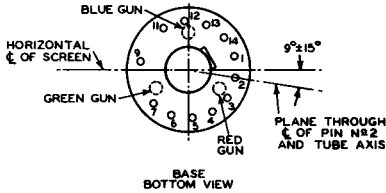
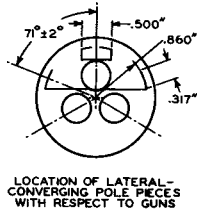
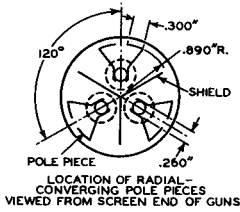
## GENERAL CONSIDERATIONS

*X-Ray Warning.* Because this color picture tube is designed to be operated at ultor voltages as high as 27.5 kilovolts (Design-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.



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**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.

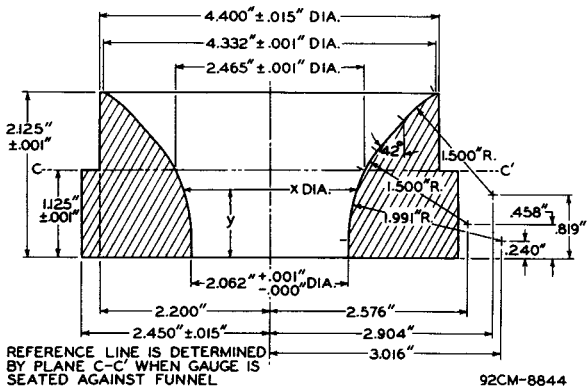
**NOTE 2:** SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

**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 LINT-LESS CLOTH.

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

## REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE



y	x
0.000"	2.062" + 0.001" - 0.000"
0.125"	2.062" + 0.001" - 0.000"
0.250"	2.062" + 0.001" - 0.000"

y	x
0.375"	2.062" + 0.001" - 0.000"
0.385"	2.062" + 0.001" - 0.000"
0.500"	2.084" ± 0.001"
0.625"	2.122" ± 0.001"





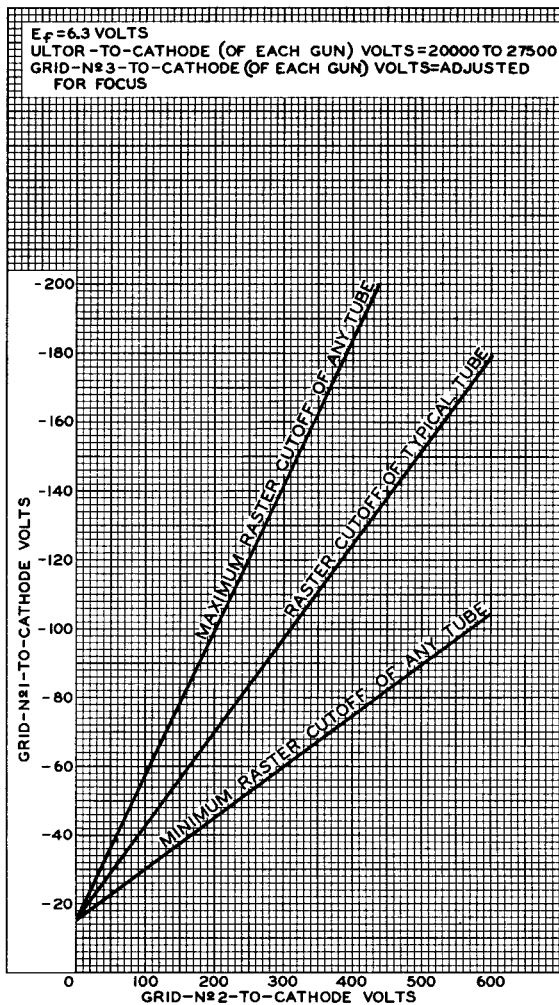
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y	x
0.750"	2.182" $\pm$ 0.001"
0.875"	2.258" $\pm$ 0.001"
1.000"	2.352" $\pm$ 0.001"
1.125"	2.465" $\pm$ 0.001"
1.250"	2.604" $\pm$ 0.001"

y	x
1.375"	2.778" $\pm$ 0.001"
1.500"	2.990" $\pm$ 0.001"
1.625"	3.216" $\pm$ 0.001"
1.750"	3.440" $\pm$ 0.001"
1.875"	3.678" $\pm$ 0.001"
2.000"	3.958" $\pm$ 0.001"
2.125"	4.332" $\pm$ 0.001"



## CUTOFF DESIGN CHART

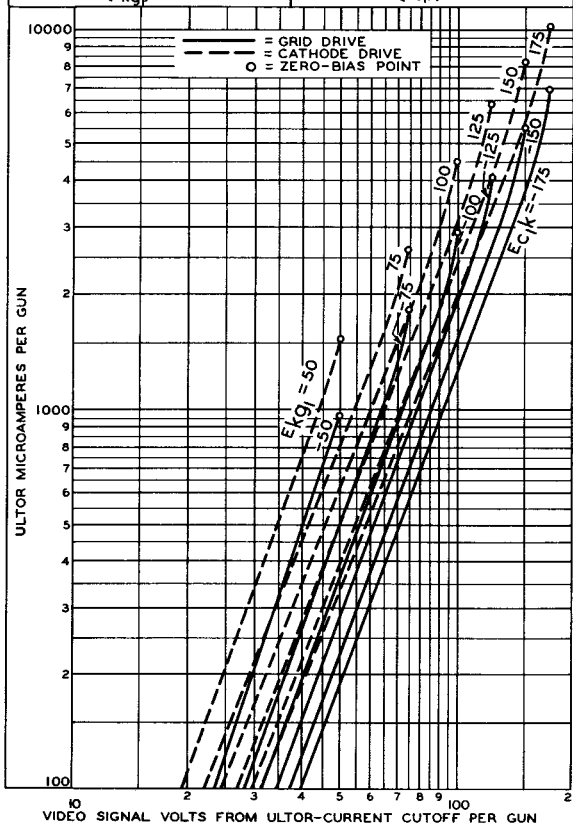


92CM-10846



## TYPICAL DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE	GRID-DRIVE SERVICE
$E_f = 6.3$ VOLTS	$E_f = 6.3$ VOLTS
ULTOR-TO-GRID-N $\#$ 1 (OF EACH GUN) VOLTS = 20000 TO 27500	ULTOR-TO-CATHODE (OF EACH GUN) VOLTS = 20000 TO 27500
GRID-N $\#$ 3-TO-GRID-N $\#$ 1 (OF EACH GUN) VOLTS=ADJUSTED FOR FOCUS	GRID-N $\#$ 3-TO-CATHODE (OF EACH GUN) VOLTS=ADJUSTED FOR FOCUS
GRID-N $\#$ 2-TO-GRID-N $\#$ 1 VOLTS (EACH GUN)=ADJUSTED TO PROVIDE ULTOR-CURRENT CUT- OFF FOR DESIRED FIXED CATH- ODE-TO-GRID-N $\#$ 1 (EACH GUN) VOLTAGE ( $E_{kg}$ )	GRID-N $\#$ 2-TO-CATHODE VOLTS (EACH GUN)=ADJUSTED TO PROVIDE ULTOR-CURRENT CUT- OFF FOR DESIRED FIXED GRID- N $\#$ 1-TO-CATHODE (EACH GUN) VOLTAGE ( $E_{ck}$ )



92CL-10845



## 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 9300°K+27M.P.C.D. WHITE LIGHT OUTPUT. PERCENTAGE OF TOTAL ULTOR CURRENT SUPPLIED BY EACH GUN TO PRODUCE 9300°K+27 M.P.C.D. WHITE:

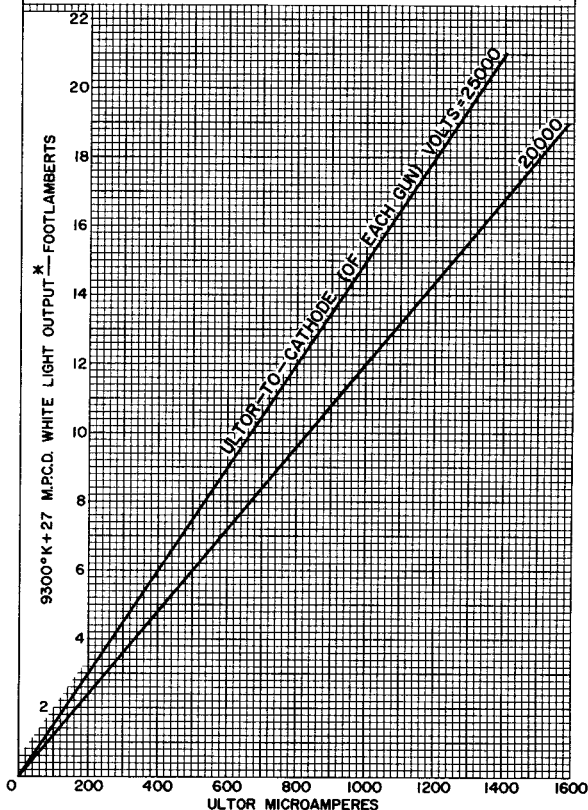
RED GUN: 42%

BLUE GUN: 28%

GREEN GUN: 30%

RASTER SIZE: 19 1/4" X 14 1/2" CENTERED ON TUBE FACE.

\*MEASURED WITHIN 5"-DIAMETER AREA CENTERED ON TUBE FACE.



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