RCA TUBE HANDBOOK HB-3



## CATHODE-RAY TUBE, STORAGE TUBE, & MONOSCOPE SECTION

This Section contains data for black-andwhite and color TV picture tubes, oscillograph tubes, special-purpose kinescopes, storage tubes, and monoscopes.

For further Technical Information, write to Commercial Engineering, Tube Division, Radio Corporation of America, Harrison, N. J



### RCA PICTURE TUBE GUIDE

	Black-an	d-White	Picture 1	lubes
Greatest Deflection Angle (Approx.) Degrees	Heater Valts/mA	Facus- ing Methad §	Design- Maximum Anade Valts	RCA Type
EL	ECTROSTAT	CDEFLE	CTION TYP	E
Kaund Glas	s Envelape			
	6.3/600	E	6500	7JP4
М.	AGNETIC DE	FLECTION	TYPES	
Round Glas			==	
50	6.3/600	F.	29,500	5TP4
52	6.3/600	M	15.500	16LP4A
55	6.3/600	M	13.000	10BP4A
55	6.3/600	M	13,000	10FP4A
55	6.3/600	M	13,000	12KP4A
60	6.3/600	M	16,500	16DP4A
70	6.3 600	M	17,500	16WP4A
Rectangular	Metal Envelo	pe		I
70	6.3/600	M	17,500	17CP4 <sup>d</sup>
70	6.3/600	E	17,500	17TP4 <sup>d</sup>
Rectangular	Glass Envelo	pe	,	
	nal Rectangul		pes	
70	6.3/600	M	17.500	16RP4B
70	6.3/600	M	15,500	16TP4
70	6.3/600	M	17,500	17BP4D
70	6.3/600	E	17,500	17HP4C
70	6.3/600	E	17.500	17LP48°
70	6.3/600	M	20,000	17QP4B
70	6.3/600	M	20,000	20 DP4D
70	6.3/600	E	17,500	20HP4E
70	6.3/600	M	20,000	21EP4C <sup>a</sup>



6.3/600

6.3/600

70

70

21FP4D°

21WP4B

E

M

20,000

20.000

Greatest Deflection Angle (Approx.) Degrees	Heater Volts/mA	Focus- ing Method	Design- Maximum Anode Volts	RCA Type
	Glass Envel			
Conventio	nal Rectangul	ar Glass T	ypes	
70	6.3 600	E	20.000	21 <b>XP</b> 4B
70	6.3 600	E	20.000	21YP4B
70	6.3 600	M	20.000	21ZP4C
72	6.3 600	Е	22,000	21AVP4C
72	6.3/600	М	20,000	21AWP4A
90	6.3 600	E	9000	8DP4
90	8.4/450	E	15,500	14ATP4
90	6.3/600	E	15,500	14WP4
90	6.3/600	Е	17.500	17BJP4
90	6.3/600	Е	17,500	17CFP4
90	6.3/600	E	17.500	17CYP4
90	6.3/600	M	20,000	21AMP4B
90	6.3 600	E	22.000	21CBP4A
9()	6.3 600	E	22,000	21 DLP4
90	6.3 600	E	22,000	21DSP4b
90	6.3 600	E	22,000	24AEP4
90	6.3 600	E	22,000	24ATP4 <sup>b</sup>
90	6.3 600	E	22,000	24AUP4
90	6.3 600	M	22.000	24CP4B
90	6.3 600	M	22.000	27RP4A
92	6.3 600	E	20,000	19BDP4b
92	6.3 600	E	22,000	23AHP4
92	6.3 600	Е	22,000	23ASP4
92	6.3 600	Е	25,000	23BJP4 <sup>b</sup>
92	6.3/450	E	22.000	23CGP4
94	6.3 600	E	23.000	23DAP4b
110	6.3 450	E	15,000	11CP4

	piack-an	u	r icroie	ubes
Greatest Deflection Angle (Approx.) Degrees	ection Heoter Ing Design Moximum Method Anode			
Rectangula	r Glass Envel	ope Cont	'd	
Conventio	nal Rectungul	ur Gluss T	ypės	
110	8.47450	E	17.500	17CDP4
110	6.3/600	Е	17.500	17CSP4
110	2.68/450	Е	17,500	17DAP4
110	6.3 600	E	23.000	17DKP4
110	6.3 450	E	17.500	17DQP4b
110	2.68 450	Е	17,500	17DRP4°
110	6.3 600	Е	20,000	17DSP4
110	6.3 450	E	17.500	17DXP4
110	6.3 450	E	20.000	17EFP4
110	6.3/600	E	20,000	21CQP4
110	6.3 600	Е	22.000	21DEP4A
110	6.3/600	E	20.000	21DFP4
110	6.3 450	E	20.000	21DHP4
110	6.3/600	Е	20,000	21EQP4
110	6.3 600	E	22.000	21FAP4
110	6.3/600	E	20,000	21FDP4
110	6.3/600	E	22.000	23ARP4
110	6.3/600	Е	22.000	23DBP4b
110	6.3/600	E	22,000	24AHP4
110	6.3 600	Е	22.000	24BAP4b
110	6.3/600	Е	20,000	24BEP4
114	6.3 450	E	20,000	16AYP4
114	2.68/450	E	20.000	19ABP4
114	6.3 450	E	17,500	19AHP4
114	6.3/450	E	20.000	19AJP4b
114	6.3/600	E	23,000	19AVP4
114	6.3/450	E	23.000	19AYP4



Greatest Deflection Angle (Approx.) Degrees	Heater Valts/mA	Facus- ing Methad	Design- Maximum Anade Valts	RCA Type
-	Glass Envelo	•		
Canventia	nal Rectangul	or Glass T	ypes	
114	6.3/600	E	23,000	19BTP4
114	6.3/600	E	20,000	19 CH P4 b
114	6.3/450	E	20,000	19CMP4 <sup>b</sup>
114	6.3/600	E	20,000	19C XP4b
114	6.3/600	E	20,000	19XP4
114	6.3/600	E	20,000	19YP4
114	6.3/450	E	22,000	20 RP4
114	6.3/450	Е	23,500	23CQP4
114	6.3/600	Е	23,500	23FP4A
114	6.3/600	E	22,000	23MP4
114	6.3/600	E	22.000	23NP4 <sup>b</sup>
Bi-Ponel R	Rectangular Gl	lass Types		
92	6.3/600	E	22,000	23BDP4d
92	6.3/600	E	25,000	23BKP4
92	6.3/600	E	25,000	23BLP4 <sup>e</sup>
92	6.3/600	E	25,000	23BTP4
92	6.3/600	E	22,000	23YP4
110	6.3 600	E	22,000	23BGP4 <sup>b</sup>
110	6.3/450	E	23,000	23BQP4
110	6.3/450	E	23,000	23CBP4 <sup>d</sup>
110	6.3/600	E	22,000	23CP4
110	6.3/600	E	23,500	23CP4A
110	6.3/600	E	22,000	23EP4 <sup>b</sup>
110	6.3/600	E	22,000	23GP4
110	6.3/450	Е	22,000	23JP4 <sup>b</sup>
114	6.3/600	E	20,000	19 <b>AFP</b> 4
114	6.3/600	E	20,000	19AUP4d

Greatest		Focus-	D	
Deflection Angle (Approx.) Degrees	Heater Volts/mA	Design- Maximum Anode Volts	RCA Type	
	Glass Envelo Rectangular			
92	6.3/600	E	25.000	23EYP4b
110	6.3/450	E	15,000	11GP4
110	6.3/450	E	23,000	23FRP4b
110	6.3/600	E	23,000	23FSP4
114	6.3/600	E	23,000	19EBP4
114	6.3/450	E	21,000	19EGP4b
Banded Re	ctangular Gla	ss Types		
90	12.0/75	E	12,000	9WP4
92	6.3/450	E	25,000	23EKP4
92	6.3/600	E	25,000	23ENP4
92	6.3/600	E	25,000	23FBP4e
94	6.3/450	E	23,500	23EZP4 b,
110	6.3/450	E	15,000	11HP4A
110	6.3/450	E	16,000	12BNP4A
110	4.2/450	E	14,000	12CNP4
110	6.3/600	.E	23,000	23ETP4
110	6.3/450	E	23,000	23FDP4b
110	6.3/450	E	23,000	23FMP4b
110	6.3/450	E	23,000	23GJP4Ab
110	6.3/600	E	23,000	23GSP49
110	6.3/450	E	22,000	23G WP4 <sup>b</sup>
110	6.3/450	E	23,000	23HFP4A
110	6.3/450	E	23,000	23HGP49
110	6.3/450	E	23,500	23HUP4Ab
110	6.3/450	E	22,000	23HWP4Ab
110	6.3/450	E	23,000	23H XP4
1 10	6.3/450	E	23,000	23JEP4
110	6.3/450	E	23,500	23JGP4 <sup>b</sup>
114	6.3/450	E	20,000	16BGP4
1 14	6.3/450	E	20,000	16CHP4Ab
114	6.3/450	E	18,000	16CMP4A
114	6.3/450	E	22,000	17 EMP4b

Greatest Deflection Angle (Approx.) Degrees	Heater Volts/mA	Focus- ing Method	RCA Type	
•	Glass Envel	•	q	
	ectangular Glo	iss lubes 		
114	6.3/450	E	23,000	19DQP4
114	6.3/600	E	23,000	19DRP4
114	6.3/600	E	20,000	19D\$P4b
1 14	6.3/450	E	20,000	19EAP4b
114	6.3/450	E	22,000	19DUP4 <sup>b</sup>
114	6.3/600	Е	18,000	19 EHP4A
114	6.3 (450	E	21,000	19ENP4Ab
114	6.3/450	E	23,500	19FEP4Bb
114	6.3/450	E	18,000	19FJP4A
114	6.3/450	E	23,000	19FLP4
114	6.3/600	Е	23,000	19FNP4 <sup>9</sup>
114	6.3/450	E	20,000	19FQP4b,9
114	6.3/450	E	23,000	19GEP4A9
114	6.3/450	E	23,000	19GJP4A
114	6.3/450	E	23,000	20 SP 4b
114	6.3/450	E	23,000	20TP4
114	6.3/450	E	23,000	21FVP4
114	6.3/450	E	22,000	21FYP4b,9
114	6.3/450	E	23,500	21GAP4Ab
114	6.3/450	E	23,000	23EQP4
1 14	6.3/600	E	23,000	23ERP4

### **Color Picture Tubes**

	Color	Picture	Tubes			
Greatest Deflection Angle (Approx.) Degrees	Heater Volts/mA	Focus- ing Method	Design- Moximum Anode Volts	RCA Type		
	ROUND G	LASS EN	/ELOPE			
Conventions	ol Types					
45	6.3/1800	E	22,000	15GP22		
70	6.3/1600	E	27,500	21CYP22A		
70	6.3/1800	E	27.500	21FBP22		
70	6.3/1800	E	27.500	21FBP22A		
70	6.3/1800	E	27,500	21GUP22 <sup>f</sup>		
Integral Pro	tective Windo	w Types	'	•		
70	6.3/1800	E	27,500	21FJP22d		
70	6.3/1800	E	27,500	21FJP22Ad,		
70	6.3/1800	E	27,500	21GVP22d, f		
	ROUND M	ETAL EN	/ELOPE	•		
70	6.3/1800	Е	27.500	21AXP22A		
1	RECTANGUL	AR GLASS	ENVELOPE	•		
Conventions	l Types					
90	6.3 /900	E	22,500	15K P 22 f		
90	6.3/900	E	27,500	19EXP22f		
90	6.3/900	E	27,500	19GVP22 <sup>f</sup>		
90	6.3/900	E	27.500	22KP22 <sup>f</sup>		
90	6.3/900	E	27,500	25BP22A <sup>f</sup>		
90	6.3/900	E	27,500	25YP22 <sup>f</sup>		
Integral Pro	tective Window	v Types				
90	6.3/900	E	22,500	15LP 22 d, f		
90	6.3/900	E	27,500	19EYP22d,f		
90	6.3/900	E	27,500	19GWP22d, f		
90	6.3/900	E	27,500	22JP22d,f		
90	6.3/900	E	27,500	25AP22Ad,f		
90	6.3/900	E	27,500	25XP22d,f		
92	6.3/1350	E	27,500	23EGP22Ad		



### Color Picture Tubes

Greatest Deflection Angle (Approx.) Degrees	Heater Volts/mA	Focus- ing Method §	Design- Maximum Anode Valts	RCA Type
Banded Typ	es			
90	6.3/900	E	22,500	15NP 22 <sup>f</sup>
90	6.3/900	E	27,500	19HCP22 <sup>f</sup>

### **Test Picture Tubes**

ROUND GLASS ENVELOPE												
53	6.3/600	E	20,000	5AXP4								
RECTANGULAR GLASS ENVELOPE												
70	6.3/1800	Е	27,500	1828P22								
90	6.3/600	E	22,000	8XP4								
90	6.3/900	E	27,500	1830P22								
110	6.3/600	E	22,000	8YP4								

- § E Electrostatic; M ≈ Magnetic
- Cylindrical Faceplate
- b Low G2 Type
- c Internal Magnetic Shield
- d Faceplate Treated
- e Low G2 Type, Faceplate Treated
- f Hi-Life type, features rare-earth red-emitting phosphor
- 9 Integral Mounting Lugs

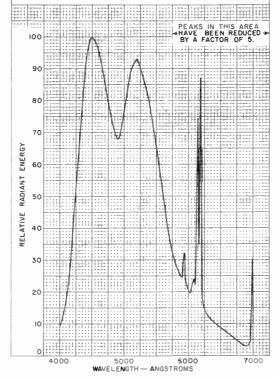
Rare-Earth (Red), Sulfide (Blue & Green) Type

### Spectral-Energy Emission Characteristic

4 The relative intensities of the narrow-emission bands of the red phosphor are dependent on the resolution of the measuring device.

SIMULTANEOUS EXCITATION OF RED PHOSPHOR, BLUE PHOSPHOR, AND GREEN PHOSPHOR TO PRODUCE 9300° K + 27 M.P.C.D. WHITE (X = 0.28), Y = 0.311).

COMPONENT COLOR	C.I.E. COORDINAT						
COMPONENT COLOR	х	7 5.524					
HED	0.676						
BLUE	0.155	0.061					
GREEN	0.290	0.590					



92CM-13088 RI



Rare-Earth (Red), Sulfide (Blue & Green) Type

#### PERSISTENCE CHARACTERISTIC

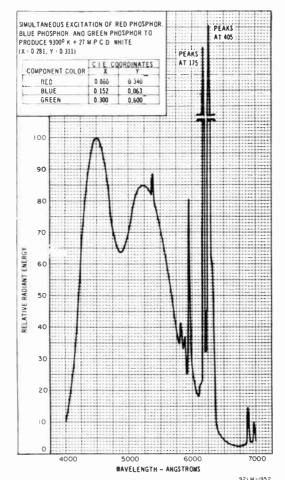
The persistence of the group phosphorescence is medium short. Persistence of the component phosphors is such that after excitation is removed, brightness decays to a level not exceeding 10 per cent of the initial value in:

22 microseconds (Approx.	)					. Blue	phosphor
60 microseconds (Approx.	)					.Green	phosphor
l millisecond (Approx.)			٠			Red	phosphor

New Rare-Earth (Red), Sulfide (Blue & Green) Type<sup>a</sup>

### Spectral-Energy Emission Characteristic

a The relative intensities of the narrow emission bands of the red phosphorage dependent on the relation of the measuring device.



New Rare-Earth (Red), Sulfide (Blue & Green) Type

#### PERSISTENCE CHARACTERISTIC

The persistence of the group phosphorescence is medium short. Persistence of the component phosphors is such that after excitation is removed, brightness decays to a level not exceeding 10 per cent of the initial value in:

22 microseconds (Approx.).					.Blue	phosphor
60 microseconds (Approx.).					Green	phosphor
I millisecond (Approx.)					, Red	phosphor



Approx. Bulb Dia. Inches	Focus- ing Method	De- flec- tion Meth- od	Minimum Screen Size Inches	Maximum Anode Voltsa	Tube Type		
Monitor	Types						
7 7 8b 8b 10 17 <sup>b</sup> 21 <sup>b</sup>	* 6 6 6 6 6	M M M M M	6-1/2 6 7-13/16 <sup>b</sup> 7-3/4 <sup>b</sup> 9-1/8 15-9/16 <sup>b</sup> 20-1/4 <sup>b</sup>	8,000 12,000 14,000c 22,000c 20,000 22,000c 22,000c	7CP4 7TP4 8HP4 8NP4 10SP4 17DWP 21EYP		
Display	Cathode-R	ay Tube					
12 <sup>b</sup>	E	м	Has in- tegrol pratec- tive window	16,000	45 57		
Projectio	n Types						
5 7 7 7	E E E	м м м	4-1/2d 5 x 3-3/4e 5 x 3-3/4e 5 x 3-3/4e	40,000° 80,000° 80,000° 80,000°	5AZP4 7NP4 7WP4 4486		
View-Finder Type							
5	м	M	4-1/4	8,000	5FP4A		
Transcrib	er Type						
5	Ε	м	4-1/4	27,000	5WP11		

- M Magnetic.
- a Design-Center volues unless otherwise noted.
- b Diggonol
- c Absolute value.
- d Quality circle diameter.
- e Quality rectongle.



De-

### FLYING-SPOT CATHODE-RAY TUBES

Bulb Dia. Inches	ing Method	tlec- tion Meth- od	Phosphor <sup>a</sup>	Maximum Anode Volts	Tube Type				
Black-an	Black-and-White Television Types								
5 5	E <b>E</b>	M	P15 P16	27,000 <sup>b</sup> 27,000 <sup>b</sup>	5WP15 5ZP16				
Color-Te	Color-Television Type								
5	E	м	P24	27,000 <sup>b</sup>	5AUP24				
MONOS	COPES								
Approx. Bulb Dia. Inches	Focus- ing Method	De- flec- tion Meth- od	Features	Maximur Anode Volts <sup>c</sup>	Tube Type				
2	E	E	Customized metal stencil electrode pattern	2,500d	4560				

Indian Head Pattern

Pattern individually styled to customer requirements

E = Electrostatic.

M = Magnetic.

5

5

a See sheet Features of Fluorescent Screens.

м

- b Design-center value.
- c Pattern-electrode voltage.

F

d Absolute-maximum value.



1,500b

1.500b

2F21

1699

Phosphor	Approx.	Max.	Tube
	Bulb	Anode	Type
	Dio.	Volts	1 , , , ,
	Inches		
Electrostati	c-Deflection	& Focus Typ	es
PΙ	1	1,500	1EP1
PΊ	2	1,100	2AP1A
PΙ	2	2,500	2BP1
PΊ	2	600	902A
PΊ	3	1,500	3APIA
PΊ	3	2,750	3AQP1
PΊ	3	2,000	3BP1A
PΙ	3	2,500	3KP1
PΊ	3	2,500	3RP1
Ρl	3	2,500	3RP1A
Ρl	3	2,500	3WP1
PΊ	5	2,000	5BP1A
PΊ	5	2,500	5UP1
Pl	7	4,000	7UP1
PΊ	5	2,800b	4499
₽2	1	1,500	1EP2
₽7	3	2,500	3KP7
P7	3	2,500	3RP7A
P7	5	2,500	5U P7
PII	1	1,500	1EP11
PII	2	2,500	2BP11
PII	3	2,500	3KP11
PII	3	2,500	3WP11
P11	5	2,500	5UP11
P31	5	2,500	5UP31
P31	7	4,000	7UP31

o Design-center volue.



b Absolute-moximum volue.

OSCILLOG	RAPH TUBI	ES (Cont'd)	
Phosphor	Approx.	Max.	Tube
	Bulb	Post	Type
	Dio.	Accel-	
	Inches	erotor	
		Volts	
Electrostoti	c.Deflection &	Focus Type	es With
Post-Deflec	tion Accelero	tor	
PΊ	3	4,000	3JP1
PΙ	5	6,000	5ABP1
PΊ	5	6,000	5ADP1
PΊ	5	4,000	5CP1A
P7	3	4,000	3JP7
P7	5	6,000 <sup>b</sup>	4510
PII	5	6,000	5ABP11
P11	5	4,000	5CP11A
P31	5	6,000	5ABP31
P31	5	6,000	5ADP31
P31	5	8,000 <sup>b</sup>	4489
P31	7	8,000b	4490
P31	8	8,000 <sup>b</sup>	4491

Phosphor	Approx.	Mox.	Tube
	Bulb	Anode	Type
	Dio.	Volts	
	Inches		
Mognetic-De	flection & Fo	cus Types	
P7	5	8,000	5FP7A
P7 7		8,000	7BP7A
	P7 7		7MP7

STORAGE		
Name	Description	Tube Type
Display	Ruggedized, 5"-diameter type having electrostatic-focus and deflection writing gun	2053
Display	Ruggedized, 10"-diameter type having electrostatic-focus and deflection writing gun	4413
Display	5''-diameter type having elec- trostatic-focus and magnetic- deflection writing gun	4454
Display	5"-diameter type having elec- trostatic-focus and deflection writing gun	6866
Display	5''-diameter type having elec- trostatic-focus and magnetic- deflection writing gun	71834
Display	Ruggedized, 5"-diameter type having two electrostatic-focus and deflection writing guns	7268E
Display	5''-diameter type having elec- trostatic-focus and deflection writing gun	7315
Radechon	Single-beam barrier-grid type for digital data storage	6499
Radechon	Variant of 6499 for binary mem- ory systems in computers	1858
Graphechon	Single-converter type with read- ing gun and writing gun	7539



#### Replacement Classification Kevs

- Replacement information is based primarily on electrical and mechanical similarity of the picture-tube types covered. The technician should make certain that replacement is in accord with all safety precautions required by the TV receiver for picture-tube insulation or mechanical mounting.
- A. RCA type does not require an external ion-trap magnet.
- B. The ball-type anode contact must be replaced with cavity-type contact.
- C. Neck length and/or overall length of RCA type is slightly greater.
- D Direct replacement.
- E. The RCA replacement type is electrically interchangeable-Mechanical modifications to the receiver may be required.
- F. The RCA replacement type has a 6.3-volt/600-milliampere heater. The receiver picture tube heater circuit must be modified to use this replacement type.
- G. A conversion Kit (RCA Part No. 12B202) is available for RCA receivers.
- H. The RCA replacement type is mechanically interchangeable-Electrical modifications to the receiver may be required.
- J. The RCA replacement is directly interchangeable in most cases; however, in some cases the red cathode lead may have to be interchanged with the blue or green cathode leads to obtain satisfactory black-and-white tracking. Replacement information is packed with the tube.
- K, Pin No. 6 (focusing electrode) of the RCA replacement must be connected to Pin No. 11 at the socket. The original tube did not require an external voltage for focus.
  - L. The RCA replacement type is electrically interchangeable -Mounting hardware may have to be modified to accept the replacement type. In some small-cabinet receivers, the replacement may not be feasible.
  - M. The RCA replacement type is electrically interchangeable The receiver socket should be replaced by RCA Part No. 112579, Eby Sales Co. Part No. 49-13DD, or equivalent.
  - N. A conversion Kit (RCA Part No. 12B101) is available for RCA receivers.
  - P. External conductive coating must be gounded.
  - Band around periphery of tube panel must be gounded and isolated from the ac line voltage.

Type To Be ★ Replaced	Replaced By RCA Type	<b>A</b>	Type To Be ★ Replaced	Replaced By RCA Type	
Color Pi	cture Tubes			_	
11SP22 11WP22	C-11WP22	D	19HFP22	H-19GWP22 C-19GWP22/ 19EYP22	D
15AEP22 15AFP22 15AGP22	H-15AEP22 C-15AEP22	• D	19HJP22 19HKP22	H-19HCP22/ 19HKP22	- D
15LP22	H-15LP22 C-15LP22	D D		C-19HCP22/ 19HKP22	• D
15NP22	H-15NP22 C-15NP22	• D	19HNP22	H-19HNP22 C-19HNP22	• D
15SP22	H-15AEP22 C-15AEP22	• D	19HQP22	H 19GVP22 C-19GVP22/ 19E XP22	D
15TP22	H-15NP22 C-15NP22	• D	19HRP22	H-19GWP22 C-19GWP22/	D
15WP22	H-15LP22 C-15LP22	D D	19HXP22	19EYP22 H-19HCP22/	D
15XP72	H-15NP22 C-15NP22	• D		19HKP22 C-19HCP22/	•D
17E ZP22 17F AP22	H-17EZP22 C-17EZP22	• D	19JBP22 19JDP22	19HKP22 H-19GVP22 C-19GVP22/	D
19E XP22	H-19GVP22 C-19GVP22/	D	19JGP22	19E XP22 H-19JWP22 C 19JWP22	D D D
19E Y P 22 19F M P 22 19F X P 22	19E XP22 H-19GWP22 C 19GWP22/	D D	19ЈНР22	H 19GWP22 C-19GWP22/ 19EYP22	D D
19GSP22 19GVP22	19E YP22 H-19G VP22	D D	19JKP22	H 19GWP22 C 19GWP22/	D
19G VP22/ 19E XP22 19GWP22	C-19G VP22/ 19E XP22 H 19GWP22	<u>D</u>	19JWP22	19E YP22 H 19JWP22 C 19JWP22	 D D
19GWP22/ 19EYP22	C-19GWP22/ 19E YP22	D	21 A X P 22 21 A X P 22 A	C-21A XP22A C-21CYP22A	D
19G XP22 19G YP22	H-19GVP22 C-19GVP22/ 19EZP22	C C	21A XP22A 21A XP22	C-21FBP22 H 21GUP22 C-21GUP22/	CJN
19GZP22	H-19GWP22 C-19GWP22/ 19EYP22	D	21CYP22 21CYP22A	21FBP22A C-21CYP22A C-21FBP22	CJN
19НВР22	H-19GWP22 C-19GWP22/ 19EYP22	D	21011224	H-21GUP22 C-21GUP22/ 21FBP22A	1
19HCP22 19HCP22/	H-19HCP22/ 19HKP22 C-19HCP22/	• D	21F BP22 21F BP22A	C-21FBP22 H-21GUP22 C-21GUP22/	D
19HKP22 <b>★</b> See note <b>▲</b> See Repla	19HKP22 on back of sheet acement informal	$\begin{array}{c c} \bullet_{D} \\ 2 \ of \ th \\ tion \ in \ t \end{array}$	<i>is guide.</i> Front of this g	21FBP22A	J



	Туре			Туре		
	To Be *	Replaced By		To Be ★	Replaced By	
	Replaced	RCA Type		Replaced	RCA Type	<b>A</b>
	21F JP22	C-21FJP22 H-21GVP22	) D	25AEP22	H-25YP22 C-25YP22/	D
	21F JP22A	C-21GVP22/	J	25001,22	25BP22A	D
	21F KP22	21FJP22A	J		H-25XP22	
	21GFP22	H-22JP22	L	25AFP22	C-25XP22/	
	21GLP22	C-22JP22	L		25AP22A	D
	21GRP22			25AGP22	H-25AJP22	• D
	21GUP22	H-21GUP22 C-21FBP22	D D	25A JP 22	C-25AJP22 H-25XP22	• D
	21GUP22/	C-21GUP22/	U	25ANP32 25AP22	C-25XP22/	D
	21FBP22A	21FBP22A	D	25AP22A	25AP22A	D
	21G VP22	H-21GVP22	D	25AQP22		
	21G VP 22/	C-21FJP22	D	25ASP22		
	21F JP22A	C-21GVP22/ 21FJP22A	D	25ASF 22 25AWP22	H-25A JP 22	• D
			_	25AXP22	C-25AJP22	• 0
	21GWP22	H-22JP22 C 22JP22	L	25AZP22		
		H-21GVP22			H-25XP22	D
	21G X P 22	C-21FJP22	Ď	25BMP22	C-25XP22/	
	21G YP22	C-21GVP22/			25AP22A	D
		21FJP22A	D	25BP22	H-25YP22 C-25YP22/	D
	22ADP22	H-22UP22	•D	25BP22A	25BP22A	D
	22AGP22	C-22UP22	• D	25CP22	H-25XP22	D
	22AHP22	H-22JP22	D	25CP22A	C-25 XP22/	_
	22JP22	C-22JP22	D	l	25AP22A	D
				25FP22	H-25 YP22	D
	22KP22	H-22KP22	D	25FP22A	C-25YP22/ 25BP22A	D
	2210, 22	C-22JP22	<u>D</u>		H-25XP22	D
	22LP22	H-22JP22 C-22JP22	D D	25GP22	C-25XP22/	U
	22QP22	H-22KP22	<u>D</u>	25GP22A	25AP22A	D
	22RP22	C-22KP22	D		H-25YP22	D
		H-22JP22	<u>D</u>	25RP22	C-25YP22/ 25BP22A	D
)	22SP22	C-22JP22	D		H-25XP22	D
		H-22UP22	•D	25SP22	C-25XP22/	
	22UP22 22XP22	C-22UP22	•D		25AP22A	D
	22YP22	H-22JP22	D		H-25XP22	D
	221122	C-22JP22	D	25 VP 22	C-25XP22/ 25BP22A	D
	23E GP 22	C 23EGP22	D		2307224	
)	23E GP22A	C 23EGP22A		25WP22 25 X P22	H-25XP22	D
•	25ABP22	H-25XP22 C-25XP22/	D	25 XP22/	C-25XP22/	D
		25AP22A	D	25AP22A	25AP22A	
				25 YP22	H-25YP22	D
	25ADP22	H-25AJP22	• D	25 YP 22/	C-25YP22/	_
	23/10/ 22	C-25AJP22	• D	25BP22A	25BP22A	D
,	4 6	and the state of the state of		hie mille		

- ★ See note on back of sheet 2 of this guide
- ▲ See Replacement information in front of this guide.



Туре			Туре		
To Be ★	Replaced By		To Be ★	Replaced By	
Replaced	RCA Type	<b>A</b>	Replaced	RCA Type	•
25 <b>Z</b> P22	H-25XP22 C-25XP22/	D	490BGB22	H-19GVP22	D
	25AP22A	D		C-19GVP22/ 19EXP22	D
370AB22 370CB22	H-15NP22 C-15NP22	• D	490BHB22	H-19GWP22 C-19GWP22/	D
490AB22	H-19GVP22	1		19E YP22	D
490ACB22 490ADB22	C-19GVP22/ 19EXP22	J	490BNB22	H-19JWP22 C-19JWP22	D D
490AEB22 490AFB22	H-19GWP22 C-19GWP22/	J	490BRB22	H-19GWP22	D
490AGB22	19EYP22	J.		C-19GWP22/ 19E YP22	D
490AHB22	H-19GVP22 C-19GVP22/	J	4908VB22	H-19JWP22	D
	19E XP22	J	490BXB22 490CB22	C-19JWP22 H-19GVP22	<u>D</u>
490AHB22A	H-19GVP22 C-19GVP22/	D	490D822	C-19GVP22/	-
	19E XP22	D	490EB22 490EB22A	19E XP22	J
490AJB22	H-19GWP22	D	490FB22 490GB22		
490A JB 22A	C-19GWP22/ 19E YP22	D	490GB22 490HB22	H-19G VP22	
490A KB22	H-19GVP22	J	490JB22	C-19GVP22/	_
490A LB22 490A MB22	C-19GVP22/ 19EXP22	J	490JB22A	19E XP22	<u>D</u>
490ANB22			490KB22 490KB22A	H-19GVP22 C-19GVP22/	1
490ARB22	H 19GWP22 C-19GWP22/	J	490LB22 490MB22	19E XP22	J
	19E YP22	J	490NB22	H-19GWP22	
490ASB22	H 19GWP22	D	490RB22 490SB22	C-19GWP22/ 19E YP22	J
	C 19GWP22/ 19E YP22	р	490TB22	1301122	
490BAB22	H-19GVP22		490UB22	H-19G VP22 C-19G VP22/	J
450BAB22	C-19GVP22/	Ŋ		19E XP22	
	19E X P 2 2	D	490 VB22	H-19GWP22 C-19GWP22/	J
490BCB22	H-19GWP22	D		19E YP22	J
	C-19GWP22/ 19E YP22	D	490WB22	H-19G VP22 C-19G VP22/	J
490BDB22	H-19GWP22		490XB22	19E XP22 H-19GWP22	J
-3000022	C-19GWP22/	3	490XB22 490YB22	H-19GWP22/	J
	19E YP22	J	490ZB22	19E YP22	J
		ŀ			

The type to be replaced may have a manufacturer's coding prefix such as AN, C, CR, H, HR, OC, RE, REA, etc. Since these prefixes do not affect the electrical characteristics or interchangeability of the type, the prefixes have been omitted from type numbers in this column.



Type			Туре		
To Be *	Replaced By		To Be ★	Replaced By	
Replaced	RCA Type	<b>A</b>	Replaced	RCA Type	
Black &	White Pictur	e Tub	oes		
7JP4	7JP4	D	16BQP4	16CMP4	•c
8DP4	8DP4	D	16CHP4	16ATP4	• E
9AEP4	9AEP4	• D	16BVP4	16CMP4A	• E
9WP4	9WP4	• D	16BWP4 16CAP4	16BGP4	• D
10ATP4	10ATP4	D	16CEP4	16CMP4A	• D
11AP4 11BP4	11HP4A	• D	16CHP4 16CHP4A	16CHP4A	• 0
11CP4	11CP4	D	16CJP4	16CMP4A	• D
11GP4	11GP4	• D	16CMP4	1001111 47	
11HP4	11HP4A	• D	16CMP4A		
11HP4A			16CTP4	16BGP4	• C
12BNP4 12BNP4A	12BNP4A	• D	16CUP4	16CMP4A	• C
12CFP4	12CNP4	• D	16C VP4	16CHP4A	• C E
12CGP4	12BNP4A	- <del>.</del> D	16KP4 16KP4A	16RP4B	Α
12CNP4	12CNP4	. D	16QP4	16RP4B	AP
12DEP4	12DEP4	- D	16RP4	16RP4B	A
12DFP4	12DFP4	- D	16RP4/ 16KP4		
12DSP4	12DSP4	D	16RP4A		
14NP4	14WP4	— <u>B</u>	16RP4A/		
14NP4A	177017	^	16KP4A		
14RP4			16RP4B	16RP4B	D
14RP4A 14SP4			16TP4	16TP4	D
14WP4	14WP4		16UP4	16RP4B	ACP
14WP4/	141114		16XP4	16RP4B	AP
14ZP4			17AP4	17BP4D	ACP
14ZP4 14ZP4/			17ATP4	17BJP4	Α
14WP4			17ATP4/ 17AVP4		
16ASP4	16CMP4A	• E	17ATP4A		
16A X P 4			17ATP4A/ 17AVP4A		
16A YP4	16BGP4	• E	17AVP4A		
16BFP4	16CMP4A	• <u>C</u>	17A VP4/		
16BGP4	16BGP4	• D	17ATP4 17AVP4A		
16BKP4	16CHP4A	• C	17A VP4A/		
16BMP4	16BGP4	• CE	17ATP4A		



Type To Be * Replaced	Replaced By RCA Type	<b>A</b>	Type To Be ★ Replaced	Replaced By RCA Type	<b>A</b>
17BJP4 17BP4 17BP4A 17BP4B	17BJP4 17BP4D 17BP4D	D AP	17FP4 17FP4A 17HP4 17HP4/ 17RP4	17HP4C	Α.
17BP4C 17BP4D 17BRP4	17BP4D 17DSP4	D A	17HP4A 17HP4B 17HP4B/ 17RP4C	171140	
17BUP4 17BZP4 17BZP4/	17BJP4 17DSP4	D	17HP4C 17JP4	17HP4C 17BP4D	D A
17CAP4/ 17CKP4 17BZP4/ 17CAP4/ 17CKP4/ 17BRP4 17CAP4			17KP4 17KP4A 17LP4 17LP4/ 17VP4 17LP4A 17LP4A/	17HP4C 17LP4B	AK A
17CBP4 17CFP4 17CKP4	17BJP4 17CFP4 17DSP4	A D D	17VP4B 17LP4B 17QP4	17LP4B 17QP4B	D A
17CLP4 17CTP4	17BJP4 17EFP4	A <sub>P</sub>	17QP4A 17QP4B	17QP4B	D
17CWP4 17CYP4	17DSP4 17CFP4	D D	17RP4 17RP4C 17SP4	17HP4C 17LP4B	A ————————————————————————————————————
17DAP4 17DHP4	17DAP4 17EFP4	<u>P</u>	17UP4 17VP4	17QP4B 17LP4B	A
17DKP4 17DLP4 17DQP4	17DSP4 17DSP4 17DQP4	D D	17VP4/ 17LP4 17VP4B		•
17DRP4 17DSP4	17DRP4 17DSP4	D D	17YP4 19ABP4	17QP4B 19ABP4	<u>A</u> <u>D</u>
17DTP4 17DXP4 17DZP4	17DSP4 17DXP4	C D	19ACP4 19ADP4 19AFP4	19CHP4 19AVP4 19AFP4	$\frac{D}{D}$
17EAP4	17HP4C 17EFP4	AK D		19AVP4 19AYP4	CD
17EFP4 17EMP4	17EFP4 17EMP4	• D	19AJP4 19AKP4	19AJP4 19AVP4	D
17EWP4 17FCP4 ▲ See <i>Rept</i>	17EWP4 17FCP4 lacement inforn	• D • D ation in	19ANP4 19ARP4 n front of th	19AYP4 19AFP4 is guide.	C D



	Type To Be * Replaced	Replaced By RCA Type	•	Type To Be * Replaced	Replaced By RCA Type	•
)	19ATP4	19AFP4	С	19DHP4	19DSP4	•D
	19AUP4	19AFP4	D	19DKP4	19DRP4	• E
	19AVP4	19A VP4	D	19DLP4	19CHP4	D
	19AWP4	19AYP4	С	19DNP4	19DRP4	٠E
	19A XP4	19AYP4	D	19DQP4	19DQP4	• D
)	19AYP4			19DRP4	19DRP4	• D
	19AZP4	19A VP4	D	19DSP4	19DSP4	• D
	19BDP4	19BDP4	D	19DTP4	19DQP4	٠c
	19BHP4	19A VP4	D	19DUP4	19DUP4	• D
	19BLP4	19A VP4	С	19DWP4	19DQP4	• D
)	19BMP4	19AFP4	С	19E A P 4	19FEP4B	• D
	19BRP4	19DRP4	• E	19E BP4	19EBP4	• D
	19BSP4	19A VP4	С	19E DP4	19DRP4	• D
	19BTP4 19BVP4	19A VP4	D	19EFP4	19DSP4	• D
	19BWP4	19AYP4	D	19EGP4	19EGP4	• D
	19BXP4	19AYP4	E	19E HP4	19DRP4	• D
	19CAP4	19A VP4		19EHP4A		
	19CDP4	19CXP4	D	19E JP4	19FEP4B	• D
	19CFP4	19CHP4	CE	19ELP4	19A VP4	D
	19CHP4	19CHP4		19EMP4	19EBP4	• C
	19CJP4	19AVP4	D	19ENP4 19ENP4A	19FEP4B	• D
	19CKP4	19CHP4	E	19ERP4	19DRP4	
	19CLP4	19BDP4		19ESP4		• D
	19CMP4	19CMP4			19DSP4	• D
h	19CMP4A	1501111 4		19E UP4	19DRP4	• D
•	19CQP4	19CXP4	D	19E VP4	19DQP4	• D
	19CRP4	19BDP4	D	19E ZP4	19EZP4	• D
	19CSP4	19CHP4	D	19FBP4	19EGP4	• D
	19CUP4	19CMP4	D	19FCP4 19FCP4A	19DQP4	• D
	19CXP4	19CXP4	D	19FDP4		
,	19CYP4	19A VP4	С	19F EP4	19FEP4B	• D
	19CZP4	19DQP4	٠E	19F EP4A		
	19DAP4			19FEP4B 19FJP4	19FEP4B	• D
	19DCP4	19DRP4	٠D	19F JP4A	19DQP4	. D
	19DEP4	19A VP4	E	19FLP4	19F LP4	• D
D	19DFP4	19CHP4	D_	19FSP4 19F TP4	19FEP4B 19FLP4	• D
			-			

Туре			Туре		
To Be ★	Replaced By		To Be ★	Replaced By	
Replaced	RCA Type	<b>A</b>	Replaced	RCA Type	
19FWP4	19AYP4	D	21AFP4	21YP4B	A P
19GAP4	19GAP4	• D	21ALP4	21CBP4A	AΡ
19GBP4	19DQP4	*E	21ALP4A		
19GEP4	19GEP4A	• D	21ALP4B		
19GEP4A			21ALP4B/		
19GFP4			21ALP4A 21AMP4	21AMP4B	A
19GHP4	19DUP4	• C	21AMP4A	2 I MIVIT 40	
19GJP4	19DQP4	• D	21AMP4B	21AMP4B	
19GJP4A					
19GNP4	19DRP4	• D	21ANP4	21CBP4A	AP
19GRP4	19DQP4	• D_	21ANP4A	24.7040	
19GTP4	19FEP4B	• C	21AP4 21AQP4	21ZP4C 21AMP4B	G AP
19XP4	19A VP4	D	21AQP4A	21AWIF4B	AF
19YP4	19AVP4	С			
19ZP4	19A VP4	D	21ASP4	21 XP4B	AP
20CP4	20DP4D	ACP		21CBP4A	ΑP
20CP4A	20DP4D	AC	21ATP4A		
20CP4B	20DP4D	ACP	21ATP4A/ 21ATP4		
20CP4C			21ATP4B		
20CP4D	20DP4D	AP	21AUP4	21AVP4C	
20DP4A			21AUP4A	ZIAVF4C	
20DP4A/	20DP4D	A	21AUP4B		
20 CP 4 A	A		21AUP4B/		
20DP4B	20DP4D	AP	21AUP4/	<b>A</b>	
20DP4C			21AUP4C	21AVP4C	D
20DP4C/	20DP4D	Α	21AVP4	21AVP4C	A
20CP4D			21AVP4/	21/11/10	
20DP4D	20DP4D	D	21AUP4		
		• D	21AVP4A		
20RP4 20SP4	20RP4	• D	21A VP4B		
20TP4	20TP4	• D	21A VP4B/		
20XP4	2011 4	_	21AVP4A		
20YP4	20SP4	• D	21AVP4B/		
20ZP4	20SP4	• D	21AUP46		
21ACP4	21AMP4B	Α	21AVP4/		
21ACP4/	217.1111 40		21AVP4C	21AVP4C	
21AMP4			21AWP4		
21ACP4A			21AWP4A	21AWP4A	A D
21ACP4A/			21AVP4A		<u>D</u>
21AMP4A 21ACP4A/	`		21BAP4	21 XP4B	A_
_			21BCP4	21CBP4A 21YP4B	<del>- 6</del>
21ACP4A/			21BDP4	21AVP4C	<del>- ŏ-</del>
21BSP4/ 21AMP4A			21BNP4	21CBP4A	D
215011 45					



			HOLA	JILII I	GUIDE
Type To Be ★	Replaced By		Type ToBe ★	Replaced B	у
Replaced	RCA Type	<b>A</b>	Replaced	RCA Type	<b>A</b>
21BSP4 21BTP4	21AMP4B 21CBP4A	A	21EP4A 21EP4B	21EP4C	Α
2161F4 2168F4	21CBP4A		215046 215046		D
21CBP4A 21CBP4A/ 21CBP4/	21CBF4A	U	21EQP4 21ESP4 21ETP4	21EMP4/ 21EQP4	D
21CMP4 21CBP4B		ļ	21EVP4	21FDP4	CF
21CEP4 21CEP4A	21EMP4/ 21EQPA	D	21FAP4	21EMP4/ 21EQP4	D
21CMP4	21CBP4A	Α	21FDP4	21FDP4	D
21CQP4	21COP4		21FLP4	21CBP4A	<u>D</u>
21CUP4	21AMP4B		21FP4	21FP4D	AP
21CVP4	21CBP4A		21FP4A 21FP4C	21FP4D	Α
2TUAN*¬ 21DEP4	UCRP4A	A	21FP4D	21FP4D	D
21DEP4A			21KP4 21KP4A	2በ፡ ሥላህ	• D
21DEP4A			21MP4	21YP4B	E
21DEP4/ 21CZP4			21WP4 21WP4A	21 WP4B	Α
21DFP4	21EMP4/	D	21WP4B	21WP4B	D
21DHP4	21EQP4 21DHP4		21XP4 21XP4A	21 XP4B	Α
21DLP4	21DLP4	D	21XP4B	21XP4B	D
21 DMP4	21EMP4/ 21EQP4	<u>D</u>	21 YP4 21 YP4A	21 YP4B	A
21DNP4	21CBP4A	AP	21YP4B	21YP4B	D
21DQP4	21DLP4	D	21ZP4	21ZP4C	AP
21DRP4	21CBP4A	D	21ZP4A	21ZP4C	Α
21DSP4	21 DSP4	D	21AP4B		
21EAP4	21FDP4	F	21ZP4C	21ZP4C	D
21EDP4 21EMP4	21EMP4/ 21EQP4	D	23ACP4 23AFP4	23YP4	D
21EMP4/			23AGP4	23CP4	С
21EQP4 21EP4	21EP4C		23AHP4	23AHP4/	D
21674	ZIEP4C	AP	23A KP4	23FP4A	С



Туре			Туре		
To Be *	Replaced By		То Ве 🛊	Replaced By	
Replaced	RCA Type	<b>A</b>	Replaced	RCA Type	
23A LP4	23CQP4	۵	23DLP4 23DLP4A	23ENP4	•C
23ANP4	23BKP4	D	23DNP4	23BKP4	D
23ARP4	23A RP4	D	23DP4	23CP4	
23ASP4	23ASP4	D	23DQP4		
23ATP4	23BKP4	D	23DSP4	23ENP4	•M
23AUP4	23AHP4/	D	23DSP4A		
			23DTP4	23E KP4	• <u>D</u>
23A VP4	23CP4	<u>C</u>	23DXP4	23CP4	D
23AWP4	23BJP4	C	23DYP4	23ETP4	• P
23BAP4	23CP4	<u>C</u>	23DZP4	23EQP4	<u>•D</u>
23BDP4	23YP4	D	23ECP4	JSEVID.	
23BFP4 23BLP4	3300.4	ט	23ENP4	23ENP4	• D
23BMP4	23YP4		23EP4	23EP4	D
23BNP4	23CP4	D	23EQP4	23EQP4	• D
23BP4	23CP4		23ESP4	23HFP4A	• D
23BQP4	23BQP4		23ETP4	23E TP4	• D
23BTP4	23YP4	<u>D</u>	23EWP4	23EQP4	• D
23B 1 P 4 23B V P 4	23174	U	23EWP4A	23E YP4	D
23BWP4			23E YP4	23EZP4	• D
23BXP4	23E KP4	•E	23EZP4	23ENP4	• <u>D</u>
23BZP4	23CGP4	D	23FBP4	23GJP4A	- <u>D</u>
23CBP4	23BQP4	D	23F CP4 23F DP4	23GJF4A	U
23CEP4	23A RP4	D	23FEP4	23ENP4	• D
23CGP4	23CGP4	D	23F HP4	23GJP4A	• D
23CP4	23CP4	D	23FJP4	23ETP4	•D
23CP4A			23FLP4	23E KP4	• D
23CQP4	23CQP4	D	23FMP4	23HFP4A	• D
23CUP4	23CP4	C	23FP4	23FP4A	D
23CZP4	23A HP4	D	23FP4A		
23DAP4	23DAP4	D	23FRP4	23F RP4	• D
23DBP4	23DBP4	D	23FSP4	23FSP4	
23DKP4	23EKP4	•D	23F VP4 23F VP4A	23HFP4A	• D
▲ See Replacement information in front of this guide.					



L			• • • • • • • • • • • • • • • • • • • •		
	Туре			Туре	-
	To Be ★	Replaced By		To Be ★ Replac	ed By
	Replaced	RCA Type	<b>A</b>	Replaced RCA	ype 🔺
	23FZP4	23GSP4	• D	23XP4 23YP	4 D
	23GBP4	23HFP4A	• D	23YP4	
,	23GEP4	23ENP4	• D	24ADP4 24CP	4B A
	23G+P4	23HGP4	• D	24ADP4/	
	23GJP4	23GJP4A	• D	24VP4A/	
	23GJP4A			24CP4A/	
	23GP4	23CP4	D	24TP4	PA D
	23GSP4	23GSP4	• D	24AEP4 24AE	-
	23GTP4	23ETP4	• D	24AHP4 24AH	
)	23GUP4	23F RP4	* D	24ALP4 24AH	
	23G VP4	23HUP4A	• D	24ANP4 24AE	
	23GWP4	23GWP4	• D	24AUP4 24AL	
	23G XP4	23GSP4	• D	24A VP4 24BE	
	23GZP4	23E KP4		24BEP4 24BE	
	23HFP4	23HFP4A	• E	24CP4 24CP	
	23HFP4A	20111177	- 0	24CP4A 24CP	
	23HGP4	23HGP4	• D	24CP4B 24CP	
	23HLP4	23GSP4	• D	24DP4 24AF	Ρ4 "
		200014	— ĭı	24VP4A	
	23HWP4	23HWP4A	• D	24XP4 24CP4	в АР
	23HWP4A	23HWP4A	•0	24YP4 24AEF	94 A
	23HXP4	23HFP4A	• D	24ZP4 24EAF	04 D
	23HYP4	23JEP4	• D	230RB4 9WP4	• D
	23JAP4	23GJP4A	• D	310AVB4 12CNP	
	23JBP4	23FSP4	•C	470ACB4 19AYF	
	23JEP4	23JEP4	•D	500KB4 20TP4	
	23JGP4	23F RP4	• <u>D</u>	SG10FP4A 10 FP4	
	23JHP4	23HFP4A	• <u>D</u>	SG14WP4 14WP4	
۱	23JLP4	23HUP4A		SG16KP4A 16RP4	
,	23JP4		- <u>-</u> P	SG17BJP4 17BJP4	
	23KP4	23JP4 23FP4A	D C	SG17BP4B 17BP4	
		23FP4A	٠ ا	SG17CKP4 17DS	
	23KP4A	025704		SG17HP4B 17HP	
	23LP4	23ETP4	- <u>D</u>	SG17LP4A 17LP SG17QP4A 17QP	76
	23MP4	23FP4A	D	SG20CP4D 20DP	70
	23MP4/			SG21ACP4A 21AN	
,	23MP4A/ 23WP4			SG21AUP48 21AV	
				SG21AWP4 21AW	
	23MP4A			SG21DEP4A21EM	
	23NP4	23NP4	D	21EO	
	23QP4	23CP4	D	SG21EP4B 21EP	4C D
	23TP4	23YP4	D	SG21FLP4 21CE	
	23UP4	23BQP4	D	SG21FP4C 21FP	
	23WP4	23FP4A	D	SG21WP4A 21W	'4B D
_	20111 7	2011777			



Type To Be ★ Replaced By Replaced RCA Type	<b>A</b>	Type To Be ★ Replaced	Replaced By RCA Type	
SG21XP4A 21XP4B	D	SG24AEP4	24A EP4	D
SG21YP4A 21YP4B	D	SG24CP4A	24CP4B	D
SG21ZP4B 21ZP4C	D		_	



## Safety Precautions For Color Picture Tubes

#### WARNING

X-Radiation.

Operation of the referenced color picture tube at abnormal conditions which exceed the 0.5 mR/h isodose-rate curve shown for this tube 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 Design-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

## Safety Precautions For Color Picture Tubes

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.

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



### FEATURES OF FLUORESCEN'T SCREENS

The fluorescent screens of the cathode-ray tubes covered in this Section are identified according to phosphor number, e.g., Pl. P2, P4, P5, P7, etc.

Phosphor Pl produces a brilliant spot having yellowish-green fluorescence and medium persistence. Types having this phosphor are particularly useful for general oscillographic applications in which recurrent-wave phenomena are to be observed visually.

Phosphor P2 is a medium-persistence screen which exhibits yellowish-green fluorescence and phosphorescence. The phosphorescence may persist for over a minute under conditions of adequate excitation and low-ambient light. Types utilizing this phosphor are particularly useful for observing either low-ormedium-speed non-recurring phenomena.

Phosphor P4 is a highly efficient screen having white fluorescence and medium-short persistence. Types having this phosphor are of particular interest for television picture tubes.

Phosphor P5 produces a highly actinic spot having blue fluorescence and medium-short persistence. Types having this phosphor are especially useful in photographic applications involving film moving at very high speeds.

Phosphor P7 is a very long-persistence, cascade (two-layer) screen. During excitation by the electron beam, this phosphor produces a purplish-blue fluorescence. After excitation, the screen exhibits a yellowish-green phosphorescence which persists for several minutes. Types having this phosphor are particularly useful where either extremely low-speed recurrent phenomena or medium-speed non-recurrent phenomena are to be observed.

Phosphor P11 produces a brilliant actinic spot of blue fluorescence and medium-short persistence to permit its use in all photographic applications except those in which film moves at high speed. P11 screens, because of their unusually high brightness characteristic, may also be used for visual observation of phenomena.

Phosphor P12 is a long-persistence phosphor which exhibits both yellowish-orange fluorescence and phosphorescence. Types utilizing this phosphor are particularly useful for observing low- and medium-speed recurring phenomena.

Phosphor P14 is a long-persistence cascade (two-layer) screen. During excitation by the electron beam, this phosphor exhibits purplish-blue fluorescence. After excitation, it exhibits a yellowish-orange phosphorescence which persists for a little over a minute. Types utilizing this phosphorare particularly useful for observing either low- and medium-speed non-recurring phenomena or high-speed recurring phenomena.



### FEATURES OF FLUORESCENT SCREENS

Phosphor P15 has radiation in the visible green region and in the invisible near-ultraviolet region. The ultraviolet radiation has short persistence which is appreciably shorter than that of the visible radiation. This phosphor finds application in flying-spot cathode-ray tubes.

Phosphor P16 has violet as well as near-ultroviolet fluorescence and phosphorescence with very short persistence. This phosphor has a stable, exponential decay characteristic and is particularly useful for the high-speed scanning requirements of a flying-spot video-signal generator.

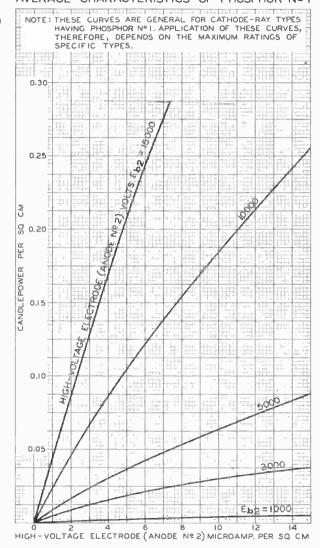
Phosphor P20 has high luminous efficiency, yellow-green fluorescence and medium-short persistence. The screen may be used in applications requiring relatively short persistence and good visual efficiency.

Phosphor P22 is the designation for three separate phosphors used in combination in a color picture tube. The separate phosphors are blue, green, and red, respectively. The persistence of the group phosphorescence is classified as medium.

Phosphor P24 is a short-persistence phosphor with green fluorescence and phosphorescence. Its spectral-energy emission characteristic has sufficient range to provide useable energy over the visible spectrum required for generating color signals from color transparencies.

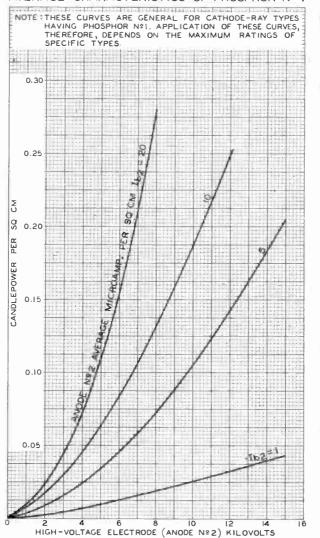


#### AVERAGE CHARACTERISTICS OF PHOSPHOR Nº I



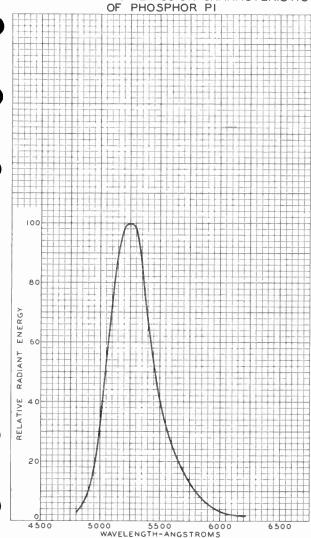


#### AVERAGE CHARACTERISTICS OF PHOSPHOR Nº I





### SPECTRAL-ENERGY EMISSION CHARACTERISTIC



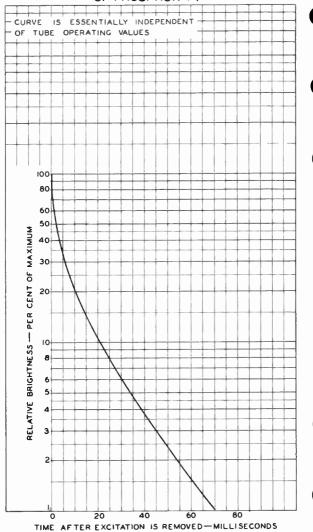
DEC.14,1948

TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92CM-5372RI



## PERSISTENCE CHARACTERISTIC OF PHOSPHOR PI

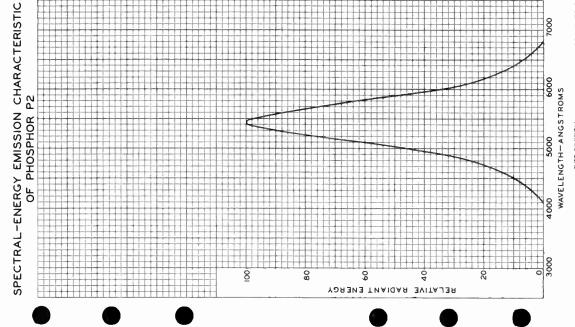


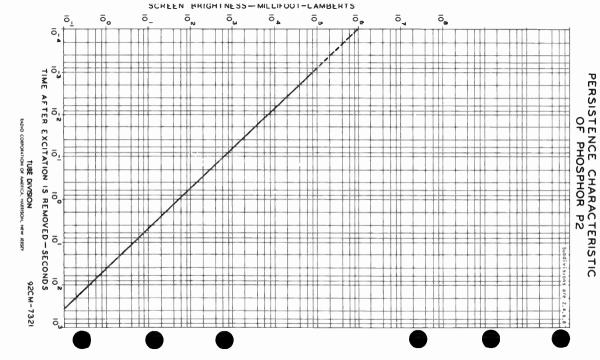
FEB. 1, 1951

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-5380R2

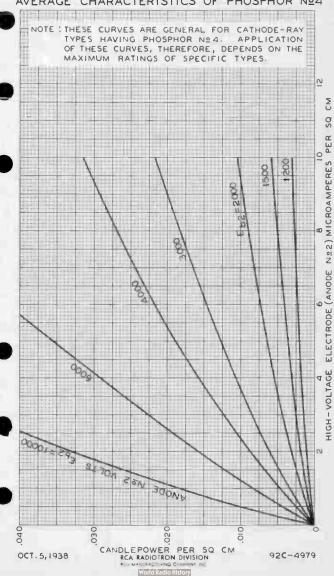






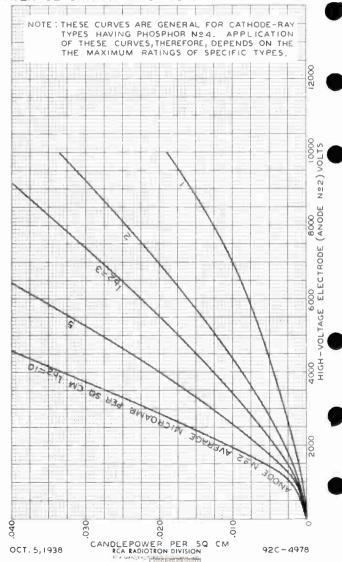


#### AVERAGE CHARACTERISTICS OF PHOSPHOR Nº4



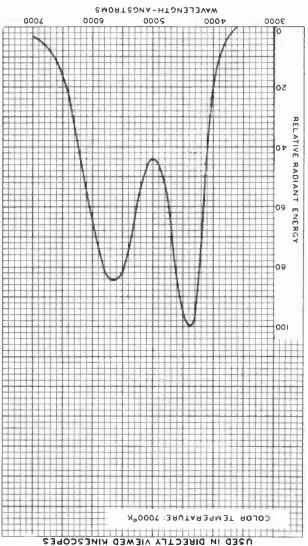


#### AVERAGE CHARACTERISTICS OF PHOSPHOR №4





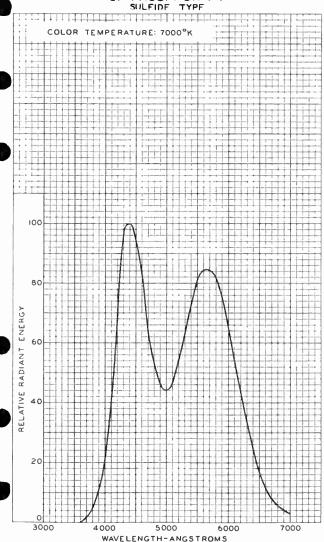
# SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR Nº4







# SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4





# PERSISTENCE CHARACTERISTIC OF PHOSPHOR P4 SULFIDE TYPE

#### FOR KINESCOPES

The persistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.

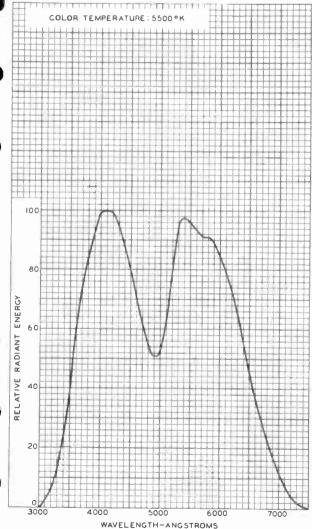
#### FOR OSCILLOGRAPH TUBES

The persistence characteristics of the phosphorescence are the same as those shown for the P11 phosphore.



# SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P4

SILICATE TYPE



AUG. 2, 1949

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON NEW JERSEY

92CM-7335

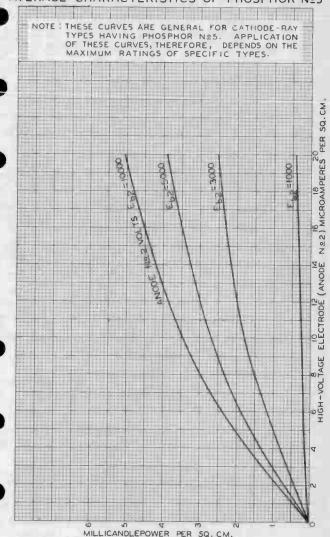


# PERSISTENCE CHARACTERISTIC OF PHOSPOR P4 SILICATE TYPE

The persistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.



#### AVERAGE CHARACTERISTICS OF PHOSPHOR Nº5



AUG. 21/1934

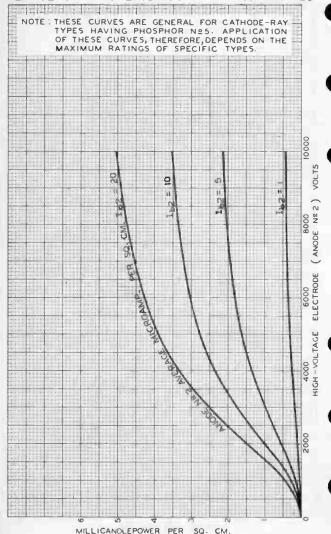
RCA RADIOTPON DIVISION

10A MANUSACTURNO CUMPANY

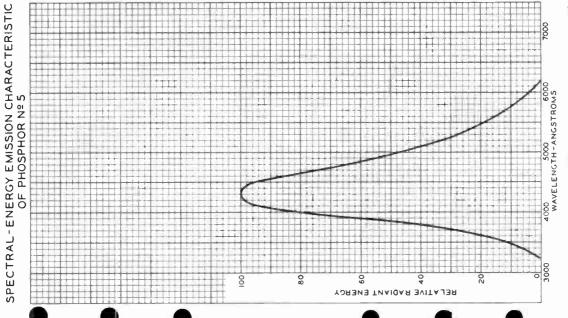
World Radio History



#### AVERAGE CHARACTERISTICS OF PHOSPHOR Nº5

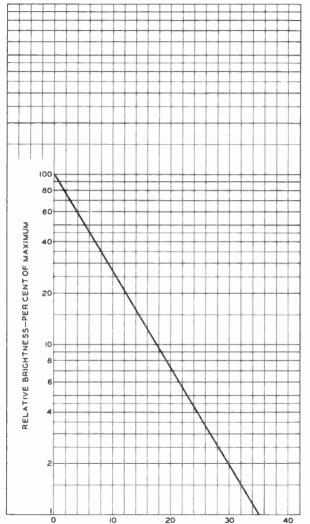








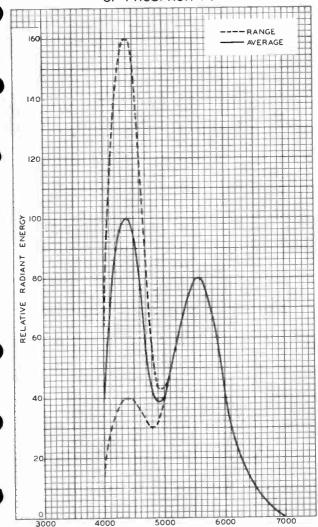
#### PERSISTENCE CHARACTERISTIC OF PHOSPHOR № 5



TIME AFTER EXCITATION IS REMOVED - MICROSECONDS



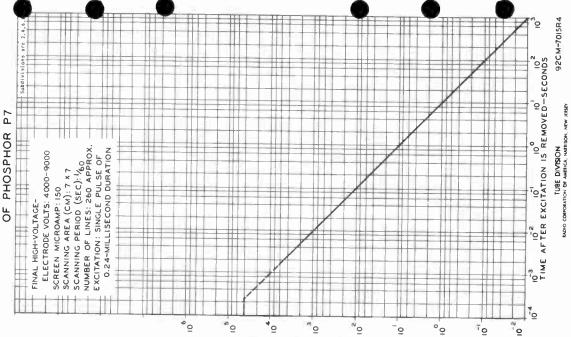
#### SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P7



WAVELENGTH-ANGSTROMS

R2A

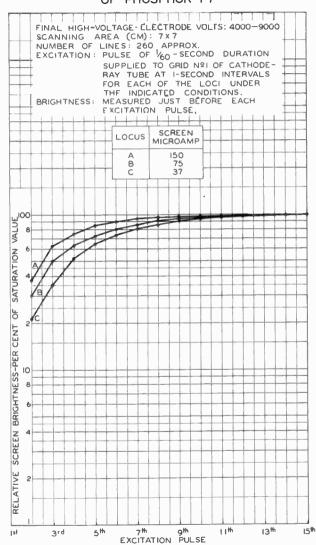
# CHARACTERISTIC P7 PHOSPHOR SISTENCE PER



STREEN BRIGHTNESS - MILLIFOOT-EMMBERTS

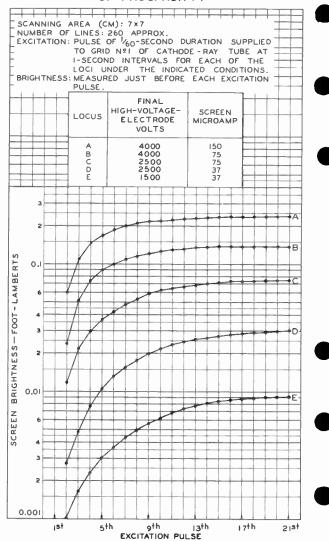


#### BUILDUP CHARACTERISTICS OF PHOSPHOR P7





#### BUILDUP CHARACTERISTICS OF PHOSPHOR P7

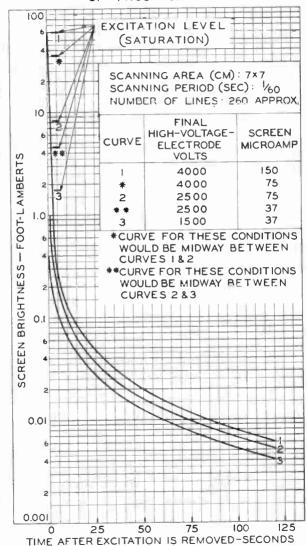


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-6805R5

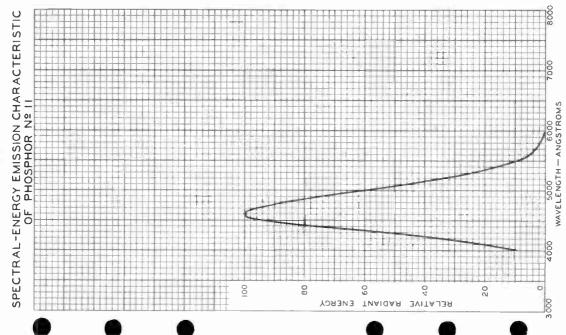


## PERSISTENCE CHARACTERISTICS OF PHOSPHOR P7



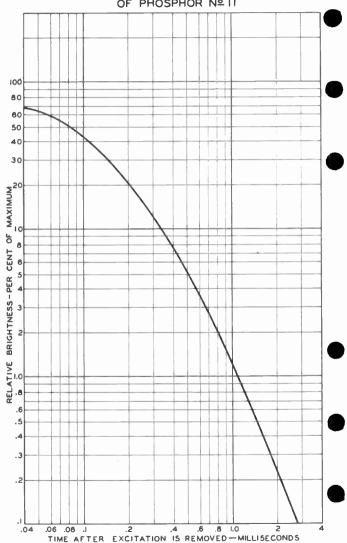
TUBE DIVISION  $92CL\!-\!6804R5$  badio componation of america, habitson, new abset





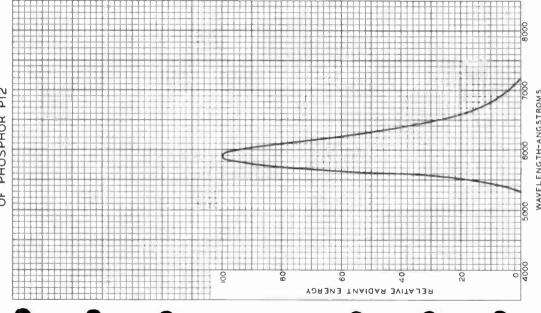


#### PERSISTENCE CHARACTERISTIC OF PHOSPHOR Nº II





# EMISSION 40SPHOR PHO NERGY

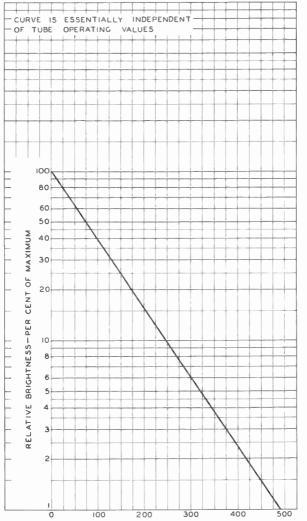


ULY 18, 1949

TUBE DEPARTMENT



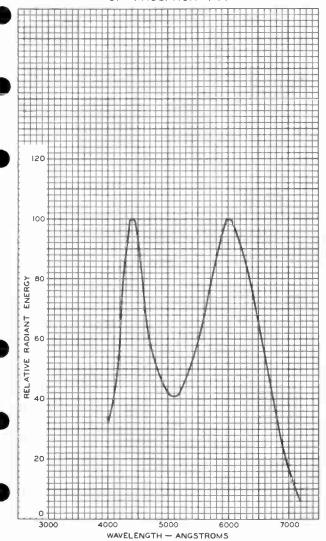
## PERSISTENCE CHARACTERISTIC OF PHOSPHOR PI2



TIME AFTER EXCITATION IS REMOVED-MILLISECONDS



# SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR PI4



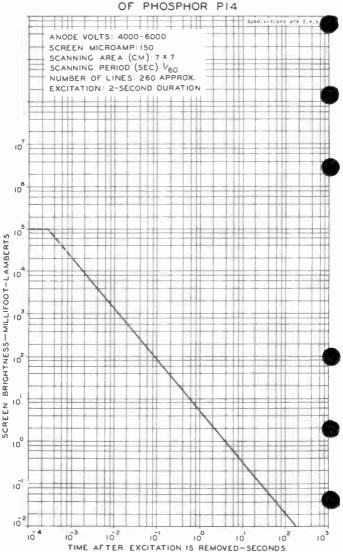
AUG. 1, 1951

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
World Radio History

92CM - 7675

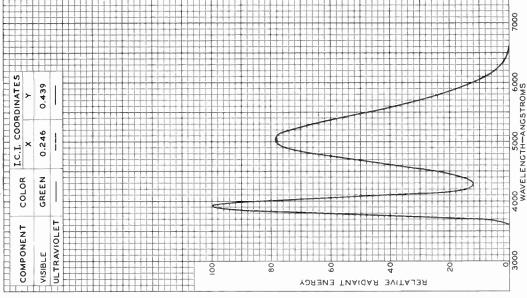


#### PERSISTENCE CHARACTERISTIC OF PHOSPHOR PI4





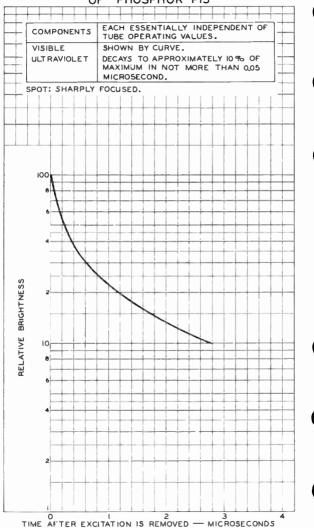
SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR PIS



92CM-6915RI



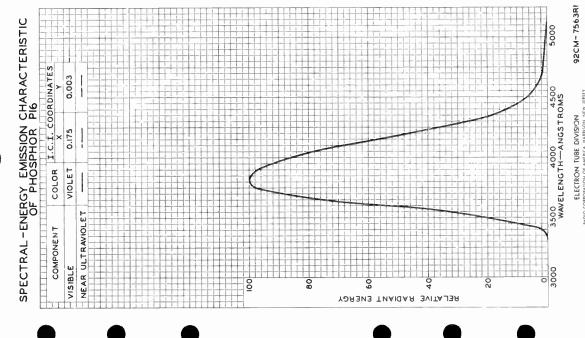
### PERSISTENCE CHARACTERISTIC OF PHOSPHOR PI5



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

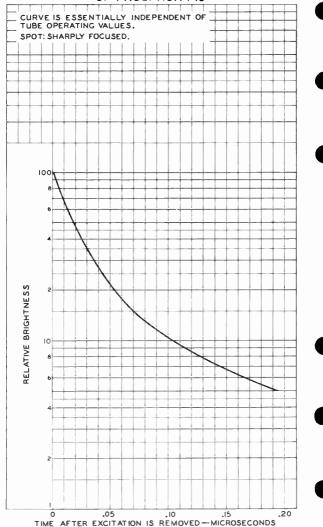
92CM-8540RI







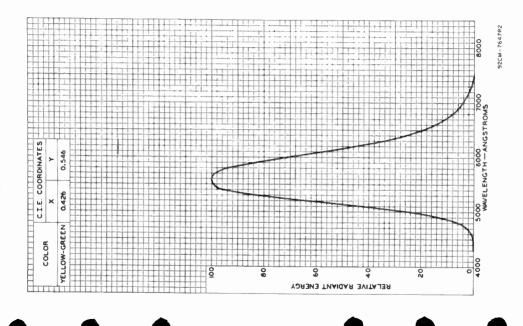
#### PERSISTENCE CHARACTERISTIC OF PHOSPHOR PI6



ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, MARRISON, NEW JERSEY

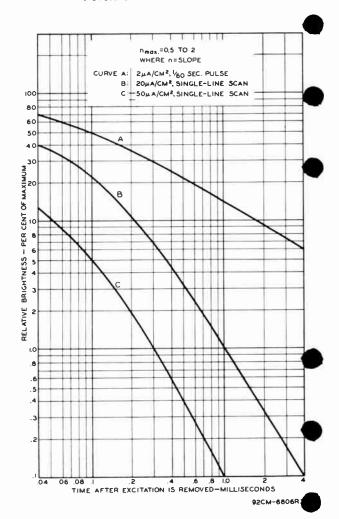
92CM-7564RI

# Characteristic Emission Spectral-Energy





#### Persistence Characteristic

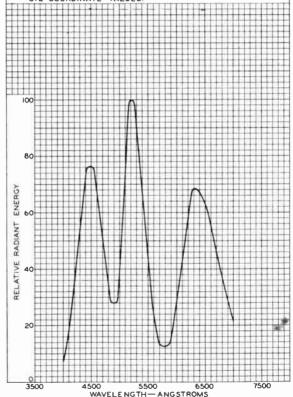


#### SPECTRAL-ENERGY EMISSION CHARACTERISTIC

SIMULTANEOUS EXCITATION OF BLUE PHOSPHOR, GREEN PHOSPHOR, AND RED PHOSPHOR TO PRODUCE 8500° K +27 M.P.C.D. WHITF (X=0.287, Y=0.316).

COMPONENT COLOR		CIE COORDINATES	
GENERAL DESCRIPTION	JEDEC DESIGNATION®	х	Y
BLUE	PURPLISH-BLUE	0.146	0.052
GREEN	YELLOWISH-GREEN	0.218	0.712
RED	REDDISH-ORANGE	0.674	0.326

#JEDEC COLOR CLASSIFICATION CORRESPONDING TO CIE COORDINATE VALUES



92CM-7969R4



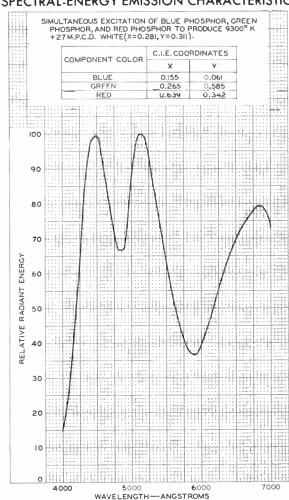
### **Group Phosphor P22**

#### PERSISTENCE CHARACTERISTIC

The persistence of the group phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.



### SPECTRAL-ENERGY EMISSION CHARACTERISTIC



92CM-10857



### **Group Phosphor P22**

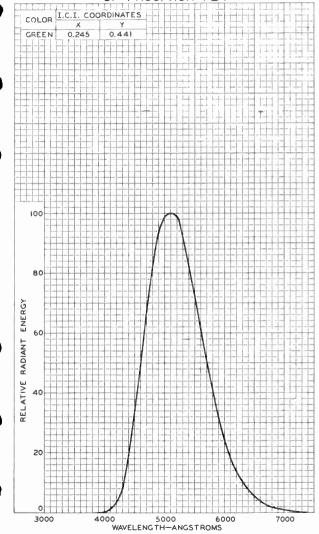
All-Sulfide Type

### PERSISTENCE CHARACTERISTIC





#### SPECTRAL -ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P24

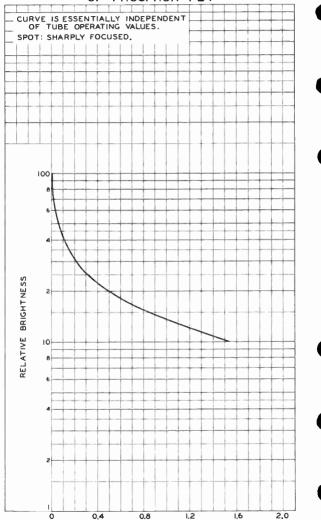


ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8204RI



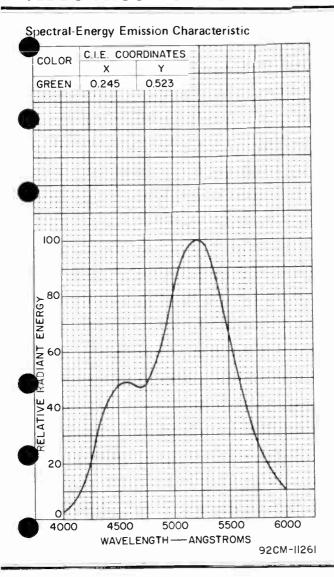
#### PERSISTENCE CHARACTERISTIC PHOSPHOR P24



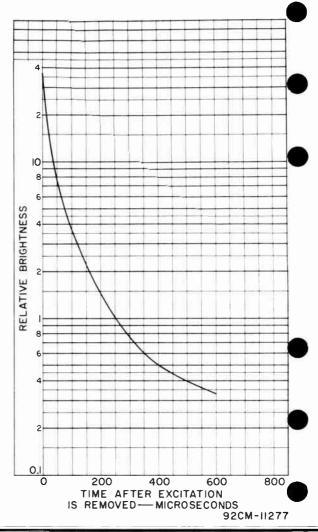
TIME AFTER EXCITATION IS REMOVED - MICROSECONDS **ELECTRON TUBE DIVISION** 

92CM - 8205R2

### JEDEC PHOSPHOR P31







# Picture-Tube Dimensional Outlines

The Dimensional Outlines on the following pages provide the basic dimensions of RCA Picture Tubes. These Dimensional Outlines are classified by Bulb Designations in accordance with the designation system established by the American Standards Association. Tubenecklength, tube overall length, base designation, and the configuration of the external conductive coating (when used) are not shown on these Dimensional Outlines. These items are covered on the data sheets for specific picture-tube types.

The terms used in the pitture-tube data shocts to describe the Type of External Conductive Coating and the Contact Area for Grounding are defined below:

#### Type of External Conductive Coating

Regular Band. A band of external conductive coating of uniform height covering part of the bulb funnel. The band may entirely encompass the funnel except for an insulated area in the region of the anode (ultor) contact.

Modified Band. A coating configuration similar to a Regular Band except for special contouring of the upper and/or lower edges.

Special. A coating configuration not defined in the industry specification for the tube type.

#### Contact Area for Grounding

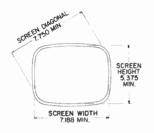
Near Reference Line. Refers to the position of the contact area usually employed for grounding a Regular or Modified Band of external conductive coating. A spring-finger contact mounted on the deflecting yoke or on the tube mounting assembly is normally employed for grounding the external conductive coating.

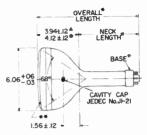
Special. Indicates that one or more contact areas for grounding the external conductive coating other than the area near the reference line are provided in the industry specification for the tube type.

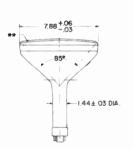


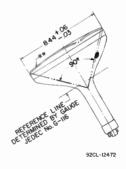
### Dimensional Outline Bulb J67-1/2 A

FOR PICTURE TUBES UTILIZING BULB J67-1/2 A
(For bulbs with and without integral protective window)









OIMENSIONS IN INCHES

See data for specific tube type.

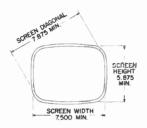
<sup>\*\*</sup> Integral protective window is indicated.

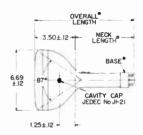
For culb without protective window.

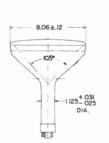
For bulb with protective a ndow.

# Dimensional Outline Bulb J67-1/2 B

FOR PICTURE TUBES UTILIZING BULB J67-1/2 B







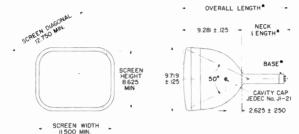


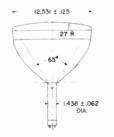
DIMENSIONS IN INCHES

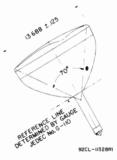
<sup>\*</sup> See data for specific tube type.

# Dimensional Outline Bulb J109-1/2 A/C

#### FOR PICTURE TUBES UTILIZING BULB J109-1/2 A/C

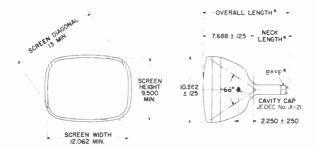


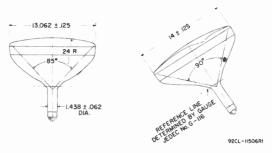




DIMENSIONS IN INCHES

#### FOR PICTURE TUBES UTILIZING BULB JI12 A/B

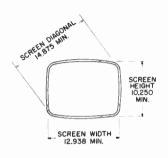


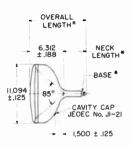


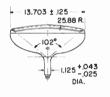
DIMENSIONS IN INCHES

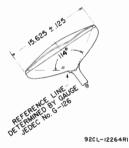
<sup>\*</sup> See data for specific tute type.

#### FOR PICTURE TUBES UTILIZING BULB J125 A AND PROTECTIVE WINDOW (FP125 A)





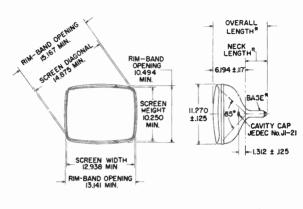


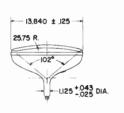


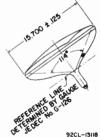
DIMENSIONS IN INCHES

<sup>\*</sup> See data for specific tuce type.

FOR PICTURE TUBE UTILIZING BULB J125 B



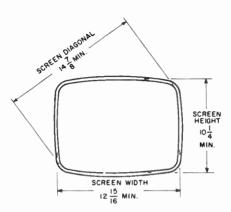


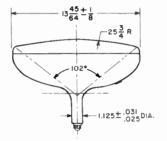


DIMENSIONS IN INCHES

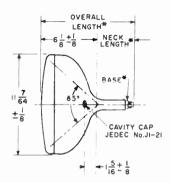
<sup>\*</sup> See data for specific tube type.

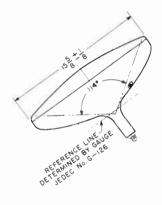
FOR PICTURE TUBES UTILIZING BULB J125 C2





BULB J125 C2



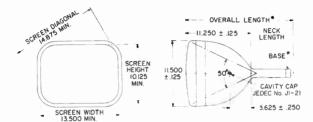


92CL-12037

DIMENSIONS IN INCHES

# Dimensional Outline Bulb J129 A/B

#### FOR PICTURE TUBES UTILIZING BULB J129 A/B





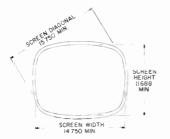


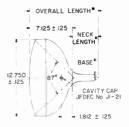
DIMENSIONS IN INCHES

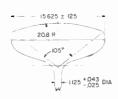
<sup>\*</sup> See data for openific tube tite.

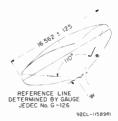
# Dimensional Outline Bulb J132-1/2 A/B

FOR PICTURE TUBES UTILIZING BULB J132-1/2 A/B





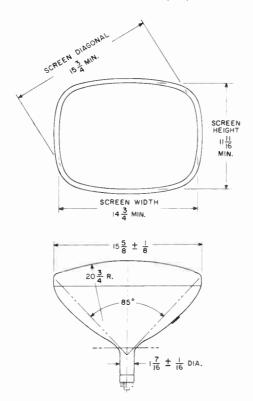




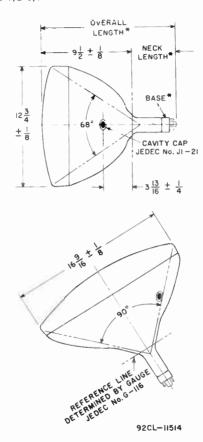
OIMENSIONS IN INCHES

<sup>\*</sup> See dita for occific tube type.

FOR PICTURE TUBES UTILIZING BULB J132-1/2 C/D



#### BULB J132-1/2 C/D

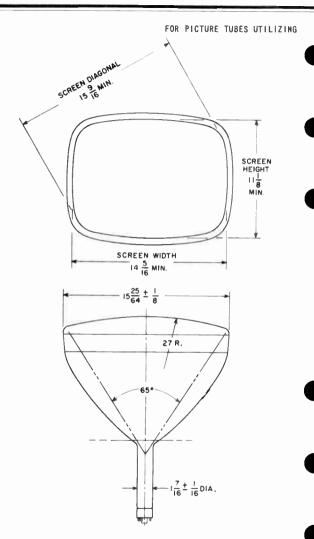


ALL DIMENSIONS IN INCHES

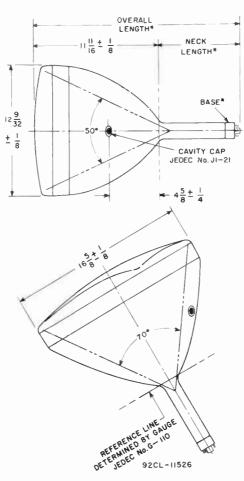
<sup>\*</sup> see dita for specific tube type.



92CL-11514



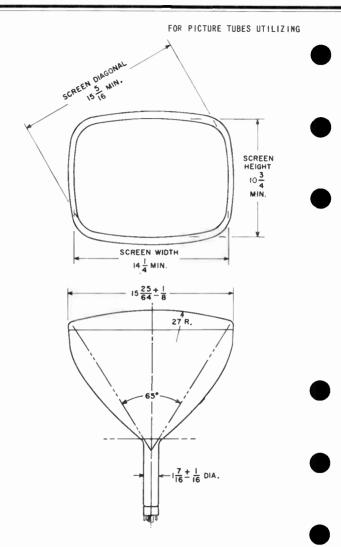
BULB JI33 B/D



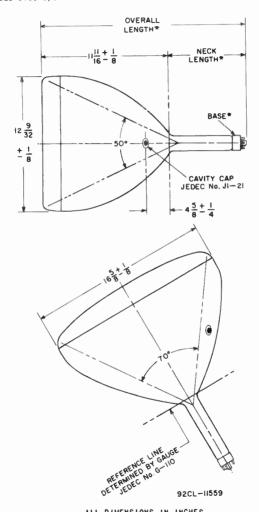
ALL DIMENSIONS IN INCHES

\* See data for specific tube type.





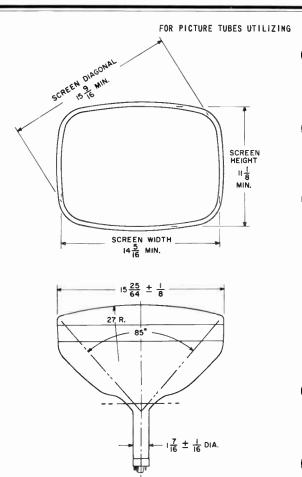
#### BULB JI33 C/E



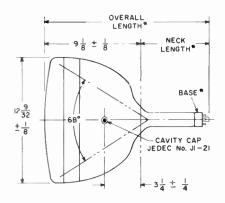
ALL DIMENSIONS IN INCHES

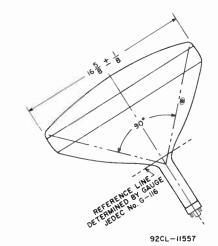
\* See data for specific tute type.





#### BULB JI33 F/G



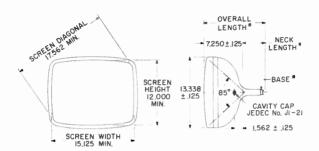


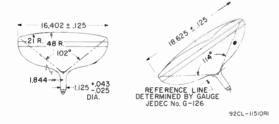
DIMENSIONS IN INCHES

See data for specific tube type.



#### FOR PICTURE TUBES UTILIZING BULB J149 A

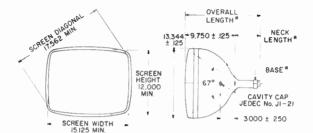


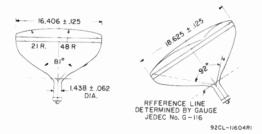


DIMENSIONS IN INCHES

See data for specific tube type.

#### FOR PICTURE TUBES UTILIZING BULB J149 B

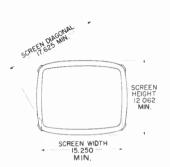


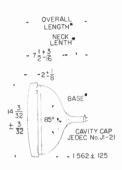


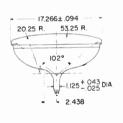
DIMENSIONS IN INCHES

<sup>\*</sup> See data for specific tube type.

#### FOR PICTURE TUBES UTILIZING BULB J149 C AND PROTECTIVE PANEL



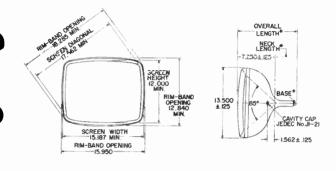


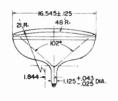




DIMENSIONS IN INCHES

FOR PICTURE TUBES UTILIZING BULB J149 F



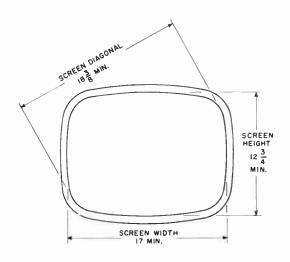


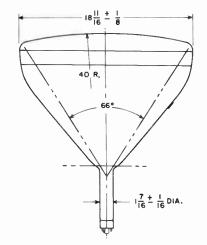


DIMENSIONS IN INCHES

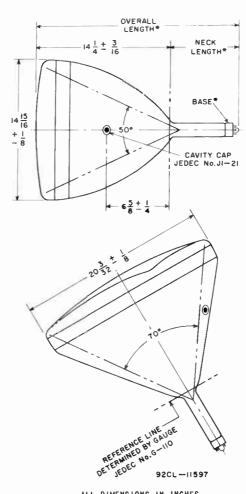
<sup>\*</sup>See data for specific tube type.

FOR PICTURE TUBES UTILIZING BULB JI61 C/D





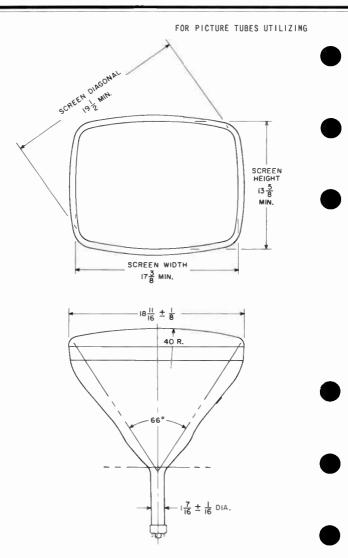
BULB JIGI C/D



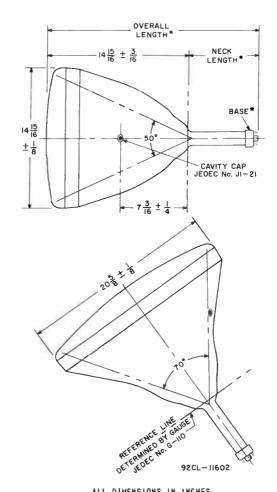
ALL DIMENSIONS IN INCHES

<sup>\*</sup> See data for specific tube type.





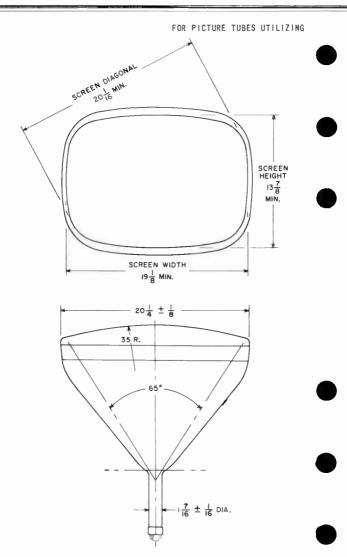
BULB JI65 Z



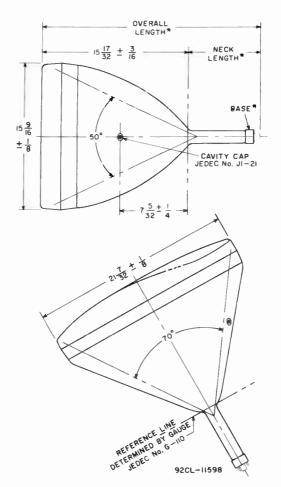
ALL DIMENSIONS IN INCHES

<sup>\*</sup>See data for specific tube type.





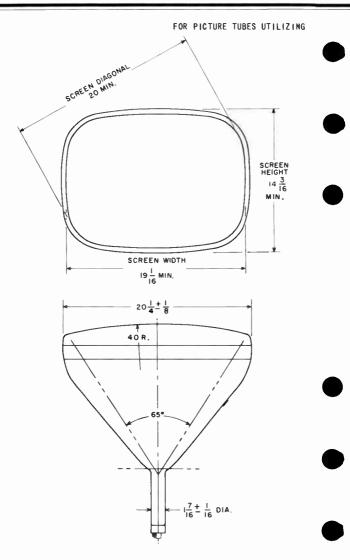
BULB JI70 A/C



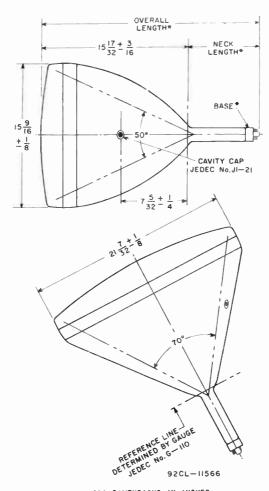
ALL DIMENSIONS IN INCHES

\* See data for specific tube type.





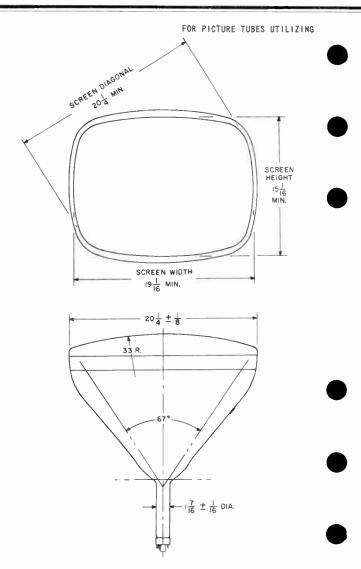
BULB JI70 B/D



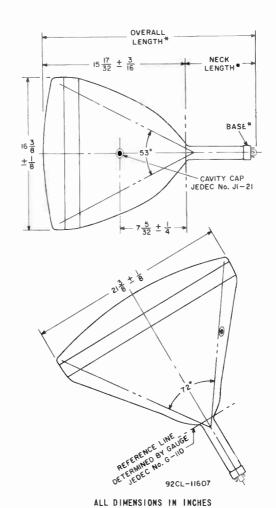
ALL DIMENSIONS IN INCHES

\* See data for specific tube type.



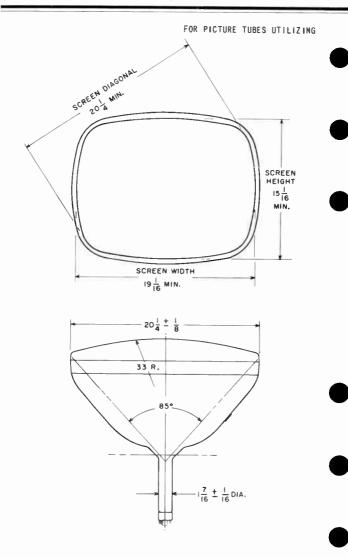


BULB JI71 B/F

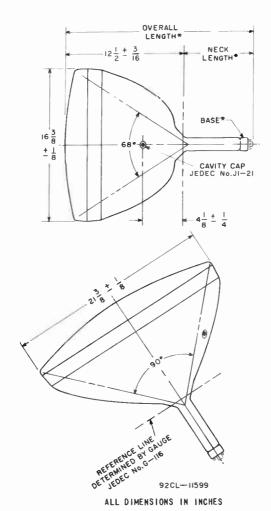


\*See data for specific tube type.



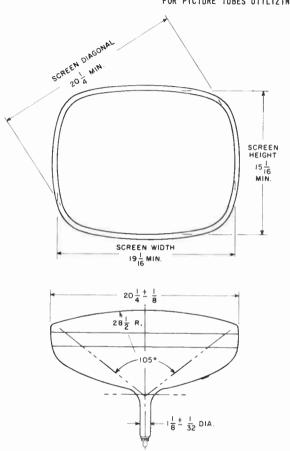


BULB JI71 D/E

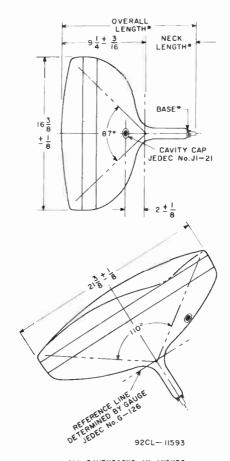


See data for specific tube type.





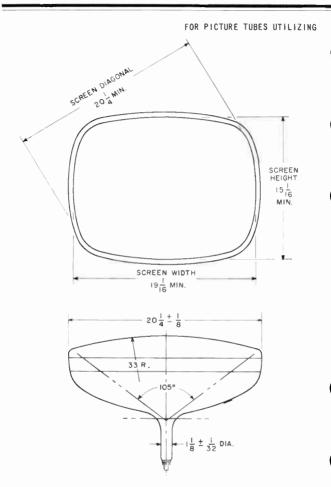
BULB JI71 G/K



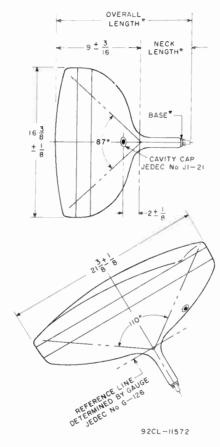
ALL DIMENSIONS IN INCHES

<sup>\*</sup> See data for specific tube type.





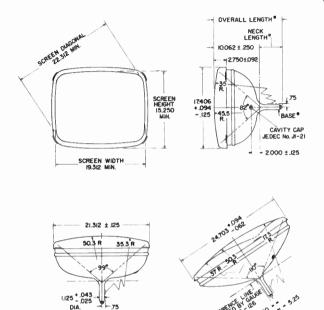
#### BULB JI71 H/J



<sup>\*</sup>See data for specific tube type.



#### FOR PICTURE TUBES UTILIZING BULB J187A AND PROTECTIVE PANEL FP198

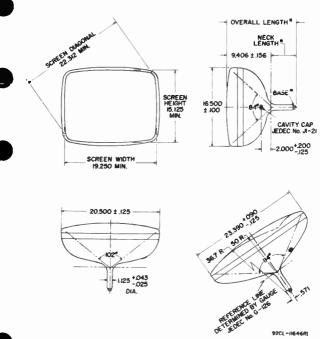


DIMENSIONS IN INCHES

92CL-11576R1

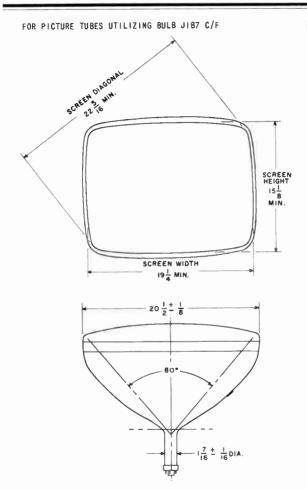
<sup>\*</sup> See data for specific tube type.

### FOR PICTURE TUBES UTILIZING BULB J187 B

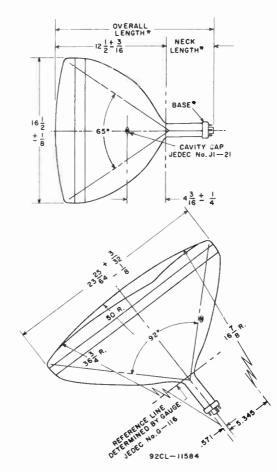


DIMENSIONS IN INCHES

\* See data for specific tube type.



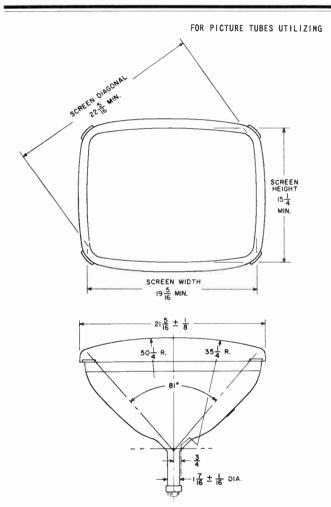
BULB J187 C/F



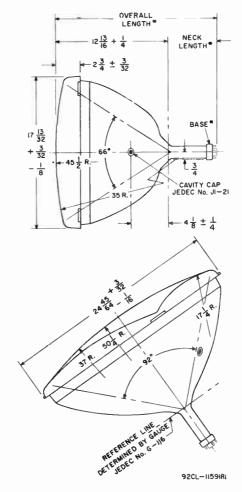
ALL DIMENSIONS IN INCHES

See data for specific tube type.





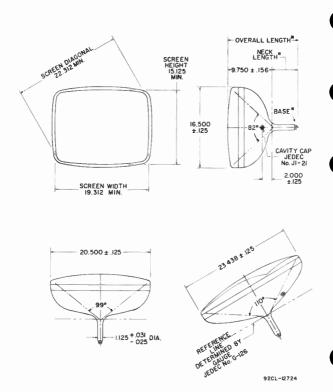
### BULB J187 D/G AND PROTECTIVE PANEL



<sup>\*</sup>See data for specific tube type.



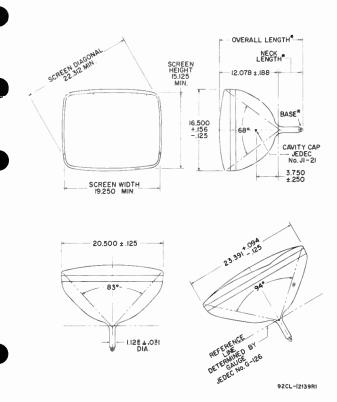
#### FOR PICTURE TUBES UTILIZING BULB J187 E



DIMENSIONS IN INCHES

\*See data for specific tube type.

FOR PICTURE TUBES UTILIZING BULB JIB7 HI

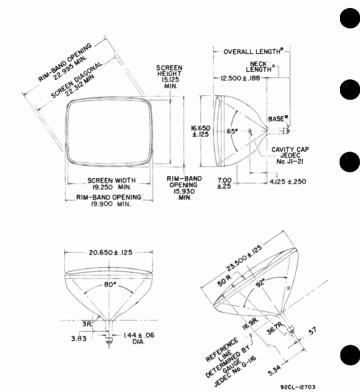


DIMENSIONS IN INCHES

\*See data for specific tube type.

CRT

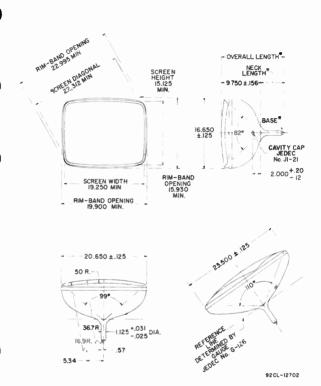
FOR PICTURE TUBES UTILIZING BULB J187 J



DIMENSIONS IN INCHES

"See data for specific tube type.

#### FOR PICTURE TUBES UTILIZING BULB JI87 K

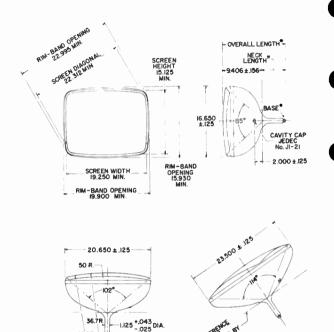


DIMENSIONS IN INCHES

\*See data for specific tube type.



### FOR PICTURE TUBES UTILIZING BULB J187 L



DIMENSIONS IN INCHES

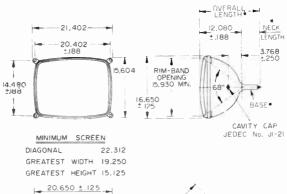
16.9R.

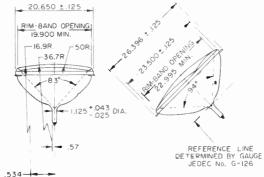
.57

92CL-13019

<sup>\*</sup>See data for specific tube type.

#### FOR PICTURE TUBES UTILIZING BULB JIB7 M

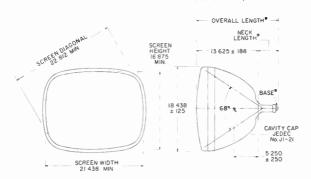


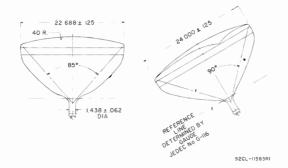


92LM- 477

## Dimensional Outline Bulb J192 A/B

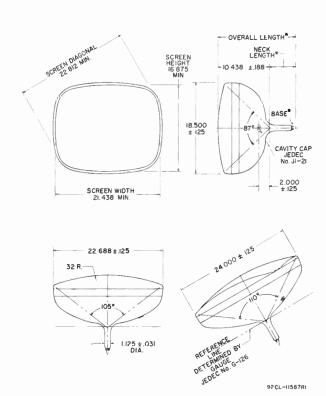
FOR PICTURE TUBES UTILIZING BULB J192 A/B





# Dimensional Outline Bulb J192 C/D

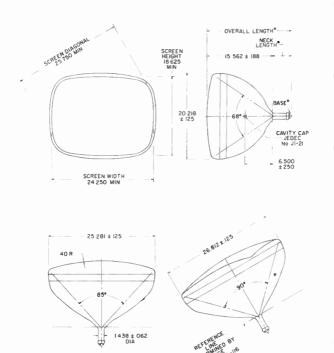
FOR PICTURE TUBES UTILIZING BULB J192 C/D



<sup>\*</sup>See data for specific tube type.

## Dimensional Outline Bulb J214-1/2 A

#### FOR PICTURE TUBES UTILIZING BULB J214-1/2 A

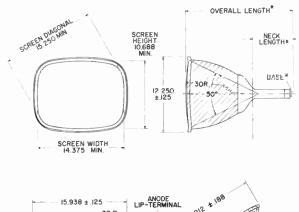


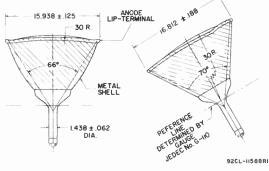
DIMENSIONS IN INCHES

\*See data for specific tube type.

92CL-11586RI

FOR PICTURE TUBES UTILIZING BULB MJ135 A

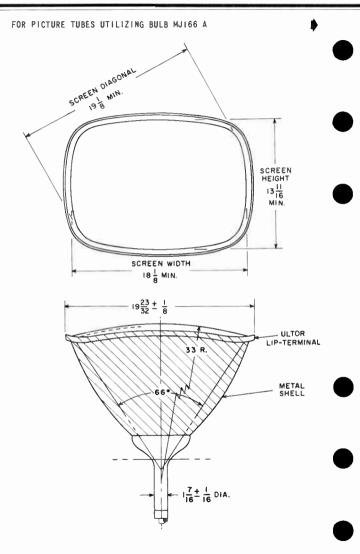




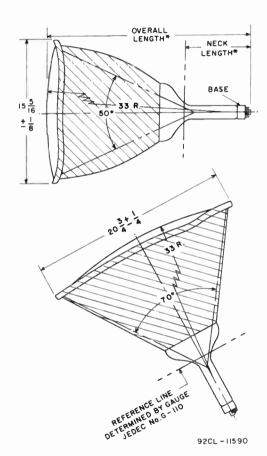
DIMENSIONS IN INCHES

Harrison, N. J.

<sup>\*</sup>See data for specific tube type.



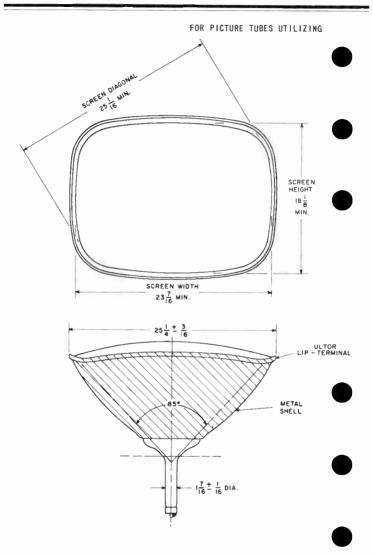
BULB MJ166 A



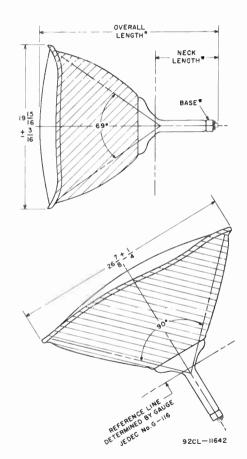
ALL DIMENSIONS IN INCHES

<sup>\*</sup> See data for specific tube type.





BULB MJ214 A



<sup>\*</sup> See data for specific tube type.





### X-Radiation Precautions

For Cathode-Ray Tubes

#### WARNING

All types of cathode—riv tubes may be operated at voltages (where ratings permit) up to 16 kilovolts without personal injury on prolonged exposure at close range.

Above 16 kilovolts, special shielding precautions for X radiation may be necessary.

### **Definitions**

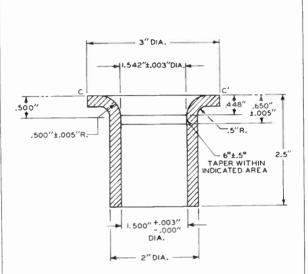
### Of Cathode-Ray-Tube Terms

**Ultor.** The "ultor" in a cathode-ray tube is the element to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

**Post-Ultor.** The "post-ultor" in a cathode-ray tube is the element to which is applied a dc voltage higher than the ultor voltage for accelerating the electrons in the beam after its deflection.



# REFERENCE-LINE GAUGE JETEC Nº G-110

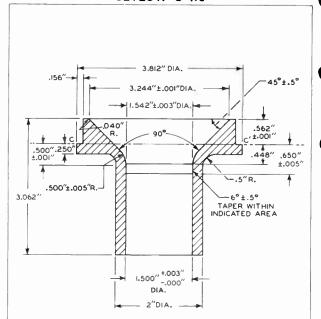


WHEN TUBE NECK IS INSERTED THROUGH GAUGE. REFERENCE LINE WILL BE DETERMINED BY PLANE C-C'WHEN GAUGE IS RESTING ON FUNNEL.

92CS-739IRI



# REFERENCE-LINE GAUGE JETEC Nº G-116

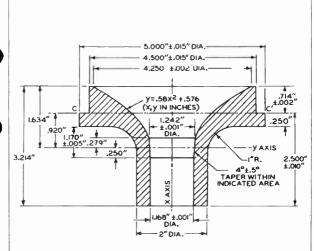


WHEN TUBE NECK IS INSERTED THROUGH GAUGE, REFERENCE LINE WILL BE DETERMINED BY PLANE C-C'WHEN GAUGE IS RESTING ON FUNNEL.

92CS-7896RI



## REFERENCE-LINE GAUGE JETEC Nº G-126



WHEN TUBE NECK IS INSERTED THROUGH GAUGE, REFERENCE LINE WILL BE DETERMINED BY PLANE C-C' WHEN GAUGE IS RESTING ON FUNNEL.

"y" VALUES MUST BE HELD TO ±.002."

92CS-9I45RI





## IEPI

OSCILLOGRAPH TUBE
FLECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

DATA

Gen	- 2	١,	

į	General:	١
Ì	Heater, for Unipotential Cathode:	l
	Voltage 6.3 ac or dc volts	l
	Current 0.6 ± 10% amp	1
ı	Direct Interelectrode Capacitances (Approx.):	ı
1	Grid No.1 to all other electrodes 6.5 μμf	l
	Deflecting electrode DJ; to	۱
i	deflecting electrodo DJ2 1.7 μμf	l
	Deflecting electrode DJ3 to	I
	deflecting electrode DJ4 0.6 μμf	I
	D <sub>I</sub> to all other electrodes 5 μμf	ł
Ì	D <sub>2</sub> to all other electrodes 5 μμf D <sub>3</sub> to all other electrodes 3.8 μμf	l
		l
	DV4 to all other electrodes 3.8 μμf Faceplate, Flat	
	Phosphor (For Curves, see front of this Section)	l
	Fluorescence	ł
	Phosphorescence	1
	Persistence	ŀ
	Focusing Method Electrostatic	Į
	Deflection Method Electrostatic	ı
	Maximum Overall Length	ı
	Maximum Diameter	ı
	Minimum Useful Screen Diameter	Į
	Mounting Position Any	ł
	Weight (Approx.)	1
	10.15	Ч
	Rase Small-Button Unidekar 11-Pin (JETEC No.E11-22)	
	Basing Designation for BOTTOM VIEW	ı

Pin 2 - Heater
Pin 3 - Grid No.1
Pin 4 - Cathode
Pin 5 - Grid No.3
Pin 6 - Deflecting
Electrode
DJ4
Pin 7 - Deflecting
Electrode
DJ3

Pin 1 - Heater



Collector)
Pin 9-Deflecting
Electrode
DU2
Pin 10-Deflecting
Electrode
DU1
Pin 11-Internal
Connection—
Do Not Use

(Grid No.2,

Grid No.4,

Pin 8-Ultor

 $DJ_1$  and  $DJ_2$  are nearer the screen  $DJ_3$  and  $DJ_4$  are nearer the base





With M2 positive with respect to M1, the spot is deflected toward the midpoint between pins 6 and 7. With M3 positive with respect to DJ4, the spot is deflected toward the midpoint between pins 9 and 10.

The angle between the trace produced by DJ3 and DJ4 and its intersection with the plane through the tube axis and the midpoint between pins 9 and 10 does not exceed ±100.

The angle between the trace produced by DJ3 and DJ4 and the

trace produced by DJ and DJ2	is 90° ± 3°.			
Maximum Ratings, Design-Cente	r Values:			
ULTOR VOLTAGE		1500 max.	volts	
GRID-No.3 VOLTAGE		1200 max.	volts	4
GRID-No.1 VOLTAGE:				Į
Negative bias value		200 max.		
Positive bias value Positive peak value		0 max. 2 max.		
PEAK VOLTAGE SETWEEN ULTOR AN		Z IIIdX.	VOILS	
ANY DEFLECTING ELECTRODE		500 max.	volts	
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect				
Heater positive with respect	to cathode.	125 max.	volts	
Equipment Design Ranges:				
For any ultor voltage (Ec.)	between			
recom	mended minimum	and 1500 1	volts	
Grid-No.3 Voltage				
for Focus	10% to 30% of	Eca	volts	
Grid-No.1 Voltage for		*		ĺ
Visual Extinction of				
Undeflected Focused Spot	1.4% to -4.2%	of Fo.	volts	
Grid-No.3 Current for	1.70 CO -7.20	0. 204	VOI (5	4
Any Operating Con-				Į
dition	-15 to +10		$\mu$ amp	
Deflection Factors:				
	210 to 310			
DJ3 & DJ4		v dc/in./kv	OT EC4	
Spot Position	<b>按</b> 推			_
Examples of Use of Design Ran	ges:			Į
For ultor voltage of	500	1000	volts	
Grid-No.3 Voltage				
for Focus	50 to 150	100 to 300	volts	

	-		
Grid-No.3 Voltage			
for Focus	50 to 150	100 to 300	volts

brilliance and definition decrease with decreasing ultor voltage. Recommended minimum for the 1FP1 in general service is 500 volts, but a value as low as 300 volts may be used under conditions of low-velocity deflection and low ambient light levels. For operation between 300 and 500 volts, it is essential that the ultor voltage be applied before beam-current flow. Otherwise, a screen charge may develop to block off or distort the scanning pattern.

\*\*: See next page.

TENTATIVE DATA





Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot7 to -21 -14 to -42 volt: Deflection Factors: DU   & DU2 105 to 155 210 to 310 volts dc/in. DU3 & DU4 120 to 175 240 to 350 volts dc/in.  Maximum Circuit Values: Grid-No.1-Circuit Resistance	Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot7 to -21  Deflection Factors: DI & DJ2 105 to 155 DJz & DJA	-14 to -42 210 to 310 vo 240 to 350 vo 1.5 max 2.0 max ot will fall with center of the tut	lts dc/in. lts dc/in megohms . megohms nin a circle
Spot	Spot	210 to 310 vo 240 to 350 vo 1.5 max 2.0 max ot will fall with center of the tut	lts dc/in. lts dc/in megohms . megohms nin a circle
Dul & Due	Di & Di	240 to 350 vo  1.5 max  2.0 max ot will fall with center of the tut	lts dc/in megohms . megohms nin a circle be face.
Grid-No.1-Circuit Resistance	Grid-No.1-Circuit Resistance	. 2.0 max ot will fall with center of the tut	. megohms
Resistance in Any Deflecting— Electrode Circuit	Resistance in Any Deflecting- Electrode Circuit  *** The center of the undeflected focused spinaving 2.5-mm radius concentric with the  It is recommended that the deflecting-elecapproximately equal.	. 2.0 max ot will fall with center of the tut	. megohm:
** The center of the undeflected focused spot will fall within a circle having 2.5-mm radius concentric with the center of the tube face.  It is recommended that the deflecting-electrode-circuit resistances by approximately equal.	## The center of the undeflected focused sphaving 2.5-mm radius concentric with the It is recommended that the deflecting-elecapproximately equal.	ot will fall with center of the tub	nin a circle be face.
It is recommended that the deflecting-electrode-circuit resistances by approximately equal.  IN6 MIN. SCREEN DIA.	It is recommended that the deflecting-elecapproximately equal.  IN6 MIN.		
SCREEN OIA.	1 1/6 will.	e-l	
		± 1/8"	

9205-8924

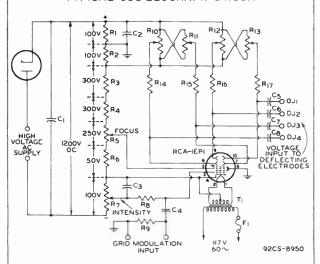
SMALL-BUTTON UNIDEKAR II-PIN BASE JETEC NºEII-22

# EPI



#### OSCILLOGRAPH TUBE





C1: 0.5  $\mu$ f, 2000 vo C2: 1  $\mu$ f, 200 volts C3: 1  $\mu$ f, 200 volts 2000 volts

C3: 1 μT, 200 VOITS C4: 0.05 μf, 1600 Volts C5 C6 C7 C8: 0.05 μf, 600 Volts R1 R2: 510.000 ohms, 1/2 watt R3 R4: 300.000 ohms, 1 watt

R5: 250,000-ohms, 2-watt po-

tentiometer R6: 51,000 ohms, 1/2 watt R7: 100,000-ohms, 1/2-watt po-

tentiometer F1: 1-ampere fuse R8: 510,000 ohms, 1/2 watt

R9: 5 megohms, 1/2 watt R10 R11: Dual 1-megohm

potentiometer R12 R13: Dual 1-megohm

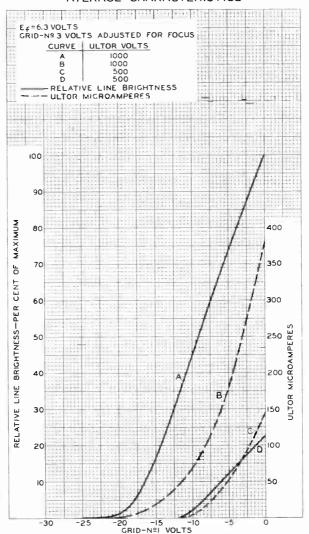
potentiometer R14 R15 R16 R17: 1.5 megohms

ransformer, 6.3 volts at 1 ampere, insulated for 2000 volts, such as Thordarson T21F08 T1: Transformer,

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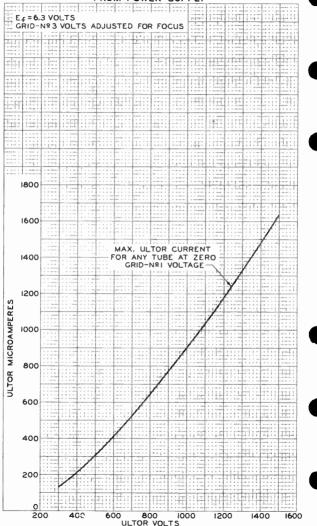
#### AVERAGE CHARACTERISTICS



(Ep,

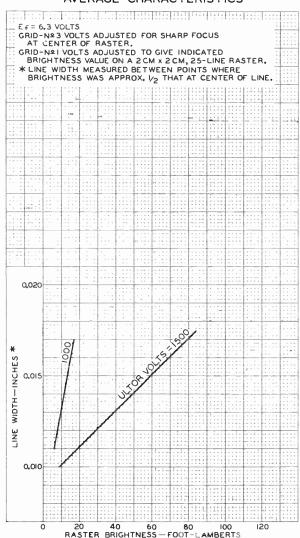


## MAXIMUM ULTOR-CURRENT REQUIREMENTS FROM POWER SUPPLY





# (Ep



World Radio History



ELECTROSTATIC DEFLECTION

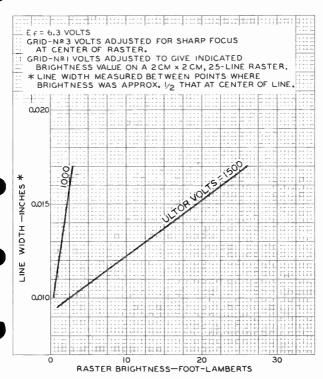
The 1EP2 is the same as the 1EP1 except for the following items:

#### General:

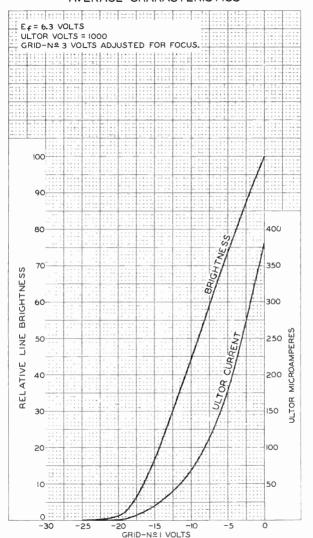
ELECTROSTATIC FOCUS

Phosphor (For Curves. see front of this Fluorescence. Phosphorescence

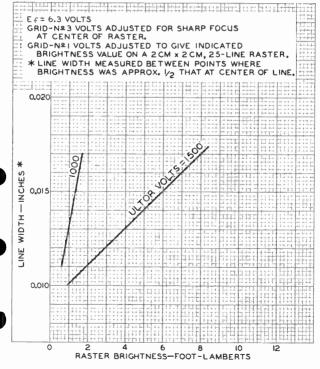
In general, operation of the 1EP2 at an ultor voltage less than 750 volts is not recommended.



E P



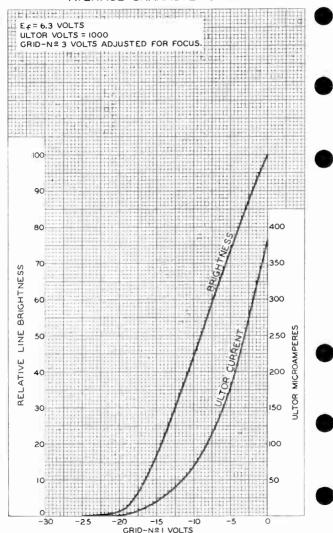
h	ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION			
	The IEP11 is the same as the IEP1 except for the followitems:	ng		
	General:			
)	Phosphor (For Curves, see front of this Section)	ue ue		
	In general, operation of the 1EP11 at an ultor voltage less than 750 volts is not recommended.			



#211/



#### AVERAGE CHARACTERISTICS



TUBE DIVISION

HADIO CORPORATION: OF AMERICA, HARRISON, NEW JERS

92CM-9298



## HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 2AP1

 $\mathcal{W}_1$  and  $\mathcal{W}_2$  are nearer the screen  $\mathcal{W}_2$  and  $\mathcal{W}_d$  are nearer the base

With  $\Omega_1$  positive with respect to  $\Omega_2$ , the spot is deflected toward pin 4. With  $\Omega_3$  positive with respect to  $\Omega_4$ , the spot is deflected toward pin I.

The angle between the trace produced by DJ3 and DJ4 and Its intersection with the plane through the tube axis and pin I does not exceed  $10^\circ$ .

The angle between the trace produced by DJ3 and DJ4 and the trace produced by DJ1 and DJ2 is  $90^{\circ} \pm 4^{\circ}$ .





#### HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)		
Maximum Ratings, Absolute Values:		- 1
ANODE-No.2 & GRID-No.2 VOLTAGE 1100	max.	volts
	mar.	volts
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:		
	max.	volts
	max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE 660	max.	volts
PEAK HEATER-CATHODE VOLTAGE:	max.	VO1 1.3
Heater negative with respect to cathode 125	max.	volts
	max.	
Typical Operation:		
,,		
		. volts
Anode-No.1 Voltage for Focus		
at 75% of Grid-No.1 Volt-		1
age for Cutoff® 125 250		
Grid-No.1 Volt. for Visual Cutoff# -30 -60		
Max. Anode-No.1 Current Range <sup>♠</sup> . Between -50 and	+10	. датр.

- ★ Brilliance and definition decrease with decreasing anode—No.2 voltage.
  In general, anode—No.2 voltage should not be less than 500 volts.
- Individual tubes may require between +20% and -45% of the values shown with grid-No.1 voltages between zero and cutoff.
- # visual extinction of stationary focused spot. Supply should be adjustable to  $\pm~50\,\mathrm{s}$  of these values.
- See curve for average values.

Deflection Sensitivity:

\*\* Individual tubes may vary from these values by  $\pm$  20%.

#### Spot Position:

The undeflected focused spot will fall within a 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ1 and DJ2. Suitable test conditions are: anode-No.2 voltage, 1000 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, I megohm each, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . . 1.5 max. megohms
Impedance of Any Deflecting-Electrode
Circuit at Heater-Supply Frequency 1.0 max. megohm

#### HIGH-VACUUM CATHODE-RAY TUBE

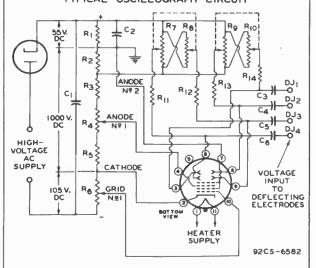
(continued from preceding page)

Resistance in Any Deflecting-

Electrode Circuit<sup>AA</sup> 5.0 max. meachms

▲▲ It is recommended that all deflecting-electrode-circuit resistances be approximately equal.

#### TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 µf

C2: 1.0 µf C3 C4 C5 C6: 0.05-µf Blocking

Capacitor \*

R1 R2: 0.5 Megohm R3: 3.0 Megohms

R4: 1.0-Megohm Potentiumeter R5: 0.5 Negohm R6: 0.5-Megohm Potentiometer R7 R8: Dual 5-Megohm Potenti

R7 R8: Dual 5-Megohm Potentiometer R9 R10: Dual 5-Megohm Potentiometer R11 R12 R13 R14: 2 Megohms

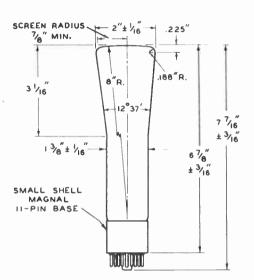
When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In Whis service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

The license extended to the purchaser of tubes appears in the License Notice accompanying them. Information contained herein is furnished without assuming any obligations.

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## HIGH-VACUUM CATHODE-RAY TUBE



92CM-6368R2

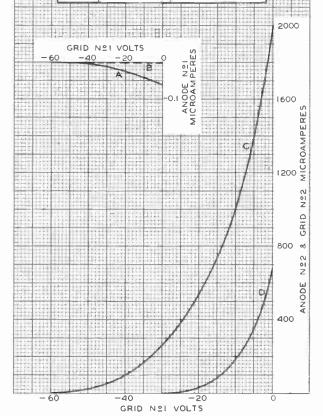
© OF BULB WILL NOT DEVIATE WORE THAN 20 IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE

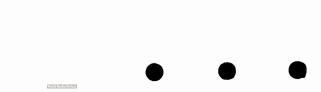


CAPIA

	VOL	15				
					FOCUS.	

CURVE	ELECTRODE CURRENT	ANODE Nº2 & GRID Nº2 VOLTS
Α	ANODE Nº1	1000
В	ANODE Nº I	500
С	& GRID Nº 2	1000
D	ANODE Nº 2 & GRID Nº 2	500







ELECTROSTATIC FOCUS

FIFCTROSTATIC DEFLECTION

#### DATA General: Heater, for Unipotential Cathode: Voltage. . . . . . . 6.5 Current. . . . . . . . . . . . . Direct Interelectrode Capacitances (Approx.): Grid No.1 to All Other Electropes . . . μμf $\mathbb{N}_1$ to $\mathbb{N}_2$ . . . . . . . . . . . . Mut DJa to DJa . . . . Di to All Other Electrodes. . . . . . Dig to All Other Electrodes. . . . . 8 DJ2 to All Other Electrodes. . . . . DJ to All Other Electrodes. . . . . Phosphor (For Curves, see front of this Section) . . Fluorescence . . Persistence. . . . . . . . . . Electrostatic Focusing Method . . . . . . . Electrostatio Deflection Method. . . . . . . 7-5/8" ± 3/16" Overall Length . . . 2" ± 1/16". Greatest Diameter of Bulb. . . . . . . Minimum Useful Screen Diameter . . Any Mounting Position. . . Small-Shell Duodecal 12-Pin Basing Designation for EOTTOM VIEW . Pin 8 - Anode No. 2. Pin 1-Heater Grid No. 2 Pin 2-Grid No.1 Pin 3 - Cathode Pin 9 - Deflecting Electrode Pin 4 - Anode No. 1 Pin 5 - Internal Connection--Pin 10 - Deflecting Do Not Use Electrode Pin 6 - Deflecting DJ1 Electrode Pin 11 - Internal Connection--

DJ, and DJ, are nearer the screen  $DJ_2$  and  $DJ_A$  are nearer the base

With DJ1 positive with respect to DJ2, the spot is deflected toward pin 4. With DJ3 positive with respect to DJ4, the spot is deflected toward pin 1.

The plane through the tube axis and pin No.4 may vary from the trace produced by DJ1 and DJ2 by an angular tolerance (measured about the tube axis) of 100.

The angle between DJ1 - DJ2 trace and DJ3 - DJ4 trace is 900 ± 30.

- Indicates a change.

Do Yot Use

Pin 12 - Heater

Pin 7 - Deflecting

Flectrode

WA



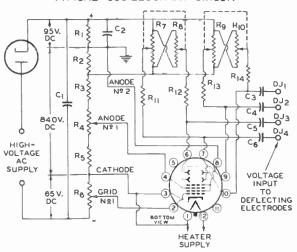


	Maximum Ratings, Design-Center Values:
- 10	ANCDE-No.2 VOLTAGE
	Negative bias value 200 max. volts Positive bias value 0 max. volts
	Positive peak value 2 max. volts PEAK VOLTAGE 8ETWEEN ANODE No.2 AND
	ANY DEFLECTING ELECTRODE 500 max. volts PEAK HEATER-CATHODE VOLTAGE:
	Heater negative with respect to cathode. 125 max. volts Heater positive with respect to cathode. 125 max. volts
	Equipment Design Ranges:
	For any anode-No.2 voltage (Eb.,) between 500° and 2500 volts
	Anode-No.1 Voltage 15% to 28% of Eb2 volts
->	Max. Grid-No.1 Voltage for Visual Cutoff. 6.75% of Eb <sub>2</sub> volts Max. Anode-No.1
	Current Range15 to +10 microamperes Deflection Factors:
	D1 & D12       115 to 155 v dc/in./kv of Eb2         D3 & D4       74 to 100 v dc/in./kv of Eb2
->	Spot Position
	Examples of Use of Design Ranges:
	For anode-No. 2 voltage of 1000 2000 volts
	Anode-No.1 Voltage . 150 - 280 300 - 560 volts Max. Grid-No.1 Voltage for Visual Cutoff67.5 -135 volts
	Deflection Factors: $\mathbb{D}_1$ & $\mathbb{D}_2$
	DJ3 & DJ4 74 ~ 100 148 ~ 200 volts dc/in.
	Grid-No.1-Circuit Resistance 1.5 max. megohms
	Resistance in Any Deflecting- Electrode Circuito 5.0 max. megohms
	Brilliance and definition decrease with decreasing anode—No.2 voltage. A value as low as 500 volts is recommended only for low—velocity de-flection and low room—light levels.
	O It is recommended that the deflecting-electrode-circuit resistances
	<ul> <li>■ Anode No.2 and grid No.2 which are connected together within tube, are referred to herein as anode No.2. The product of anode—No.2 voltage and average anode—No.2 current should be limited to 6 watts.</li> </ul>
	O The center of the undeflected, focused spot will fall within a circle having a 5.0-mm radius concentric with the center of the tube face.
	4

DATA

> Indicates a change.





#### 92CM-6777R1

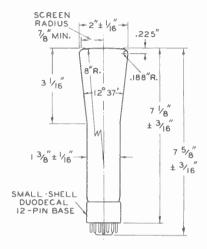
C1: 0.2 µf C2: 1.0 µf C3 C4 C5 C6: 0.05-µf Blocking Capacitors\* R1 R2: 2.5 Megohms, 0.5 watt R3: 2.5 Megohms, 1 Watt Ku; 1.0-megohm Potentiometer R5: 0.5 megohm, 0.5 watt R6: 0.35 Megohm, 0.5 watt R7 R8: Dual 5-megohm Potentiometer R9 R10: Dual 5-megohm Potentiometer R11 R12 R13 R1u: 2 megohms, 0.5 watt

when cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded. They may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

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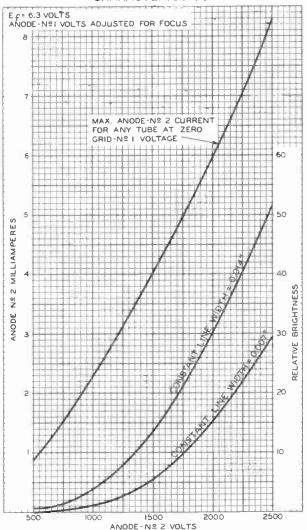


 ${\widehat {\bf t}}$  OF "JL" WILL NOT DEVIATE MORE THAN 20 IN ANY DIMECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE MASE.

92CS-6639

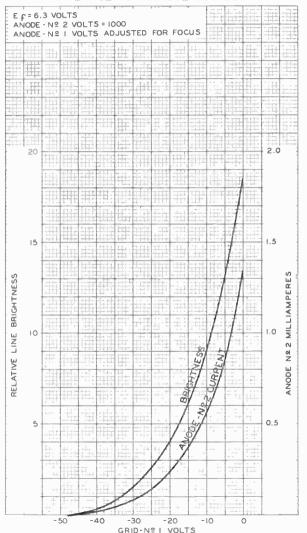


#### CHARACTERISTICS











## PAPI

#### OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 2BP11 is the same as the 2BP1 except that it has a phosphor of the short-persistence, blue-fluorescence type designated P11. The blue radiation of the P11 screen is highly actinic and has sufficiently short persistence to permit use of the 2BP11 in all moving film photographic applications without blurring except in those where film moved at a high speed. The 2BP11 is also quite satisfactory for visual observation of phenomena because its phosphor has unusually high brightness for a blue screen.

In general, operation of the 2BP11 at an anode-No.2 voltage less than 1000 volts is not recommended.

THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC and the PERSISTENCE CHARACTERISTIC of the P11 Phosphor are shown at the front of this Section







5-INCH MAGNETIC-DEFLECTION TYPE Supersedes Type 1899

-	Superseues Type 1000	_
)	General:	
)	Heater, for Unipotential Cathode: Voltage 6.3 $\pm$ 10% ac or dc volt Current 0.6 am Direct Interelectrode Capacitances: Grid No.1 to All Other Electrodes 7	f
_	Dimensions (Approx.)	s c c
•	Overall Length	i y n
	Maximum Ratings, Design-Center Values:	
<b>)</b>	PATTERN-ELECTRODE VOLTAGE 1500 max. volt GRID-No.4 (COLLECTOR) VOLTAGE 1500 max. volt GRID-No.3 (FOCUSING ELECTRODE) VOLTAGE . 600 max. volt GRID-No.2 (ACCELERATING ELECTRODE) VOLTAGE: 1600 max. volt GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:	s s
	Negative Bias Value	s
	Typical Operation: ?	1
	Pattern-Electrode Voltage 1000 volt Grid-No.4 Voltage 1050 volt Grid-No.3 Voltage for Focus at	s
	O.5 µamp Grid-No.4 Current* 300 approx. volt Grid-No.2 Voltage 1000 volt Grid-No.1 Voltage for Visual Cutoff on Monitor* -50 approx. volt	s
)	Internal Resistance between Grid No.4 and Pattern Electrode Greater than 1 meg Grid-No.4 Current 0.5 µam	
	₹, ♣, #: See next page.	

JUNE 20, 1946

TENTATIVE DATA





#### MONOSCOPE

Pattern-Electrode S	Signal	Cu	rr	en	t						
							eak				µamp
Resolution Capabili	ty▲▲								500		lines

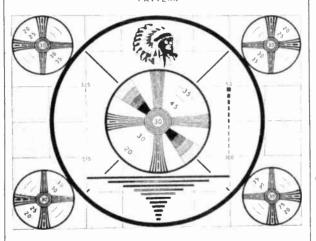
#### Maximum Circuit Value:

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms

- Individual tubes may require between + 20% and 20% of these values.
  Deflection must be maintained at all times, when scanned area does not cover entire pattern, the beam current should be reduced accordingly and time of operation limited to prevent damaging the pattern.
- # Supply should be adjustable between + 40% and 80% of this value.

with full scanning.

#### PATTERN

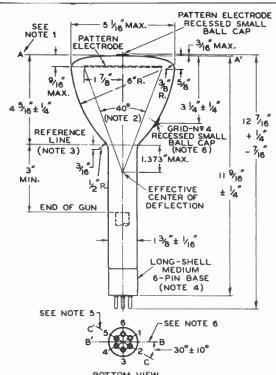


9203-6665



#### 2F2I MONOSCOPE





BOTTOM VIEW

9204-6653

NOTE 1: LINE AA' IS PERPENDICULAR TO THE AXIS OF THE TUBE AND INTERSECTS THE FACE CONTOUR I/2" FROM THE AXIS OF THE TUBE.

NOTE 2: DEFLECTION ANGLE BETWEEN DIAGONALLY OPPOSITE CORNERS OF PATTERN.

NOTE 3: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.438" ± .003 I.D. AND 2" LONG WILL REST ON BULB COME.

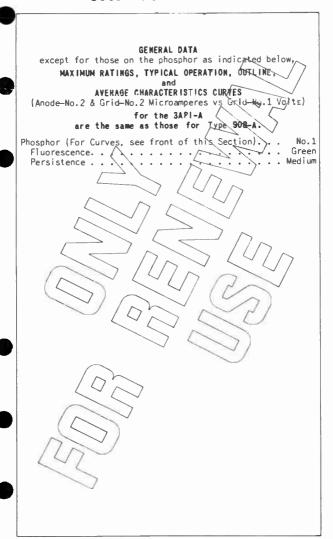
NOTE 4: ( OF BULB WILL NOT DEVIATE MORE THAN 2º IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

NOTE 5: MINOR AXIS OF PATTERN ELECTRODE MAY VARY FROM PLANE CC' THROUGH PIN 2 AND TUBE AXIS BY 10°. TOP EDGE OF PATTERN IS ON SAME SIDE OF TUBE AS PIN 5.

NOTE 6: BB' INDICATES PLANE THROUGH TUBE AXIS AND GRID-No.4 TERMINAL.



BADIA





## Oscillograph Tube

#### ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

DATA

DATA					
General:					
Heater, for Unipotential Cathode: Voltage (AC or DC)	6.3 volts				
Current	nrox.).				
Grid No.1 to all other electrodes .					
Cathode to all other electrodes					
Deflecting electrode DJ to deflecti	ng				
electrode DJ2 Deflecting electrode DJ3 to deflecti	5.2 μμf				
electrode DJ4	7 muf				
DJ <sub>I</sub> to all other electrodes	$\dots$ 10.1 $\mu \mu f$				
DJ <sub>2</sub> to all other electrodes					
DJ3 to all other electrodes	8.1 μμf 9.2 μμf				
DJ <sub>4</sub> to all other electrodes Faceplate, Spherical	Clear Glass				
Phosphor (For Curves, see front of thi	s Section) P1				
Fluorescence	Yellowish-Green				
Phosphorescence	Yellowish-Green				
Persistence	Medium				
	Electrostatic				
Deflection Method					
Overall Length	9-1/8" ± 1/4"				
Minimum Useful Screen Diameter	2–3/4"				
Useful Scan (Centered with					
respect to tube face):					
By deflecting electrodes DJ & DJ2.	2-3/4"				
By deflecting electrodes DJ & DJ	2-1/4"				
Operating Position	Any				
Bulb	J24P1				
BaseSmall-Shell Duodecal 12-Pin (JE					
Basing Designation for BOTTOM VIEW.					
Pin 1 - Heater	Pin 8-Ultor				
Pin 2-Grid No.1	(Grid No.2,				
Pin 3 - Cathode	Grid No.4.				
Pin 4 – Grid No.3	Collector)				
Pin 5 - Internal Con-	Pin 9-Deflecting Electrode				
Do Not Use O	DJ <sub>2</sub>				
Pin 6 - Deflecting	Pin 10 - Deflecting				
Electrode	Electrode				
DJ 2 (2) (1)	DJ I				
Pin 7 - Deflecting	Pin 11 - Internal Con-				
Electrode	nection—				
DJ <sub>4</sub>	Do Not Use				
	Pin 12 - Heater				
$DJ_1$ and $DJ_2$ are nearer the screen					

DJ3 and DJ4 are nearer the base

## 3AQP1

Maximum and Minimum Ratings, Design-Center	Values:					
ULTOR VOLTAGE	∫2750 max. volts					
ULTOD INDUT (AMEDIACE)	`\ 500 min. volts					
ULTOR INPUT (AVERAGE)	• 6 max. watts					
GRID-No.1 VOLTAGE:	. 1100 max. volts					
Negative-bias value	. 200 max. volts					
Positive-bias value	. 0 max. volts					
Positive-peak value	. 2 max. volts					
PEAK VOLTAGE RETWEEN ULTOR AND						
ANY DEFLECTING ELECTRODE	. 550 max. volts					
PEAK HEATER-CATHODE VOLTAGE:						
Heater negative with respect to cathode:						
During equipment warm-up period						
not exceeding 15 seconds	. 410 max. volts					
After equipment warm-up period	. 125 max. volts					
Heater positive with respect to cathode.	. 125 max. volts					
Equipment Design Ranges:						
For any ultor voltage (Ecu) between 500 and 2750 volts						
Grid-No.3 Voltage						
for focus 16.5% to 31% of Ec.	volts					
Negative Grid-No.1						
Voltage for visual						
extinction of						
undeflected spot . 2.8% to 6.7% of $E_{c_{A}}$	volts					
Grid-No.3 Current						
for any operating						
condition —15 to +10 Deflection Factors:	μа					
DJ & DJ <sub>2</sub> 73 to 99	y dolin /ky of E					
DJ <sub>3</sub> & DJ <sub>4</sub> 26 to 35	v dc/in./kv of E <sub>c4</sub> v dc/in./kv of E <sub>c4</sub>					
20 (0 )	V GC/III./RV OI Ec4					



# SARIA

# HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type 3RP1
General:
Heater, for Unipotential Cathode:  Voltage
$D ar U_1$ and $D ar U_2$ are nearer the screen $D ar U_3$ and $D ar U_4$ are nearer the base
With DJ <sub>1</sub> positive with respect to DJ <sub>2</sub> , the spot is deflected toward pin 5. With DJ <sub>3</sub> positive with respect to DJ <sub>4</sub> the spot is deflected toward pin 2. The angle between the trace produced by DJ <sub>1</sub> and DJ <sub>2</sub> and its intersection with the plane through the tube axis and pin 5 does not exceed $10^{\circ}$ .
The angle between the trace produced by $DJ_3$ and $DJ_4$ and
the trace produced by DJ <sub>1</sub> and DJ <sub>2</sub> is 900 ± 30.  Maximum Ratings, Abolute Values:
ANODE-No.2 & GRID-No.2 VOLTAGE
JULY 1, 1945 RCA VICTOR DIVISION DATA 1



# 38944 HIGH-VACUUM CATHODE-RAY TUBE

(continued from precedin) page	)		
GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:			
Negative Value	200	mar.	volts
Positive Value	0	max.	volts
PEAK VOLTAGE BETWEEN ANODE No.2 AND			
ANY DEFLECTING ELECTRODE	550	max.	volts
PEAK HEATER-CATHODE VOLTAGE:			_
Heater negative with respect to cathode		max.	volts
Heater positive with respect to cathode	10	max.	volts
Typical Operation:			
Anode-No.2 & Grid-No.2 Voltage 1500	2000		. volts

Alloue Host fortage			
at 75% of Grid-No.	.1 Volt-		
	for Cutoff . 430	575	volts
Grid-No.1 Volt. for	/isual Cutoff# -45	-60	volts
Max. Anode-No.1 Curr	rent Range <sup>®</sup> Between	-50 and $+10$	цатр.

Deflection Sensitivity:  $DJ_1$  and  $DJ_2$  . . . . . 0.169 0.127 mm/v dc

DJ3 and DJ4 . . . 0.229 0.172 . mm/v dc Defléction Factor:\*\* DJ1 and DJ2 . . . . . . 150 v dc/in. DJ3 and DJ4 . . . . . 111 148 .

- Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1500 volts.
- Individual tubes may require between +20% and -30% of the values shown with grid-No.1 voltages between zero and cutoff.
- Yisual extinction of stationary focused spot. Supply should be adjustable to  $\pm\ 50\mbox{\ensuremath{\$}}$  of these values.
- See curve for average values.

Anode No. 1 Voltage for Focus

individual tubes may vary from these values by ± 20%.

#### Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ; and DJ2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, I megohm each, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

#### Maximum Circuit Values:

megohms Grid-No.1-Circuit Resistance 1.5 max. Impedance of Any Deflecting-Electrode

megohm Circuit at Heater-Supply Frequency 1.0 max. Resistance in Any Deflecting-Electrode Circuit \*\*

It is recommended that all deflecting-electrode-circuit resistances be approximately equal.

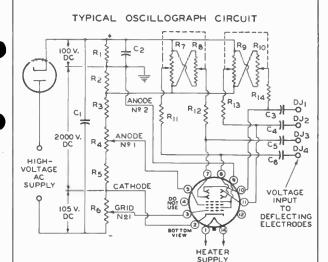
megohms

5.0 max.



# 30p.

#### HIGH-VACUUM CATHODE-RAY TUBE



92CS-6514

C1: 0.1 µf

C2: 1.0 µf C3 C4 C5 C6: 0.05-µf 8locking Capacitors\*

R1 R2: 2 Megohms R3: 5.5 Megohms

RN: 2-Megohm Potentiometer R5: 1.5 Megohms

R6: 0.5-Megohm Potentiometer R7 R8: Dual 5-Megohm Potenti

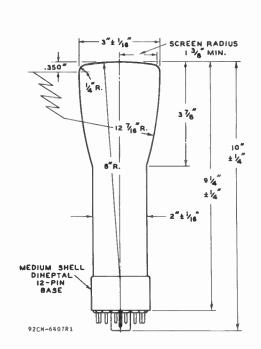
R7 R8: Dual 5-Megohm Potentiometer R9 R10: Dual 5-Megohm Potentiometer R11 R12 R13 R14: 2 Megohms

When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electroder resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

The license extended to the purchaser of tubes appears in the License Motice accompanying them. Information contained herein is furnished without assuming any obligations.



#### HIGH-VACUUM CATHODE-RAY TUBE



© OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE

3BPHA

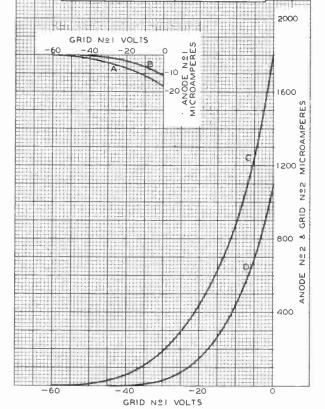


ABD!A

#### AVERAGE CHARACTERISTICS

# ANODE Nº 1 VOLTS ADJUSTED TO GIVE FOCUS

CURVE	ELECTRODE CURRENT	ANODE Nº2 & GRID Nº2 VOLTS
А	ANODE Nº I	2000
В	ANODE Nº I	1500
С	ANOUL Nº 2 & GRID Nº 2	2000
D	ANODE Nº 2 & GRID Nº 2	1500



APR. 18,1945

RCA VICTOR DIVISION

BADIO CORPORATION OF AMERICA HARRISON NEW JERSEY

92CM-6412R1

World Radio History





POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

#### DATA

	DATA
	General:
)	Heater, for Unipotential Cathode:  Voltage 6.3 ac or dc volts  Current 0.6 amp  Direct Interelectrode Capacilances (Approx.):
	Grid Nn.1 tn All Other Electrodes 8 μμ1
	Cathode to All Other Electrodes 8 Mul
	D1 to D2 2.5 μμf
	DJ3 to DJ4 2 μμt
	Du1 to All Other Electrodes 8 μμ
)	DU2 to All Other Electrodes 7 mm
	DJ3 to All Other Electrodes 7
	DU4 to All Other Electrodes 8 ###
	Phosphor (For Curves, see front of this Section) P1
	Fluorescence and Phosphorescence
	Persistence of Phosphorescence Medium Focusing Method Electrostatic
	Deflection Method Electrostatic
	Overall Length
	Greatest Diameter of Bulb 3" ± 1/16"
	Minimum Useful Screen Diameter
	Mounting Position
	Base Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)
	Basing Designation for BOTTOM VIEW 14J <sub>1</sub>
	Pin 1 – Heater Pin 9 – Anode No. 2.
	Pin 2 - Cathode Grid No. 2
	Pin 3-Grid No.1 Pin 10-Deflecting
	Pin 4 - Internal Electrode
	Connection— 5/ DJ2
	Do Not Use Pin 11 - Deflecting
	Pin 5 - Anode No.1 Electrode
	Pin 7 - Deflecting DJ1
	Electrode Pin 12 - No
	DJ3 Connection
	Pin 8 - Deflecting Pin 14 - Heater Cap - Anode No.3
	Electrode 104
	27 1 27

#### $DJ_1$ and $DJ_2$ are nearer the screen $DJ_3$ and $DJ_4$ are nearer the base

With DJ1 positive with respect to DJ2, the spot is deflected toward pin 5. With DJ3 positive with respect to DJ4, the spot is deflected toward pin 2.

The plane through the tube axis and each of the following items may vary from the trace produced by D1 and D2 by the following angular tolerances measured about the tube axis: Pin 5, 100; Cap (on same side of tube as pin 5), 100.

The angle between  $D_1 - D_2$  trace and  $D_3 - D_4$  trace is  $90^{\circ} \pm 3^{\circ}$ .





	_
laximum Ratings, Design-Center Values:	
NODE-No.3 VOLTAGE 4000 max. vol	t:
NODE-No. 2º VOLTAGE 2000 max. vol	t:
ATTO OF ANODE-No.3 VOLTAGE TO	
ANODE-No.2 VOLTAGE 2.3:1 max.	
NODE-No.1 VOLTAGE 1000 max. vol	t
GRID-No.1 VOLTAGE:	
Negative bias value 200 max. vol	
Positive bias value 0 max. vol	
Positive peak value 2 max. vol	τ
PEAK VOLTAGE BETWEEN ANODE No.2  AND ANY DEFLECTING FLECTRODE 500 max. vol	
AND AN DE ELOTTIO CELOTITIO	·
PEAK HEATER-CATHODE VOLTAGE:  Heater negative with respect to cathode. 125 max. vol	t
Heater positive with respect to cathode. 125 max. vol	
heater positive with respect to cathode. 123 max. vo.	٠
quipment Design Ranges:	
For any anode-No.3 voltage (Eb3) between 2000* and 4000 vol	t
ind any anode-No.2 voltage (Eb2) between 1500** and 2000 vol	
Anode-No.1 Voltage 20% to 34.5% of Eb2 vol Grid-No.1 Voltage† 1.5% to 4.5% of Eb2 vol	
Anode-No.1 Current for any	
Operating Condition $-50 \text{ to } +10$ $\mu$	эт
Deflection Factors:	
When $Eb_3 = 2 \times Eb_2$ $DJ_1 \& DJ_2$	- b
001 0 002 1 1 1 1 1 1 1 1 1 1 1 1	
When $Eb_3 = Eb_2$ Du 1 & Du 2	Eh
501 002	∟v
DJ3 & DJ4 50 to 68 v dc/in./kv of 1	
Spot Position *	

- Anode No. 2 and grid No. 2, which are connected together within tube, and referred to herein as anode No. 2.
- At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode-No.2 input power to 6 watts.
- It is recommended that anode-No.3 voltage benot less than 3000 volts for high-speed transients.
- \*\* Recommended minimum value of anode-No.2 voltage.
- with heater voltage of 6.3 volts, anode-No.3 voltage of 3000 volts, anode-No.2 voltage of 1500 volts, anode-No.1 voltage adjusted for focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through 1-megohm resistor to anode No.2, and tupe shielded from all extraneous fields, the undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tupe face and having one side parallel to the trace produced by D11 and D12.

†: See next page. AUG. 1, 1951



## 3JPI



١.					
Example	s of	Use	of	Design	Ranges:

For anode-No.3 voltage of and anode-No.2	2000	3000	1000	volts
voltage of	f 2000	1500	2000	volts
Anode-No.1 Volt.	400 to 690	300 to 515	400 to 690	volts
Grid-No.1 Volt.	−30 to −90	22.5 to -67.5	-30 to -90	volts
Deflection Factors	5:	107 . 170		

 $DJ_1 \& DJ_2 ... 136 \text{ to } 184 127 \text{ to } 173 170 \text{ to } 230$   $DJ_3 \& DJ_4 ... 100 \text{ to } 136 94 \text{ to } 128 125 \text{ to } 170$ 

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 m	nax. megohms
Resistance in Any Deflecting-Electrode Circuit*	5.0 m	max. megohms

For visual extinction of undeflected focused spot.

#### OPERATING NOTES

The 3JPI utilizes a medium-persistence screen having green fluorescence and phosphorescence. The screen has high visual efficiency and exceptionally good brightness contrast between the scanned line and the background. Under conditions of high ambient light, contrast may be maintained by the use of a green filter, such as Wratten No.58.

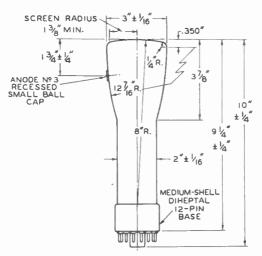
For high-speed scanning, it is recommended that the anode-No.3 (post-deflection accelerator) voltage be not less than 3000 volts, but for low- and medium-speed scanning, anode No.3 may be operated at a voltage as low as 2000 volts.

Because of its medium persistence, the 3JPI is particularly useful where either medium—speed non-recurring phenomena or medium— and high-speed recurring phenomena are to be observed. The persistence is such that the 3JPI can be operated with scanning frequencies as low as 20 cycles per second without excessive flicker.

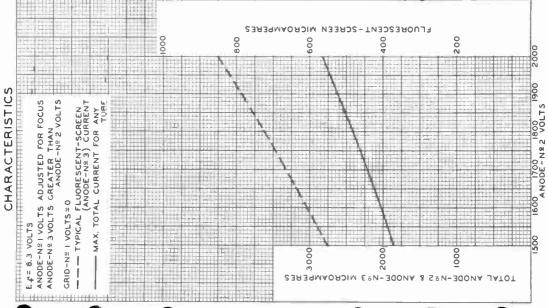
m volts dc/in.

A It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



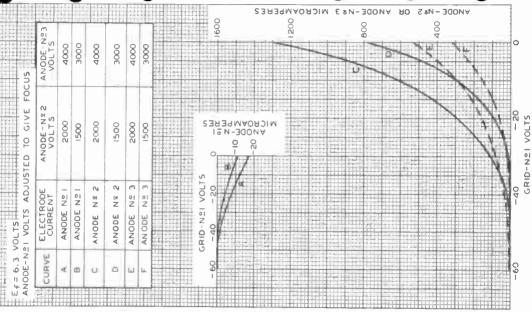


92CM-65B3





# VERAGE CHARACTERISTIC



INE 22, 1951

TUBE DEPARTMENT COPPORATION OF AMERICA, HARRISON, NE

7670

Wastel Darlin



# 12/01

#### OSCILLOGRAPH TUBE

PUST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS
ELECTROSTATIC DEFLECTION

The 3JP7 is electrically and mechanically like the 3JP1 but utilizes a long-persistence, cascade (two-layer) screen which exhibits bluish fluorescence of short persistence and greenish-yellow phosphorescence which persists for several minutes under conditions of adequate excitation and low ambient light.

Because of its long persistence, the 3JP7 is particularly useful where either low-speed non-recurring phenomena or high-speed recurring phenomena are to be observed.

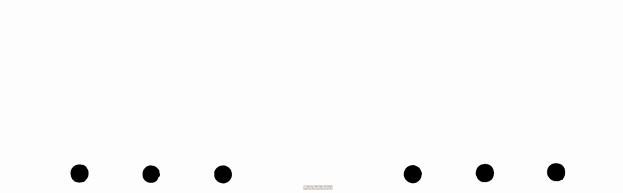
The persistence is such that the 3JP7 without filter can be operated with scanning frequencies as low as 30 cycles per second without excessive flicker. When used with a yellow filter, such as Wratten No.15 (G), the 3JP7 can be operated with much lower scanning frequencies.

## GENERAL DATA, MAXIMUM RATINGS, AND EQUIPMENT DESIGN RANGES

for the 3JP7 are identical with those for the 3JP1 except that Spot Position is defined as follows:

With heater voltage of 6.3 volts, anode-No.3 voltage of NOOD volts, anode-No.2 voltage of 2000 volts, anode-No.1 voltage adjusted for focus, grid-No.1 voltage adjusted to give Spot that is just visible, each deflecting electrode connected through 1-megohm resistor to anode No.2, and tube shielded from all extraneous fields, the undeflected focused spot will fall within a 12-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJI and DJ2.

THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC,
BUILDUP CHARACTERISTICS,
and PERSISTENCE CHARACTERISTICS of
the P7 Phosphor are shown at the
front of this Section.





ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

	DATA
	General:
	Heater, for Unipotential Cathode:  Voltage 6.3 ac or dc volts  Current amp
)	Direct Interelectrode Capacitances (Approx.): Grid No.1 to all other electrodes 8 μμf
	Deflecting electrode W1 to deflecting electrode D2 2.5   puf Deflecting electrode D3 to
	deflecting electrode D4 2.5 μμf
	$\mathbb{D}_1$ to all other electrodes
)	D3 to all other electrodes 7 µµf
	Dia to all other electrodes 8 μμf
	Eaconlato Clear Glass
	Phosphor (For Curves, see front of this Section)
	Fluorescence
	Porsistance Medium
	Focusing Method Electrostatic
	Ineflection Method Liectrostatic
	10. orall Length 11-1/2" ± 1/4
	Greatest Diameter of Bulb . 3" ± 1/16" Mimimum Useful Screen Diameter
	Mimimum Useful Screen Diameter
	Mounting Position
	Basing Designation for BOTTOM VIEW
<b>.</b>	Pin 1 - Heater Pin 8 - Deflecting Pin 2 - Grig No.1 Electrode Pin 3 - Cathode DJ2
,	Pin 4 - Grid No.3 Pin 5 - Deflecting Pin 5 - Deflecting Pin 5 - Deflecting
	Electrode D1  DJ3  Pin 10 - Internal
	Pin 6 - Deflecting 3 Connection-
	Electrode 2 Do Not Use

 $DJ_1$  and  $DJ_2$  are nearer the screen  $DJ_2$  and  $DJ_d$  are nearer the base

- Indicates a change.

Pin 11 - Heater

DJa

(Grid No.2, Grid No.4, Collector)

Pin 7 - Ultor





With  $\Omega_1$  positive with respect to  $\Omega_2$ , the spot is deflected toward pin 4. With DJ3 positive with respect to DJ4, the spot is deflected toward pin 1. The plane through the tube axis and pin 1 may vary from the trace produced by DJ3 and DJ4 by ±100 (measured about the tube The angle between D1 - D2 trace and D3 - D4 trace is 900 Maximum Ratings, Design-Center Values: ULTOR VOLTAGE . 2500 max. volts ULTOR INPUT (AVERAGE) . . 6 max. watts GRID-No.3 VOLTAGE . . . volts 1000 max. GRID-No.1 VOLTAGE: Negative bias value . . . . 200 max. volts Positive bias value . . . . . 0 max. volts Positive peak value. 2 max. volts PEAK VOLTAGE BETWEEN ULTOR AND 500 max. volts PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode . 125 max. volts Heater positive with respect to cathode . 125 max. volts Equipment Design Ranges: For any ultor voltage (Eca) between recommended minimum" and 2500 volts Grid-No.3 Voltage 16% to 30% of Ec. volts Visual Extinction of Undeflected Focused Spot. . . . . . . 1,9% to 4.5% of E<sub>CA</sub> volts Grid-No.3 Current for Any Operating Condi--15 to +10  $\mu$ amp v dc/in./kv of Ec4  $\mathbb{N}_1$  &  $\mathbb{N}_2$  . . . . . 50 to 68 v dc/in./kv of Ec. DJ3 & DJ4 . . . . . . 38 to 52 Spot Position . . . ##

#### Examples of Use of Design Ranges:

For ultor voltage	of	1000	2000	volts
Grid-No.3 Voltage for Focus		160 to 300	320 to 600	volts

Brilliance and definition decrease with decreasing ultor voltage. Recommended minimum for the 3kPl in general service is 1000 volts but a value aslow as 500 volts may be used under conditions of low-velocity deflection and low ambient-light levels.

The center of the undeflected focused spot will fall within a circle having 7.5-mm radius concentric with the center of the tube face.

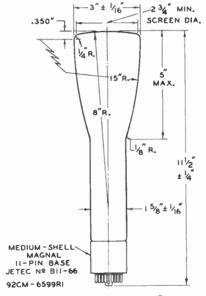
- Indicates a change.





For ultor voltage of	1000	gnen	volts
Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot Deflection Factors:	-19 to -45	-38 to -90	völts
₩1 8 ₩2 ₩3 & ₩4	50 to 68 38 to 5∠		volts dc/in.
MaxImum Circuit Values:			max. megohms

It is recommended that the deflecting-electrode-circuit resistances of approximately equal.



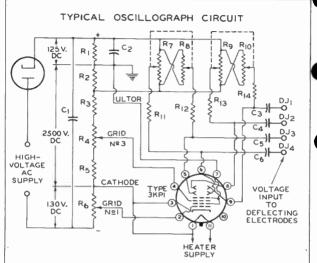
 $\ensuremath{\xi}$  OF BULB WILL NOT DEVIATE MORE THAN  $2^{O}$  IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

- Indicates a change.

DATA 2







92CS-669QR2.

C1: 0.1 µf, 3000 Volts

C2: 1.0 µf. 200 Volts

C3 C4 C5 C6: 0.05-µf Blocking Capacitors

R1 R2: 2 Megohms, 0.5 Watt

R3: 6 Megohms, 0.5 watt

R5: 1.0 Megohm, 0.5 watt

R6: 0.5-Megohm Potentiometer, 0.5 watt

R7 R8: Dual 5-Megohm Potentiometer, 0.5 watt

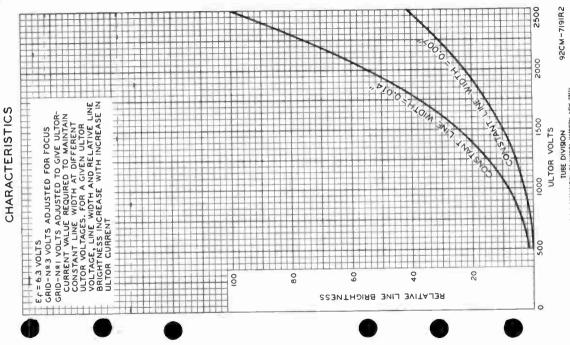
R9 R10: Dual 5-Megohm Potentiometer, 0.5 watt

when cathode is grounded, capacitors should have high voltage rating (3000 volts); when ultor is grounded, they may have low voltage rating (200 volts). For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading, effect on amplifier. In order to minimize spot defocusing, it is essential that ultor be returned to a point in the amplifier system which will give the lowest possible potential difference between ultor and the deflecting electrodes.

R4: 2-Megohm Potentiometer, 0.5 watt R11 R12 R13 R14: 2 Megohms, 0.5 watt

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

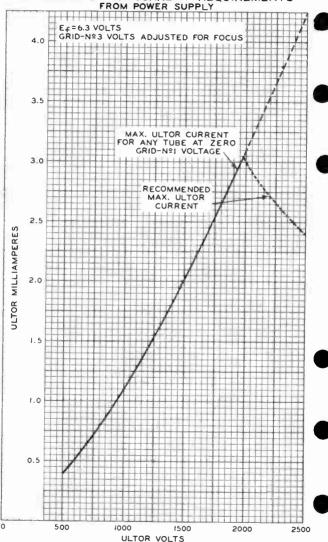




348

## RCA 3KPI

## MAXIMUM ULTOR-CURRENT REQUIREMENTS

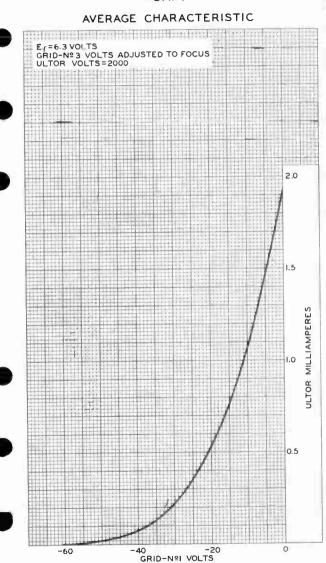


TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7192RI



#### AVERAGE CHARACTERISTIC



TUBE DIVISION RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY 92CM-6658R2







.Medium-Short

ELECTROSTATIC DEFLECTION

#### OSCILLOGRAPH TUBE

The SKP1 is the same as the SKP1 except for the follow-

In general, operation of the EKP4 at an ultor voltage less

The PERSISTENCE CHARACTERISTICS
of the PM-sulfide phosphor are the same as those shown for

ELECTROSTATIC FOCUS

Fluorescence. . . . Phosphorescence . .

Persistence . .

Phosphor (For Curves, ec 'ron' o' 'ris Section) .

than 1500 voits is not recommended.

ing items:
General:

	3KP7
	LLOGRAPH TUBE
ELECTROSTATIC FOCUS	S ELECTROSTATIC DEFLECTION
The $3KP^n$ is the same ing items:	as the 3KP1 except for the follow-
General:	
Fluorescence  Persistence  Phosphorescence	see front of this Section). P7 Purnlish-Blue .Medium-Short Yellawish-Green Very Lang
1	
than 1500 volts is n	n of the 3KP7 at an ultor voltage less ot recommended.
than 1500 volts is n	ot recommended.
than 1500 volts is n	3KPII LLOGRAPH TUBE
OSCII	S ELECTROSTATIC DEFLECTION
OSCII  ELECTROSTATIC FOCU  The 3KP1: is the same	S ELECTROSTATIC DEFLECTION
OSCII  ELECTROSTATIC FOCU  The 3KP11 is the same ing items:  General: Prosphor (For Curves, Fluorescence	3KPII LLOGRAPH TUBE

34816



#### 3KPI6 OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

than 1500 volts is not recommended.

ELECTROSTATIC DEFLECTION

The 3KP16 is the same as the 3KP1 except for the following items:

#### General:

Phosphor (For Curves, Fluorescence—	Se	e	fr	on	t	o f	t	hí	S	Se	сt	io	n)				. f	<sup>9</sup> 16	
Visible radiation.																٧	io	et	
Invisible radiatio	n.		٠									Νe	eai	 Jì.	tr	av	io	let	

Persistence of visible radiation . . . . . Very Short Persistence of invisible radiation . . . . Very Short In general, operation of the 3KP16 at an ultor voltage less

11-58



ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

STOIL

The 3KP11 is the same as the 3KP1 except that it has a phosphor of the short-persistence, blue-fluorescence type designated P11. The blue radiation of the P11 screen is highly actinic and has sufficiently short persistence to permit use of the 3KP11 in all moving-film photographic applications without blurring except in those where film moves at a high speed. The 3KP11 is also quite satisfactory for visual observation of phenomena because its phosphor has unusually high brightness for a blue screen.

In general, operation of the 3KP11 at an anode-No.2 voltage less than 1500 volts is not recommended.

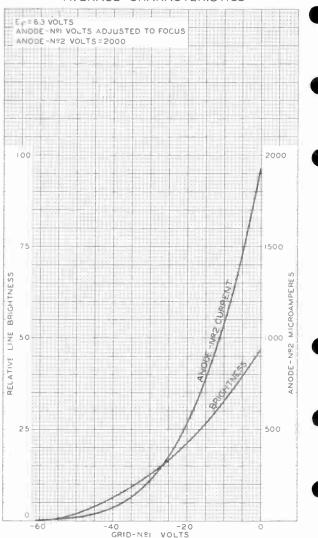
THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC and the PERSISTENCE CHARACTERISTIC of the P11 Phosphor are shown at the front of this Section

The curve showing MAXIMUM ANODE-No.2 CURRENT REQUIREMENTS FROM FOWER SUPPLY for Type 3KP1 also applies to the 3KP11





#### AVERAGE CHARACTERISTICS





SARDI

#### OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

,	DATA
	General:
	Heater, for Unipotential Cathode:  Voltage 6.3 ac or dc volts  Current 0.6 amp  Direct Interelectrode Capacitances (Approx.):  Cathode to All Other Electrodes 2.2
	Grid No.1 to All Other Flectrodes 10.3
,	Fluorescence
	Överall Length       8" ± 1/4"         Greatest Diameter of Bulb       3" ± 1/16"         Minimum Useful Screen Diameter       2-3/4"         Mounting Position       Any
	Base
)	Pin 5 - Deflecting Electrode DJ4 Pin 6 - No Pin 9 - Anode No. 2, Grid No. 2 Pin 10 - No Connection Pin 11 - Cathode
	Connection Pin 12 - Heater $DJ_1$ and $DJ_2$ are nearer the screen $DJ_3$ and $DJ_{11}$ are nearer the base
)	With DU <sub>1</sub> positive with respect to DU <sub>2</sub> , the spot is deflected toward pin 4. With DU <sub>3</sub> positive with respect to DU <sub>4</sub> , the spot is deflected toward pin 1.  The plane through the tube axis and pin 4 may vary from
	the trace produced by DJ <sub>1</sub> and DJ <sub>2</sub> by an angular tolerance (measured about the tube axis) of 10°.  Maximum Ratings, Design-Center Values:
	ANODE-No.2 VOLTAGE# 2500 max. volts
,	<ul> <li>Anode No.2 and grid No.2 which are connected together within tube, are referred to herein as anode No.2.</li> </ul>

The product of anode-No.2 voltage and average anode-No.2 current should be limited to 6 watts.

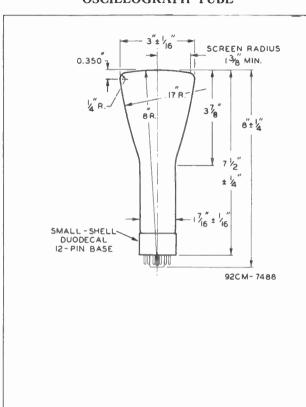




ANODE-No.1 VOLTAGE			100	0 max.	volts
GRID-No.1 VOLTAGE:					
Negative bias value.					volts
Positive bias value.					volts
Positive peak value.				2 max.	volts
PEAK VOLTAGE BETWEEN AF					
ANY DEFLEC			50	0 max.	volts
PEAK HEATER-CATHODE VOI					
Heater negative with					volts
Heater positive with	respe	ect to catl	hode. 12	5 max.	volts
Equipment Design Range:	s:				
For any anode-#0.2 voltage		between			
_	~		ided nininum"		
Anode-No.1 Voltage		20% to 35%	of Eb <sub>2</sub>		volts
Max. Grid-No.1 Voltage					
for Visual Cutoff		6.3% of	Eb <sub>2</sub>		volts
Anode-No.1 Cur. for any					
Operating_Condition.		-15 to	+10	microam	peres
Deflection Factors:					
$\mathbb{D}_1$ & $\mathbb{D}_2$		115 to	145 v dc/	in./kv o	I LD2
N3 & N4		110 to	140 v dc/	in./kv o	T LD2
Examples of Use of Des	ign Ra	inges:			
For anode-No. 2 voltage	of	1000	2000		volts
Anode-No.1 Voltage		200-350	400-700		volts
Max. Grid-No.1 Voltage					
for Visual Cutoff		-63	-126		volts
Deflection Factors:		-/			i
$D_1 & D_2 \dots$		115-145	230-290		
DJ3 & DJ4		110-140	220-280	volts d	c/in.
Maximum Circuit Values					,
Grid-No.1-Circuit Resi			1.5	max. me	gohms
Resistance in Any Defl	ecting	3-			
Electrode	Circu	ıit"	5.0	max. me	gohms
* Dell'Illiana and definition	doces	see with do	reassing and	a a=No 2 vol	tage.
Brilliance and definition Recommended minimum for a value as low as 500 vol	the 3M	ase with det P1 in genera	al service is	1000 volt	s but
a value as low as 500 vol	ts may	be used und	der condition	s of low-v	eloc-
ity deflection and low a  It is recommended that t	amoren t	~iight leve	15.		
It is recommended that t approximately equal.	ne der	recting-elec	C C TO US C T T CUT	f 16212fgD	





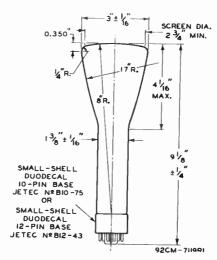




ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

UPP.



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN  $2^{\rm O}$  IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

SEPT. 1, 1955





# SABILA

#### OSCILLOGRAPH TUBE

ELECTROSTATIC FORUM

ELECTROSTATIC DEFLECTION

,	CECO OSTATIC TO CO
	DATA
	General:
	Heater, for Unipotential Cathode:
	Voltage 6.3 ar or dc volts
	Current 0.6 ± 10% amp
)	Direct Interelectrode Capacitances (Approx.):
	Grid No. 1 to all after destrodes 8 part Deflecting electrode DJ to
	deflecting electrode DJ,
	Deflecting electrode DJ3 to
	deflecting electrode Du., 2 $\mu\mu f$
	D1 to all other electrode 11 μμf
	Due to all other electrods 8 $\mu\mu$ f
	DJ3 to all other electrodes 7 μμf DJ4 to all other electrode 8 μμf
	W4 to all other electrode 8   μμf  Faceplate Flat Clear Glass
	Phosphor (For Curves, see front of thi Section) Pl
	Fluorescerce
	Phosphorescence
	Pers' stence
	Focusing Method
	Overall Length
	Greatest Dismeter of Bulb 3" ± 1/16"
	Minimum Breful Screen Diameter
	Mounting Polition
	Weight (Arrrown)
	Bulb
	or Smile hell [ .o.denal 12-Pin ( IFTEC No. B12-43)
	Baling Designation for POT'ON VIEW
i	Fin 1 - Heatur Fir 8 Ultor
	Fig Grig No. 1 (Grid No. 2.
	Pir 3 - Cathod- Grid No.4.
	Pin 4 - Unit Ac. 3 Collector)  Pin 4 - Unit Ac. 3 Pin 9 - Deflecting
i	
	Do in use DJ2
	Pir 6 - Deflecting (3) Pin 10 - Deflecting
	Electrode 2 1 Electrone
	D'1
	Pin 7 - Deflecting Fin 11*- Internal Connection-
	Electrode Conjection— Dua Do Not Use
	En 12 - Heater
П	1 1 1

 $DJ_1$  and  $DJ_2$  are nearer the screen  $DJ_3$  and  $DJ_4$  are nearer the base

A Pins 5 and II are omitted from the 10-pin base.





With DJ<sub>1</sub> positive with respect to DJ<sub>2</sub>, the spot is deflected toward pin 4. Ath Dug positive with respect to Dug, the spot is deflected toward pin 1.

The plane through the tube axis and pin 1 may vary from the trace produced by DJ3 and DJ4 by 100 (measured about the tube

The angle between DJ: - DJ, trace and DJ3 - DJ4 trac- is  $90^{\circ}$ ± 30.

ĺ	Maximum Ratings,	Desig	n - (	e n	te	r	Va	lu	e s	:			
	ULTORO VOLTAGE .											2500	max.
	ULTOR INPUT (AVE	RAGE).										6	max.

GRID-No.3 VOLTAGE. . . . . .

Negative bias value. . . . . 200 max. volts Positive peak value. . . . . 2 max.

PEAK VOLTAGE BETWEEN JUTOR AND

ANY DEFLECTING ELECTRODE . . . . . . PEAK HEATER-CATHODE VOLTAGE: 125 max.

Hester negative with respect to dithose.

Heater positive with respect to cathode.

#### Equipment Design Ranges:

For any ultor voltage ( $E_{C_A}$ ) between 500° and 2500 volts Grid-No.3 Voltage

for Focus. . . . . . . 16.5% to >1% of E Maximum Grid-No.1

Voltage for Visual Extinction of Ur-

deflected Focused Spot . . . . . . . . . . . . . Grid-No.3 Current for -6.75% of Ec.

Any Operating Con-

dition . . . . . . датр

Deflection Factor:

73 to 93 v dc/in./kv of Ec4 52 to 70 v dc/in./kv of Ec4 DJ1 & DJ2. . . . . . . DJ3 & DJ4. . . . . . .

Spot Position. . . .

watts

1000 max.

The "ultor" in a cathode-ray tube is the electrode to which is applied the highest do voltage for accelerating the ele trons in the beam prior to its deflection, in the 3Ppl-a, the ultor function is performed by grid No.4. Since prid No.4. grid No.2, and collector are connected together within the 3Ppl-A, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

Brilliance and definition decrease with decreasing ultor voltage. A value as low as 500 volts is recommended only for low-velocity deflection and low amountaint levels.

<sup>##</sup> The center of the undeflected focused spot will fall within a circle having 7.5-mm radius concentric with the center of the tube face.



#### 3RPI-A

# SPOLY

#### OSCILLOGRAPH TURE

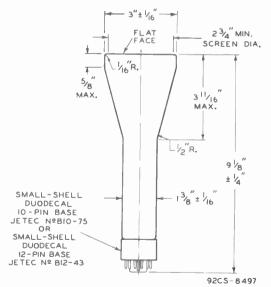
	Examples of Use of Desi	gn Ranges:		
	For ultor voltages of	1000	2000	volts
	Grid-No.3 Voltage for Focus	165 to 210	220 +0 620	volts
	Maximum Grid-No.1	103 (3 )10	330 10 620	VOILS
)	Voltage for Visual Extinction of Un-			
	deflected Focused			
	Spot	-67.5	-135	volts
	DJ & DJ2	73 to 99		volts dc/in.
	DJ3 & DJ4	52 to 70	104 to 140	volts dc/in.

#### Maximum Circuit Values:

Grid-No.1-Circuit Fesistance . megohms Resistance in Any Deflecting-

Electrode Circuit . . . . 5 max. megohms

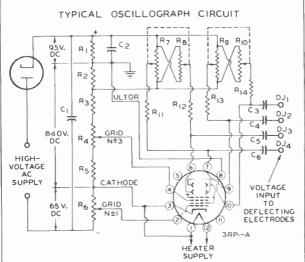
" It is recommended that the deflection—electrode circuit resistances be approximately equal.



CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 20 IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM 3RP1.A



#### OSCILLOGRAPH TUBE



92CS-6777RI

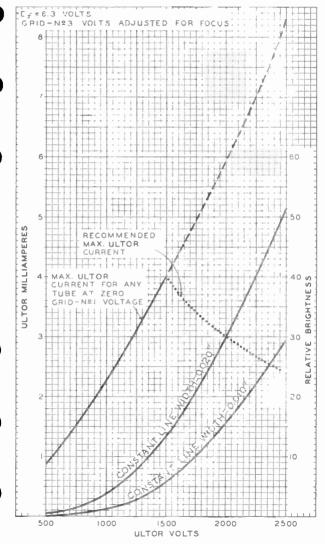
C1: 0.2 µf C2: 1.0 µf C3 C4 C5 C6: 0.05-µf Blocking Capacitors\* R1 R2: 2.5 Megohms, 0.5 watt R3: 2.5 Megohms, 1 watt R4: 1.0-Megohm Potentiometer R5: 0.5 Megohm, 0.5 Watt R6: 0.35 Megohm, 0.5 Watt R7 R8: Dual 5-Megohm Potentiometer R9 R10: Dual 5-Megohm Potentiometer R11 R12 R13 R1u: 2 Megohms, 0.5 watt

When cathode is grounded, capacitors should have high voltage rating; when ultor is grounded, they may have low voltage rating. For do amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that ultor be returned to a point in the amplifier system which will give the lowes; possible potential difference between ultor and the deflecting electrodes.

Devices and arrangements shown or described herein may use patents of RCA or others. Information contain, herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent right.

## RCA 3RPI-A CHARACTERISTICS





MAR. 24, 1955

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7143RI





#### AVERAGE CHARACTERISTICS

GF	TOP	3 VO R VC	DLT	S=10 OLTS	00 AD	JUS	TED	FOF	R FO	CUS		_			
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							=								-
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#### **OSCILLOGRAPH TUBE**

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

i	The $gRP4$ is the same as the $gRP1$ except for the fullowing items:
	General:
	Phosphor (for curves, see front of this Section) P4—Sulfide Type Fluorescence
	In general, operation of the 3RP4 at an ultor volt- age less than 1500 volts is not rocommended.





#### 3WPI OSCILLOGRAPH TUBE

SHO,

ELECTROSTATIC FOCUS

FLEGTROSTATIC DEFLECTION

ELECTROSTATIC FOLUS		F1F41	KU5 I A	IIC D	EFLEC	TON	_
	DAT	ΓΑ					
General:							
Heater, for Unipotential	Cathode	٥.					
Voltage					ac or	do vo	ol t
Current	. 0.	6 ± 10	%				am.
Direct Interelectrode Ca	pacitano	ces:					
- Grid Na.1 to all other							141
Cathode to all other e		es		3 t	0 5.7		141
Doffectina electrode D							
deflecting electrode				1.7	to 3.	3	μμ
Deflecting electrode D							
deflectina electrode	DJ4 .			_ 1	to 2	_	μ
DJ; to all other elect	roges.			0.0	to 10.	. D	μ,
DJ <sub>2</sub> to all other elect	rodes.			2.5	to 10.	. 5	μ
DJ <sub>3</sub> to all other elect DJ <sub>4</sub> to all other elect	rodes.			2.5	to 6.	Ω Ω	14
Faceplate, Flat	rodes.			7.0	(14	o ear G	lag
Phosphor (For Curves, se	e front	of th	is Sec	tion	)	u	
Fluorescence							
Phosphorescence							
Persistence						<ul> <li>Ne</li> </ul>	di
Focusina Method					.Eleci	trost	at
Deflection Method					.Elect	trost	at
Deflecting-electrode							
arrangement			. See	Dimen	siona	l Out	11:
Overall Length					11-1/	Z" ±	17
Greatest Diameter of Bul Minimum Useful Screen Di	D				• • >	1 1	37 71
Minimum Useful Scan (Len	വസഭ (ലേ) പെട്ക്ക് ഡ	l + la					٠, ر
respect to tube face):		1 111					
By deflecting electron	les Dli	& Dla				. 2-	1/
By deflecting electron	les DJ3	& DJA				. 2-	1/
Weight (Approx.)							1
Mountina Position							
Bulb							
Base Small—She							
or Small-Sh							
Basing Designation for	, ROLLOW	VIEW					Τ
Pin 1 - Heater			Pin	8 -	Ulto		_
Pin 2 - Grid No.1					(Grie	d No. d No.	
Pin 3 - Cathode Pin 4 - Grid No.3	٦	KO				lecto	
Pin 6 - Deflecting	V 3	7 X 0	) Pin	Q _	Defl		
Electrode	<u> </u>			<i>j</i> –	Ele		
DJ	3\x=	F /0	)		DJa		
Pin 7 - Deflecting	(2)	$\searrow$	Pin	10 -	Defi	ectir	na
Electrode	( )	(12)				ctrod	
$\mathbb{N}_2$					DJ <sub>3</sub>		
_			Pin	12 -	Heat	er	





#### OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center	Values:		
ULTOR VOLTAGE ULTOR INPUT (AVERAGE) GRID-No.3 VOLTAGE		2500 max. 6 max. 1000 max.	watts
GRID-No.1 VOLTAGE: Negative bias value Positive bias value		200 max. 0 max.	volts
Positive peak value PEAK VOLTAGE BETWEEN ULTOR AND DEFLECTING ELECTRODE	ANY	0 max. 500 max.	
PEAK HEATER—CATHODE VOLTAGE: Heater negative with respect Heater positive with respect			
Equipment Design Ranges:			
For any ultor voltage (E minimum* and			
Grid-No.3 Voltage for Focus 16.5% to Grid-No.1 Voltage for Visual Ex- tinction of Unde-	31% of E <sub>C4</sub>		volts
flected Focused Spot3% to Srid-No.3 Current for Any Operat-	-5% of E <sub>c4</sub>		volts
ino Condition —15 Deflection Factors:	to +10		$\mu a$
DJ <sub>3</sub> & DJ <sub>4</sub> 28.5	to 50.5 to 35	v dc/in./kv v dc/in./kv	of Ec <sub>4</sub> of E <sub>c4</sub>
Examples of Use of Design Range	s:		
For ultor voltage of 1000	1500	2000	volts
Grid-No.3 Volt- age for Focus. 165 to 310 Grid-No.1 - Voltage for	247 to 465	330 to 620	volts
Visual Ex- tinction of Unieflected Focused Shot3c to -50 Deflection Fiscors:	-45 to -75	-60 to -100	volts

\*\*: See nekt page.

4-57

TENTATIVE DATA 1

Brilliance and definition decrease with decressing ultor voltage. Recommended minimum for the 3xPl in general service is 1000 volts but a value as low as 500 volts may be used under conditions of low-velocity deflection and low ambient—light levels.





## OSCILLOGRAPH TUBE

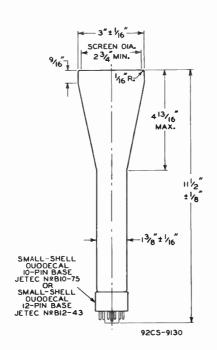
Maximum Circuit Values:

Resistance in Any Deflecting— Electrode Circuit	Cincia Contact	
SPECIAL PERFORMANCE DATA  For ultor voltage of 1500 volts  Line Width*		.ms
For ultor voltage of 1500 volts  Line Width*	e Circuit 5 max. megoh	ms
Line Width*	SPECIAL PERFORMANCE DATA	
Peak Grid-No.1 Drive from Spot Cutoff	For ultor voltage of 1500 volts	
Cutoff		ch
*** with grid-No.1 voltage adjusted to give a spot that is just visit and the tube shielded from all extraneous fields, the center of undeflected focused spot will fall within a circle of 3/16-inch rac concentric with the center of the tube face.  It is recommended that the deflecting-electrode-circuit resistances approximately equal.  Under the following conditions: heater voltage of 6.3 volts, brightr of 7 foot-lamberts measured on a 2" x 2", 49-line raster with his frequency scanning applied to deflecting electrodes DJ, and DJ2. line-width measurement, the high-frequency scanning is adjusted give a raster width of 6.9 cm with the grid-No.3 voltage adjusted give sharpest focus at center of tube face. Raster height is ciracted until the individual scanning lines are just barely dist guishable. Line width is expressed as the quotient of the contrac raster height measured at the center line of the tube face divided voltage adjusted for focus, and grid-No.1 voltage adjusted to give mean dimensions of 1.875 in 1DJ2 direction and 1.688 in 3DJ4 direction, all points on the raster will within the area between the two rectangles also centered with rest to the tube face; the one, 1,920 in 1DJ2 direction and 1.646 in 3 direction; the other, 1.830 in 1DJ2 direction and 1.646 in 3 direction.		t s
and the tube shielded from all extraneous fields, the center of undeflected focused spot will fall within acticle of 3/16-inch rac concentric with the center of the tube face.  It is recommended that the deflecting-electrode-circuit resistance: approximately equal.  Under the following conditions: heater voltage of 6.3 volts, bright of 7 foot-lamberts measured on a 2" x 2", 49-line raster with his frequency scanning applied to deflecting electrodes DJ3 and DJ2 line-width acquirement, here ight from the following the state of the following size sharpest focus at center of tube face. Raster height is contracted until the individual scanning lines are just barely distinguishable. Line width is expressed as the quotient of the contract raster height measured at the center line of the tube face divided with rumber of scanning lines (us).  Under the following conditions: heater voltage of 6.3 volts, grid-1 voltage adjusted for focus, and grid-No.1 voltage adjusted to give mean dimensions of 1.875 in 10.2 direction and 1.686 in 30.3 direction, all points on the raster will within the area between the two rectangles also centered with rest to the tube face; the one, 1,920 in 10.2 direction and 1.686 in 3 direction, the other, 1.830 in 10.12 direction and 1.646 in 3 direction, the other, 1.830 in 10.12 direction and 1.646 in 3 direction.		
approximately equal.  Under the following conditions: heater voltage of 6.3 volts, bright of 7 foot-lamberts measured on a 2" x ?" u9-line raster with his frequency scanning applied to deflecting electrodes DJJ and DJZ. If new width measurement, the high-frequency scanning is adjusted give a raster width of 6.9 cm with the grid-No.3 voltage adjusted give sharpest focus at center of tube face. Raster height is ciracted until the individual scanning lines are just barely dist quishable. Line width is expressed as the quotient of the contrac raster height measured at the center line of the tube face divided the number of scanning lines (u9).  Under the following conditions: heater voltage of 6.3 volts, grid-voltage adjusted for focus, and grid-No.1 voltage adjusted to give mean dimensions of 1.875 in 1DJZ direction and 1.688 in 3DJU direction, all points on the raster will within the area between the two rectangles also centered with rest to the fube face; the one, 1,920 in 1DJZ direction and 1.646 in 3 direction, the other, 1.830 in 1DJZ direction and 1.646 in 3 direction.	ube shielded from all extraneous fields, the center of t ed focused spot will fall within a circle of 3/16-inch radi	he
under the following conditions: heater voltage of 6.3 volts, bright of 7 foot-lamberts measured on a 2" x 2", 49-line raster with his frequency scanning applied to deflecting electrodes Dij and Diz. If ne-width sedsurement, the high-frequency scanning is adjusted give a raster width of 6.9 cm with the grid-No.3 voltage adjusted give snarpest focus at center of tube face. Raster height is c tracted until the Individual scanning lines are just barely dist guishable. Line width is expressed as the quotient of the contract raster height measured at the center line of the tube face divided. Under the following conditions: heater voltage of 6.3 volts, grid-voltage adjusted for focus, and grid-No.1 voltage adjusted to give mean dimensions of 1.875° in 1DJ2 direction and 1.688° in 3DJ4 direction, all points on the raster will within the area between the two rectangles also centered with rest to the tube face; the one, 1,920° in 1DJ2 direction and 1.686° in 3 direction; the other, 1.830° in 1DJ2 direction and 1.646° in 3 direction.		be
Under the following conditions: heater voltage of 6.3 volts, grid-toltage adjusted for focus, and grid-Ho.1 voltage adjusted to gvisible raster. With 49-line raster centered with respect to the face and size adjusted to give mean dimensions of 1.875° in 1012 dirtion and 1.688° in 3014 direction, all points on the raster will within the area between the two rectangles also centered with rest to the tube face; the one, 1,920° in 1012 direction by 1.730° in 3 direction; the other, 1.830° in 1012 direction and 1.646° in 3 direction.	following conditions: heater voltage of 6.3 volts, brightne.—lamberts measured on a 2" x 2", 49-line raster with hig scanning applied to deflecting electrodes DJJ and DJ2. F. & measurement, the high-frequency scanning is adjusted ister width of 6.9 cm with the grid-No.3 voltage adjusted opest focus at center of tube face. Raster height is control to the individual scanning lines are just barely distiplications of the contract inght measured at the center line of the tube face divided	h- oroto n- ed
The deflection factor for either DJ1 and DJ2 electrodes or DJ3	following conditions: heater voltage of 6.3 volts, grid—No djusted for focus, and grid—No.1 voltage adjusted to gi aster. With 49—line raster centered with respect to the tu- ize adjusted to give mean dimensions of 1.875 in 10J2 dire 1.688 in 30J4 direction, all points on the raster will 1 e area between the two rectangles also centered with respe be face; the one, 1.920 in 10J2 direction by 1.730 in 30 n; the other, 1.830 in 10J2 direction and 1.646 in 30	ce
$DJ_{ij}$ electroides for a deflection of less than 75 per cent of the rest tive useful scan will not differ from the deflection factor for corresponding deflecting electrodes at 25 per cent of the useful s by more than 2 per cent.		nd c= he an

34P1



#### OSCILLOGRAPH TUBE



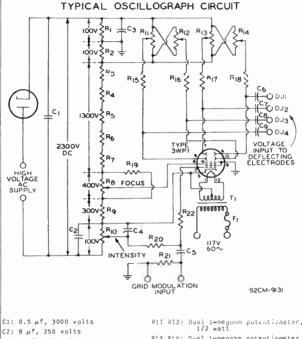
THE PLANE THROUGH THE TUBE AXIS AND PIN 3 MAY VARY FROM THE TRACE PRODUCED BY DJ, AND DJ, BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm$  10°. ANGLE BETWEEN DJ, - DJ, TRACE AND DJ, - DJ, TRACE IS 90°  $\pm$  1°.

DJ<sub>1</sub> AND DJ<sub>2</sub> ARE NEARER THE SCREEN: DJ<sub>3</sub> AND DJ<sub>4</sub> ARE NEARER THE BASE. WITH DJ<sub>1</sub> POSITIVE WITH RESPECT TO DJ<sub>2</sub>, THE SPOT WILL BE DEFLECTED TOWARD PIN 3: LIKEWISE, WITH DJ<sub>3</sub> POSITIVE WITH RESPECT TO DJ<sub>4</sub>, THE SPOT WILL BE DEFLECTED TOWARD PIN 12.



# SHO,

#### OSCILLOGRAPH TUBE



- C3: 1 uf. 200 volts
- C4: 1 µf, 200 volts
- C5: 0.05 uf, 3000 volts
- C6 C7 C8 C9: 0.05 uf, 600 volts
- R1 R2: 510000 ohms, 1/2 watt
- R3 R4 R5 R6: 270000 ohms, 1/2 watt
- R7: 220000 ohms, 1/2 watt
- R8: 500000-ohm potentiometer,
- 1/2 watt
- R9: 300000 ohms, 1/2 watt

- 1/2 watt
- R10: 100000-ohm potentiometer,

- R13 R14: Dual 1-megohm potentiometer,
- R15 R16 R17 R18: 1.5 megohms, 1/2
- R19: 2 megohms, 1 watt
- R20: 510000 ohms, 1/2 watt
- R21: 5 megohms, 1/2 watt
- R22: 5100 ohms, 1/2 watt
- T1: Transformer, with 6.3-volt/1-ampere secondary, insulated for at least 3000 volts, such as Thordarson T26F65.
- F1: 1-ampere fuse

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.



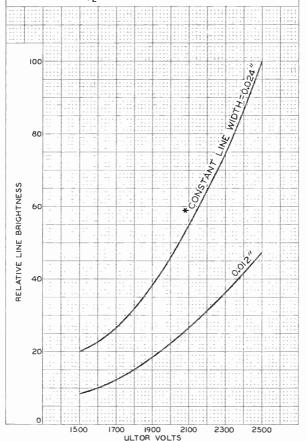
#### AVERAGE CHARACTERISTICS

 $E_f = 6.3 \text{ VOLTS}$ 

GRID-Nº3 VOLTS ADJUSTED FOR FOCUS.

GRID-NºI VOLTS ADJUSTED TO GIVE ULTOR-CURRENT VALUE REQUIRED TO MAINTAIN CONSTANT LINE WIDTH AT DIFFERENT ULTOR VOLTAGES, FOR A GIVEN ULTOR VOLTAGE, LINE WIDTH AND RELATIVE LINE BRIGHTNESS INCREASE WITH INCREASE IN ULTOR CURRENT.

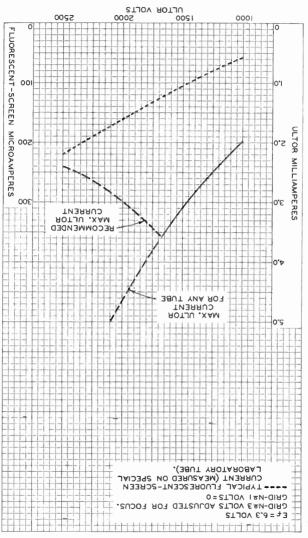
\* LINE WIDTH MEASURED BETWEEN POINTS WHERE BRIGHTNESS WAS APPROX. 1/2 THAT AT CENTER OF LINE.







#### CHARACTERISTICS



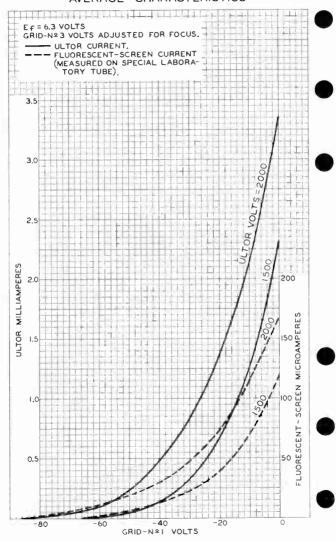
92CM-9158

BYDIO COSSOSYLION OF AMERICA, HARRISON, NEW JERSEY

3401



#### AVERAGE CHARACTERISTICS



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON NEW JERSEY

92CM-9159



### OSCILLOGRAPH TUBE

SHOW

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 3WP2 is the same as the 3WP1 except for the following litems:

#### General:

Line width and drive values for the 3WP2 are the same as those shown for type 3WP1 under the heading SPECIAL PERFORMANCE DATA and are based upon operation at brightness values calculated from 3WP1 performance.

#### 3WPII OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

The 3WP11 is the same as the 3WP1 except for the following items:

#### General:

Line width and drive values for the 3WP11 are the same as those shown for type 3WP1 under the heading SPECIAL PERFORMANCE DATA and are based upon operation at brightness values calculated from 3WP1 performance.





**OSCILLOGRAPH TUBE** 

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

Pin 14 - Heater Cap - Post-Ultor

> (Grid No.5, Collector)

SABA

 $DJ_1$  and  $DJ_2$  are nearer the screen  $DJ_2$  and  $DJ_A$  are nearer the base

Electrode DJ3

Pin 8 - Deflecting Electrode DJA

With DJ<sub>1</sub> positive with respect to DJ<sub>2</sub>, the spot is deflected toward pin 5. With DJ<sub>3</sub> positive with respect to DJ<sub>4</sub>, the spot is deflected toward pin 2. The plane through the tube axis and each of the following items may vary from the trace produced by DJ<sub>1</sub> and DJ<sub>2</sub> by

JUNE 1, 1953 TIME DEPARTMENT TENTATIVE DATA 1





## 5ABPI OSCILLOGRAPH TUBE

the following angular t axis): Pin 5, 10°; side pin 5), 10°. Angle bet trace is 90° ± 1.5°.	terminal	(on same	side of tu	ube as
Maximum Ratings, Design-C	anter Val	405.		
POST-ULTOR® VOLTAGE			6000 max 2600 max	
GRID-No.3 VOLTAGE GRID-No.1 VOLTAGE:	· · · ·		2.3:1 max 1000 max	. volts
Negative bias value Positive bias value Positive peak value PEAK VOLTAGE BETWEEN ULTO			200 max 0 max 2 max	. volts
ANY DEFLECTING E PEAK HEATER-CATHODE VOLTA Heater negative with re	LECTRODE GE:		500 max 125 max	1
Heater positive with re Equipment Design Ranges:			125 max	
for any post-ultor voltage and any ultor voltage (	$(E_{C_3})$ between	etween 200 een 1500*	o and 600 and 2600	volts
Grid-No.3 Voltage for Foo Grid-No.1 Voltage for Vis Extinction of Undeflect	cus 20 sual ced	% to 34.5%	of E <sub>C4</sub> · ·	. volts
Focused Spot	/			· γolts
When	Ec5 = 2 x	Ec.		
DJ <sub>1</sub> & DJ <sub>2</sub>	2	6.5 to 36 18 to 24	v dc/in./ v dc/in./	
DJ1 & DJ2		1.5 to 29 3.5 to 19.5 ##	v dc/in./ v dc/in./	kvof E <sub>C4</sub> kvof E <sub>C4</sub>
Examples of Use of Design	Ranges:			
For post-ultor voltage of 20 and ultor	00	3000	4000	volts
	00	1500	2000	volts
	690 300 5 –87 –39	) to 515 4 ) to -65 -	00 to 690 52 to –87	volts volts
●,♠,O,*,**,##,□: See next pa	ige.			

JUNE 1, 1953

TENTATIVE DATA 1

# SABDI

#### OSCILLOGRAPH TUBE

lDefle⊊t	ion	Factors:#

DJ1 & DJ2	43 to 58	40 to 54	53 to 72	v dc/in	
DJ3 & DJA	29 to 39	27 to 36	36 to 48	v dc/in	.

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms
Resistance in Any Deflecting-

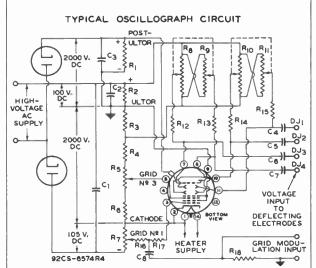
Electrode Circuit . . . 5.0 max. megohms

- The "post-ultor" in a cathode-ray tube is the electrode to which is applied a dc voltage higher than the ultor voltage for accelerating the electrons in the beam after its deflection. In the 5AB-types, the post-deflection acceleration function and the collector function are both performed by grid No.5 which is conveniently referred to as "postultor".
- The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 548-types, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 548-types, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.
- O At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.
- It is recommended that the post-ultor voltage be not less than 3000 volts for high-speed scanning.
- \*\* Recommended minimum value of ultor voltage.
- # The deflecting electrodes D<sub>J3</sub> and D<sub>J4</sub> are designed to have extra-high deflection sensitivity and consequently produce less than full-screen deflection. With post-deflection acceleration, the length of deflection may be limited to a inches; without post-deflection acceleration, deflection to full screen diameter will ordinarily be obtained. These electrodes are, therefore, more suitable for the signal voltage than for the time-base voltage.
- ## with heater voltage of 6.3 volts, post-ultor voltage of 4000 volts, ultor voltage of 2000 volts, grid-No.3 voltage adjusted to give focus, grid-No.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through a 1-megoha resistor to ultor, and tube shielded from all extraneous fields, the center of the undeflected, focused spot will fall within a circle having a 12.5-mm radius concentric with the center of the tube face.
- For visual cutoff of undeflected focused spot.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

# SABPI



#### OSCILLOGRAPH TUBE



C1: 0.1 µf, 2500 Volts C2: 1.0 µf, 200 Volts C3: 0.1 µf, 2500 Volts C4 C5 C6 C7: 0.05-µf, Blocking Capacitor Capacitors CB: 0.0001 µf, 2500 Volts R1: 50 Wegohms (Five 10-W ohm, 1-Watt Resistors 10-Megin Series)

0.5 Watt

R2 R3: 2 Megohms, 0.5 Wa R4: 5.5 Megohms, 2 Watts

R5: 2-Megohm Potentiometer R6: 1.5 Megohms, 0.5 Watt R7: 0.5-Megohm Potentiometer R8 R9: 5-Megonm Potentiometer RIO RII: Dual 5-Megohm Potentiometer RIO RII: Dual 5-Megohm Potentiometer RI2 RI3 RI4 RI5: 2 Megohms, 0.5 Watt RI6: 0.5 Megohm, 0.5 Watt RI7: Not less than 2000 ohms per volt of positive signal

R18: 5 Megohms, 0.5 Watt

when cathode is grounded, capacitors should have high voltage rating (2500 volts); when ultor is grounded, they may have low voltage rating (200 volts). For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that ultor be returned to a point in the amplifier system which will give the lowest possible potential difference between ultor and the deflecting electrodes. deflecting electrodes.

> Devices and arrangements shown or described herein may use patents of RCA or thers, information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

JUNE 1, 1953

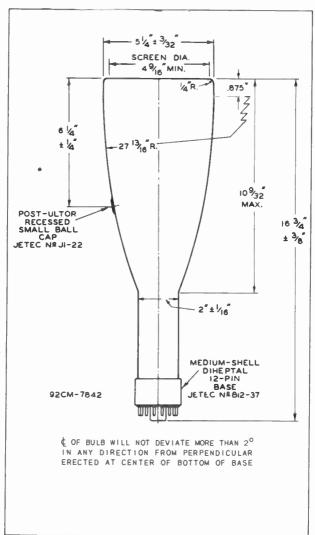
TUBE DEPARTMENT

CE-6574R4



# SABDI

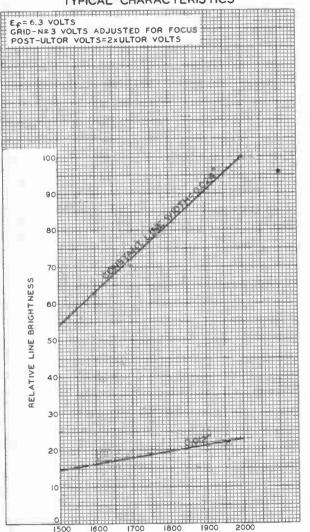
#### **OSCILLOGRAPH TUBE**







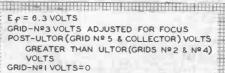
#### TYPICAL CHARACTERISTICS



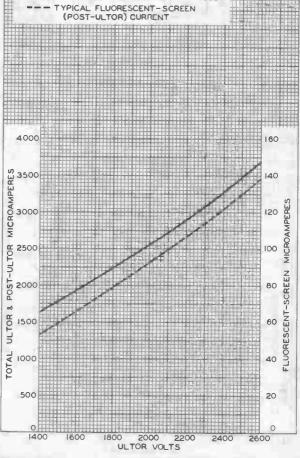




#### CHARACTERISTICS



--- MAX. TOTAL CURRENT FOR ANY TUBE

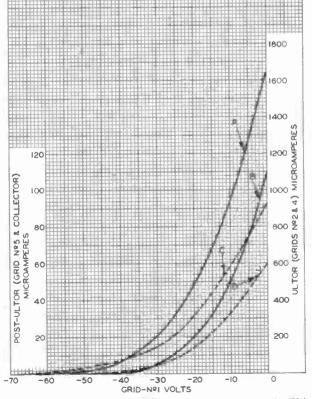




#### AVERAGE CHARACTERISTICS

E<sub>f</sub> = 6.3 VOLTS
GRID-Nº3 VOLTS ADJUSTED FOR FOCUS

++++++	<del>                                      </del>	1111111111	
CURVE	ELECTRODE CURRENT	ULTOR VOLTS	POST-ULTOR VOLTS
Α	ULTOR	2000	4000
В	ULTOR	1500	3000
С	POST-ULTOR	2000	4000
D	POST-ULTOR	1500	3000



FEB.4,1953



# 5ABP4 OSCILLOGRAPH TUBE



POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The  $5ABP_4$  is the same as the  $5ABP_1$  except for the following items:

#### General:

#### THE PERSISTENCE CHARACTERISTICS

of the P4-sulfide phosphor are the same as those shown for the P11 phosphor at the front of this Section

#### 5ABP7 OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR
FLECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

#### 5ABPII OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 5ABP11 is the same as the 5ABP1 except for the following items:

#### General:

Phosphor (For Cu <b>r</b> v									
Fluorescence									.Blue
Phosphorescence				 					.Blue
Persistence .							٠	•	Short





## 5ADPI OSCILLOGRAPH TUBE



POST-DEFLECTION ACCELERATOR
ELECTROSTATIC FOCUS ELECTRUSTATIC DEFLECTION

	RECTROSTATIC FOCOS ELECTROSTATIC DEFELCTION
_	DATA
	General:
	Heater, for Unipotential Cathode:
	Voltage 6.3 ac or dc volts
•	Current 0.6 ± 10% amp
,	Nirent Interelectrode Capacitances:
_	Grid No.1 to all other electrodes 4.2 to 7.9 μμί
	Cathodo to all other electrodes 3.1 to 5.8 $\mu\mu$ f
	Deflecting electrode D <sub>1</sub> to
	deflecting electrode D <sub>2</sub> 1.7 to 3.1 μμf
_	deflecting electrode $M_4 \dots 0.7$ to 1.3 $\mu\mu$ f
	$D_1$ to all other electrodes 4.4 to 9.2 $\mu\mu$ f
	Die to all other electrodes 4.4 to 9.2 unf
	$D_3^2$ to all other electrodes 2.8 to 5.3 $\mu\mu$ f
	$\mathbb{D}_3$ to all other electrodes 2.8 to 5.3 $\mu\mu$ f $\mathbb{D}_4$ to all other electrodes
	Faceplate, Flat
	Phosphor (For Curves, see front of this Section) Pl
	Fluorescence
	Persistence Medium
	Focusing Method
	Deflection Method
	Deflecting-electrode
	arrangement See Dimensional Outline
	Overall Length
	Greatest Diameter of Bulb 5-1/4" ± 3/32" Minimum Useful Screen Diameter
	Weight (Approx.)
	Mounting Position
_	Mounting Position
	Bulb
	Base Medium-Shell Diheptal 12-Pin (JETEC No.B12-37)
	Basing Designation for BOTTOM VIEW
	Pin 1 - Heater Pin 9 - Ultor
	Pin 2 - Cathode (Grid No.2, Pin 3 - Grid No.1) Grid No.4)
	Pin 4 - No Connec- Pin 10 - Deflecting
	tion-Do (7)(a) Electrode
	Not Use DJ2
	Pin 5 - Grid No.3 Pin 11 - Deflecting
	Pin 7 - Deflecting (C) Electrode
	Electrode DJ
	Pin 8 ~ Deflecting Pin 12 - No Connection
	Pin 8 ~ Deflecting tion Electrode Pin 14 - Heater
	DJ4 Cap - Post-Ultor
	(Grid No.5,
	Collector)





#### OSCILLOGRAPH TUBE

Maximum Ratings, Design	-Cen	ter	Val	ues	::					
POST-ULTOR VOLTAGE			: :		:			max. max.		lts Its
RATIO OF POST-ULTOR VOL ULTOR VOLTAGE GRID-No.3 VOLTAGE							2.3:1	max.	vo	lts
GRID-No.1 VOLTAGE: Negative bias value.							200	max.	VO	lts
Positive bias value			: :	:	:	: :		max.		lts
Positive peak value. PEAK VOLTAGE BETWEEN UL							2	ma×.		lts
DEFLECTING FLECTRODE PEAK HEATER—CATHODE VOL				•	•		500	max.	VO	lts
Heater negative with respect to cathode Heater positive with						. <b>.</b>	180	max.	VO	lts
respect to cathode							180	max.	VO	lts
Equipment Design Ranges	:									
With any post-ultor vo- and any ultor volta	ltage ge (E	(Ec	) be betwe	etus en	en 150	2000	o* and 60 and 2600	oo vol volts	ts	
Grid-No.3 Voltage for Focus Grid-No.1 Voltage	209	% to	34.	5%	of	E <sub>C4</sub>			VO	lts
for Visual Ex- tinction of Unde- flected Focused										
Spot	-2.2	5% t	0 –3	. 75	% (	of E	-c <sub>4</sub>		VO	lts
Condition Deflection Factors:#		-3	.5 t	0 .	10				μ	amp
When $E_{c} = 2 \times E_{c}$ :  D <sub>1</sub> & D <sub>2</sub> D <sub>3</sub> & D <sub>4</sub>			.7 t 0.3				v dc/i v dc/i	n./kv n./kv	of of	E <sub>C</sub> 2
When $E_c = E_c$ : $D_1 & D_2$ : $D_3 & D_4$ .  Spot Position			.5 t 16 t	0 2		5	v dc/i v dc/i	n./kv n./kv	of of	E <sub>C4</sub>
• At or near this rating.	the e	ffec			sis	tano	e of the	e ultor	· Sup	ply

- At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.
- It is recommended that the post-ultor voltage te not lessthan 3000 volts for high-speed scanning.
- \*\* Recommended minimum value of ultor voltage.
- ## with heater voltage of 6.3 volts, post-ultor voltage of mu00 volts,
  ultor voltage of/2000 volts, grid-And, voltage adjusted to give focus,
  grid-And. 1 voltage adjusted to give spot that is just visible, each
  deflecting electrode connected through a 1-megonm resistor to ultor,
  and the tube shielded from all extraneous fields, the center of the
  undeflected, focused spot will fall within a circle naving an 8-mm
  radius concentric with the center of the tube face.

\*: See next page.



# STOR

#### OSCILLOGRAPH TUBE

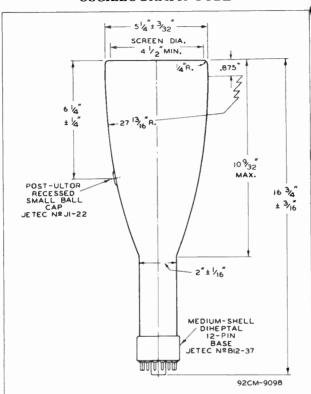
Examples of Use of D	esign Ra	nges:		
with post-ultor voltage of	-	3000	4000	volts
and ultor voltage of	2000	1500	2000	volts
Grid-No.3 Voltage for Focus	00 to 690	300 to 515	400 to 690	volts
Undeflected Focused Spot Deflection Factors:#	45 to +75	-34 to -56	-45 to -75	volts
DJ: & DJ2	43 to 53 32 to 40	40 to 50 30.5 to 37.5	53.4 to 66.6 40.6 to 50	v dc/in. v dc/in.
Maximum Circuit Value	es:			
Grid-No.1-Circuit Re Resistance in Any De			1.5 max.	megohms
Electrode Circuit			5.0 max.	megohms
SP	ECIAL PE	RFORMANCE DA	Τ <b>Δ</b>	
With post-u and ultor v			3000 volts 1500 volts	
Line Width			0.030 max.	inch
Spot Cutof Raster Shape			45 max. §	volts
* The deflecting electro	des in the	SADP1 are des	igned to have	extra-high

- deflection sensitivity and consequently produce less than full-screen deflection, with post-deflection acceleration, the length of deflection in either horizontal or vertical direction may be limited to 4-1/4 inches; without post-deflection acceleration, deflection to full screen diameter will ordinarily be obtained.
- is recommended that the deflecting-electrode-circuit resistances be approximately equal.
- Under the following conditions: heater voltage of 6.3 volts, brightness of 15 foot-lamberts measured on a 2" x 2", 49-line raster with high-frequency scanning applied to deflecting electrodes DJ, and DJ. For line-width measurement, the high-frequency scanning is adjusted to give a raster width of 12 cm with the grid-No.3 voltage adjusted to give sharpest focus at center of tube face. Raster height is contracted until individual scanning lines are just barely distinguishable. Line width is expressed us the quotient of the contracted raster height measured at the center line of the tube face divided by the number of scanning lines (49).
  - under the following conditions: heater voltage of 6.3 volts, grid-No.3 voltage adjusted for focus, and grid-No.1 voltage adjusted to give visible raster, with 49-line raster, the size of which is adjusted so that the widest points on the raster just touch the sides of a square 3.075° on a side, no point on the raster sides will lie within an inscribed square 2.925° on a side having its sides parallel to the sides of the 3.075° square and its center at the center of the 3.075" square.

SADRI



#### OSCILLOGRAPH TUBE



 $\ensuremath{\mbox{\mbox{$\xi$}}}$  OF BULB WILL NOT DEVIATE MORE THAN 2  $^{\rm O}$  IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE TRACE PRODUCED BY DJ1 AND DJ2 BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 5,  $\pm 10^{\circ}$ , SIDE TERMINAL (ON SAME SIDE OF TUBE AS PIN 5),  $\pm 10^{\circ}$ . ANGLE BETWEEN DJ1 - DJ2 TRACE AND DJ3 DJ1 TRACE IS  $90^{\circ}$   $\pm 1^{\circ}$ .

DJ $_1$  AND DJ $_2$  ARE NEARER THE SCREEN. DJ $_3$  AND DJ $_4$  ARE NEARER THE BASE. WITH DJ $_1$  POSITIVE WITH RESPECT TO DJ $_2$ , THE SPOT WILL BE DEFLECTED TOWARD PIN 5; LIKEWISE, WITH DJ $_3$  POSITIVE WITH RESPECT TO DJ $_4$ , THE SPOT WILL BE DEFLECTED TOWARD PIN 2.

CE-9098



## 5ADPI

SADD

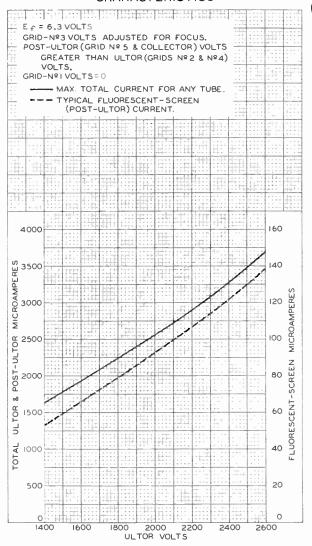
# AVERAGE CHARACTERISTICS

			VOLTS		FOR FOC	us.	
			CURVE	ELECTRODE	ULTOR	POST-ULTOR VOLTS	
	w		Α	ULTOR	<del></del>	4000	-
	1			1	2000		
			•	ULTOR	1500	3000	
			C	POST-ULTOR		4000	
			D	POST-ULTOR	1500	3000	
					1		-
					1		
	# # # # # * ¥						
							1800
					1	******	
		-					1600
	Η:						
							1400
						A	1400
	1.						
	120					- Y	1200
_		0.000				1	
S.		6 (propose					
E	00					1	1000
Щ							
<b>=</b>							17
8						/	# 000
∞ <sub>10</sub>	80					1	800
5 1						/ /	
ž						1 4	
⊿≌	60					1 11	600
æ ₹	-						
٠ <u>٨</u>						1 11	
α¥						/ //	
POST-ULTOR (GRID Nº5 & COLLECTOR) MICROAMPERES	40				1	111	400
4					/	111	
Ī					//	11	
S					11	11	
A	20			1	12		200
				1	1		
					1		
						1	

GRID-NºI VOLTS

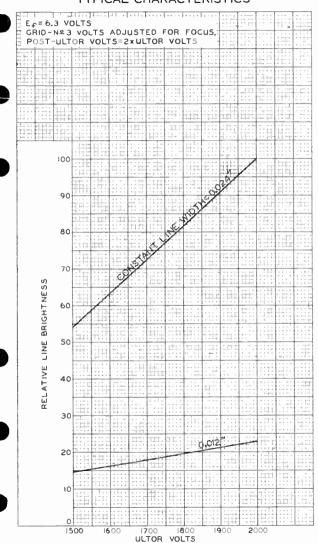


#### CHARACTERISTICS





#### TYPICAL CHARACTERISTICS



SADA





#### SAUP24

# SAURZA

## COLOR FLYING-SPOT CATHODE-RAY TUBE

HIGH-RESOLUTION CAPABILITY ELECTROSTATIC FOCUS ALUMINIZED SCREEN
MAGNETIC DEFLECTION

For neg ne	fluiné-spot	acanner	in color nideo-signal generators	

					DATA								
General:													
Heater, 1 Voltage Current	3 1				0.6	+ 1				. ac	or o	ic v	olts , amp
Direct In Grid No Cathode Extern	n.1 to e to al	all ot 1 othe	ter r el	elec ectr	tiro odes	es. 							μμ' μμ
coat	ing to	ulter								{500	) max. ) min.		μμ'
Faceplate	e, Flat										.Cle	ar G	1 155
Phosphor											· Ali	ar i n	ize
Focusing Deflecti Deflecti Overall Greatest Minimum Operatin Weight ( Cap Socket Basina	oresceristence istence Methodon Methodon Methodon Diame Useful a Positi Approx	i	Dia Dia			Small See	· · · · · · · · · · · · · · · · · · ·	Cav	ity		TEC Nonside		3/8 3/8 1/8 1/4 .An 1/51 1/51
Pin 2 Pin 6	Do I	No.1 No.3 rn:1 nectio		C NAME OF THE PARTY OF THE PART				Pin	12 Car	- He: - III: - (G	thode ater tor rid N ollec terna onduc eck C	o.4 tor.	)
Pin 10													ing
Maximum	Rating	•											
Maximum ULTOR VC	Rating OLTAGE. 3 VOLT	AGE								2700 600	ν:νπ Ο λεπ Ο Χεπ Ο		volt volt
Maximum ULTOR VC GRID-No. GRID-No. GRID-No.	Rating CLTAGE. 3 VOLT 2 VOLT	AGE AGF AGE:								2700 600 35	x:vm 0		volt



## COLOR FLYING-SPOT CATHODE-RAY TUBE

PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to During equipment warm-up perio	cathode:	
not exceeding 15 seconds	410 max	. volts
Characteristics Range Values for E	quipment Design:	ŀ
For any ultor voltage (Ecy) betwe	en 20000° and 27000	volts
Grid-No.3 Voltage for focus with ultor current of 200 $\mu a$ . Grid-No.2 Voltage when circuit design utilizes fixed grid-No.1 voltage ( $E_{C_1}$ ) for visual extinction of undeflected fo-	17% to 21.5% of $E_{C_4}$	volts.
cused spot	2 to 5 times Ec <sub>1</sub>	volts
(Ec <sub>2</sub> ) at fixed value	20% to 50% of Ec <sub>2</sub>	volts
ultor current of 200 $\mu$ a Grid-No.2 Current	170 -15 to +15	μa μa
Examples of Use of Design Ranges:		
For ultor voltage of	27000	volts
Grid-No.3 Voltage for focus with ultor current of 200 $\mu a$ . Grid-No.2 Voltage when circuit	4600 to 5800	volts
design utilizes fixed arid- No.1 voltage of -70 volts for visual extinction of undeflec- ted focused spot Grid-No.1 Voltage for visual extinction of undeflected fo- cused spot when circuit design	140 to 350	volts
utilizes grid-No.2 voltage of 200 volts	-40 to -100	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	5
Brilliance and definition decrease wit general, the ultor voltage should not b	h decreasing ultor volt e less than 20,000 volt	age. In
OPERATING CONSIDE	EDATIONS	

#### OPERATING CONSIDERATIONS

X-Ray Warning. X-ray radiation is produced at the face of the 5AUP24 when it is operated at its normal ultor voltage. These rays can constitute a health hazard unless the tube is

→ Indicates a change.

DATA 1



SAUPZA

#### COLOR FLYING-SPOT CATHODE-RAY TUBE

adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure that it provides the required protection against personal injury.

The base pins of the 5AUP24 fit the Duodecal 12-contact socket. The socket contacts corresponding to the vacant pin neitinns should be omitted in order to provide the maximum insulation for the high-coltage pins A and 7. The socket should be made of high-grade, arc-resistant, insulating material and should preferably be designed with bafflas

Heater Protection. Although maximum values of peak heater-cathode voltage are specified in the tabulated data, it is recommended that the mid-tap or one side of the heater transformer winding be connected directly to the cathode to minimize the possibility of heater burnout. This connection will also minimize the possibility of damage due to heater-cathode shorts produced by arcing between heater and cathode when a possible momentary arc causes the voltage between heater and cathode to exceed the maximum heater-cathode ratings.

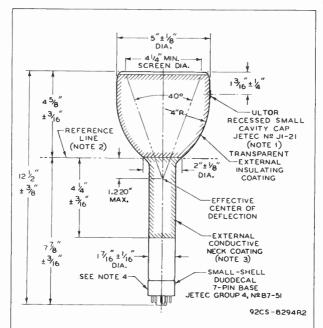
When in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data. It is also recommended that a series timiting resistance of 50,000 ohms be placed in both the ultor and grid-No.3 leads between the tube and any filter capacitors.

Resolution of better than 800 lines at the center of the reproduced picture can be produced by the 5AUP24 when it is operated with 27,000 bilts on the ultor. At lower ultor voltages, the resolution capability decreases. To obtain high resolution in the horizontal direction, it is necessary to use a video amplifier having a bandwidth of about 20 megacycles.





#### COLOR FLYING-SPOT CATHODE-RAY TUBE



**ROTE 1:** THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm~10^{\circ}$ . ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION 3.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE—LINE GAUGE JETEC NO.G—IIO (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY INTERSECTION OF PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

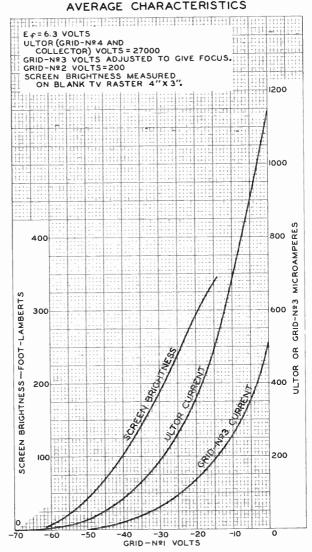
NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

**NOTE 4:** ( OF BULB WILL NOT DEVIATE MORE THAN  $2^{\circ}$  IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.



# SAUDER

#### AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION

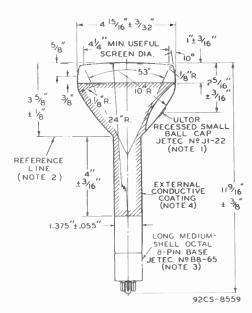
92CM-8343RI





# SALOA

#### VIEW-FINDER KINESCOPE



NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLEHANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm~10^{\circ}$ . ULTOR TERMINAL IS ON SAME SIDE OF TIBE AS PIN 5.

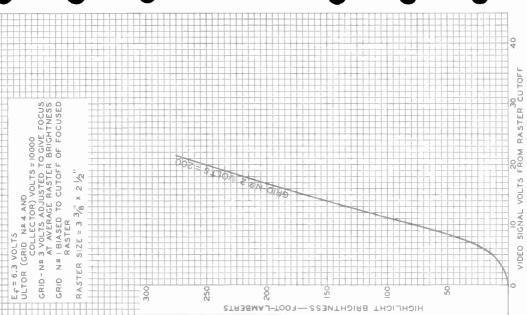
NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + 0.003" -0.000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 20 IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.



## 5 $\overline{\alpha}$ L HARAC DRIVE GRID RAGE



B. 24, 1955

854

## **Projection Kinescope**

P4 - Aluminized Silicate Phosphor Screen

Electrostatic Focus	Magnetic Deflection
Forced-Air	Cooled
For Use with Reflective	ve Optical Systems
ELECTRICAL	
Heater Current at 6.3 volts	0.6 A
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angle (Approx.)	50°
Direct Interelectrode Capacitance	es (Approx.):
Grid No.1 to all other electrode	s8 pF
Cathode to all other electrodes	5 pF
OPTICAL	
Faceplate, Spherical Cle	ar, Browning-Resistant Glass
Minimum Useful Screen Diameter	4.50"
Minimum Optical-Quality- Circle Diameter	4.25"
Refractive Index of Faceplate	
Phosphor, Aluminized	P4 Silicate Type
C.I.E. Coordinates:	
x-coordinate	0.333
y-coordinate	0.347
Luminance	
Persistence	Medium
MECHANICAL	
Tube Dimensions :	
Overall Length	12.19" + 0.37" -0.38"
Greatest Diameter of Bulb	5.00" ± 0.12"
Base	. Small-shell duodecal 7-pin, (JEDEC No.B7-51)
Anode Lead Molded-	on, Insulated Cable, 48" Long
Bulb	J4OH1
Operating Position	
Weight (Approx.)	
MAXIMUM AND MINIMUM RATIN Face Temperature	



Anode Voltage.

.... 42,000 max.

## 5AZP4

Average Anode Power:	
Without forced-air cooling of faceplate 9 max. W	_
With forced-air cooling of faceplate	
Air Flow to Face, when Average Anode Power Exceeds 9	
Watts: An air-cooling system is required to cool the face of these tubes when they are operated with an average anode input in excess of 9 watts. The system consists of a suitable blower and an air duct, having an outlet diameter of about 2 inches, directed perpendicularly onto the face of the tube. The air flow must be adequate to limit the faceplate temperature to 100° C. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the anode power supply to prevent operation of the tube without cooling.	
Cooling of the face by a tangential flow of air across the face is not recommended because the temperature gradient produced across the face may result in immediate or delayed cracking of the face.  Grid-No.3 (Focusing Electrode)	
Voltage	
Grid-No.2 Voltage 400 max. V	
Grid-No.1 Voltage:	
Negative bias value 150 max. V	
Positive bias value 0 max. V	
Positive peak value 2 max. V	
Peak Heater-Cathode Voltage:	
Heater negative with respect to cathode	D
Heater positive with respect to cathode	
Heater Voltage (ac or dc):	
Under operating conditions 5.7 min. V	
( ****	
RECOMMENDED OPERATING VALUES Unless otherwise specified, values are positive with respect to	
cathode.	
Anode Voltage	
Average Anode Current	
Grid-No.3 (Focusing Electrode) Voltage for an Anode Current of 300 microamperes	



_		
	Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused Spot See accompanying	og Cutoff
		ign Chart
	TYPICAL PERFORMANCE DATA	
	At recommended operating values	
	Grid-No.3 Current (Total) See accompanyin  Grid-No.3 Current Chara	
<b>\</b>	Grid-No.2 Current	_
,	Equivalent Passband (N <sub>e</sub> )	270
	(For sine-wave response, see accompanying	
	Typical Sine-Wave Response)	
	Center Resolution d	
)	Drive Characteristics See accompanying Drive Chara	cteristics
	Luminance at 300 µA See accompanying	
	Luminance Chard	
	LIMITING CIRCUIT VALUES	
	(See accompanying Schematic Diagram of Circuit Show Protective Elements Employed to Prevent Tube Dama	
	HIGH-VOLTAGE CIRCUITS	
	In order to minimize the possibility of damage to caused by a momentary internal arc, it is recomme the high-voltage power supply and the grid-No.3 powbe of the limited-energy type.  Anode-Circuit Resistance	nded that
		$min.\ M\Omega$
<b>\</b>	Grid-No.3 Circuit Resistance (unbypassed) 0.1	мΩ
,	LOW-VOLTAGE CIRCUITS	
	Grid-No.2 Circuit Resistance (bypassed)	kΩ
	Grid-No.1 Circuit Resistance (unbypassed)	kΩ
	Effective Grid-No.1-to-Cathode Circuit Resistance 1.5	max. MΩ
	Cathode Circuit Resistance (unbypassed)	kΩ
	Heater Circuit Resistance (bypassed) to one side of heater 10	kΩ
, 	b For maximum cathode life, it is recommended that supply be regulated at 6.3 volts.	he heater



### 5AZP4

- <sup>c</sup> Brilliance and definition may change with decreasing anode voltage. In general, the anode voltage should not be less than 30,000 volts.
- d Determined for a 3-inch high TV resolution test pattern with tube operating at an average screen current of 300 micro-amperes.

#### HIGH-VOLTAGE PRECAUTIONS

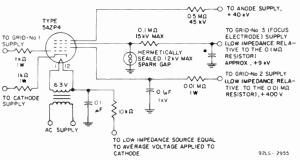
The high voltages at which this type is operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Precautions include the enclosing of high-potential terminals and the use of interlocking switches to break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

#### X-RADIATION WARNING

X-radiation is produced at the face of this tube when it is operated at normal anode voltage.

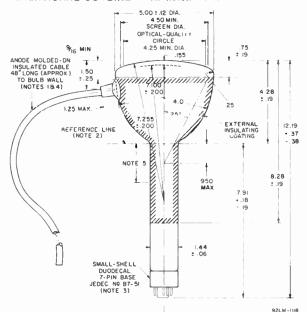
These rays can constitute a health hazard unless the tube is adequately shielded. Make sure that the shielding provides the required protection against personal injury.

## SCHEMATIC DIAGRAM OF CIRCUIT SHOWING PROTECTIVE ELEMENTS EMPLOYED TO PREVENT TUBE DAMAGE



\* The value of this capacitor should be such that its charging time constant is at least five times greater than the firing time of the spark gap..

#### DIMENSIONAL OUTLINE - Dimensions In Inches



Note 1: The plane through the tube axis and vacant pin position No.3 may vary from the plane through the tube axis and anode-cable connection at bulb wall by angular tolerance (measured about the tube axis) of  $\pm 20^{\circ}$ . Anode-cable connection is on same side as vacant pin position No.3

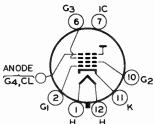
Note 2: Reference line is determined by position where gauge 1.500" + 0.003" - 0.000" 1.D. and 2' long will rest on bulb cone.

Note 3: Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. Socket contacts corresponding to vacant pin positions No.3, 4, 5, 8 and 9 should be removed in order to provide maximum insulation for pins No.6 and 7.

Note 4: Anode cable should not be sharply bent within 3" of bulb wall.

Note 5: The windings of the deflecting yoke should not extend more than 2" from the reference line toward the base. They should be insulated to withstand 20 kV and be spaced at least 1/10" from the tube neck.

#### TERMINAL DIAGRAM (Bottom View)



Pin 1: Heater

Pin 2: Grid No.1 Pin 6: Grid No.3

Pin 7: Internal Connection - Do not use

Pin 10: Grid No.2

Pin 11: Cathode

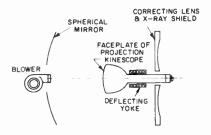
Pin 12: Heater

Flexible Cable: Anode (Grid No.4, Collector)

Note: Socket contacts for vacant pin positions No.3, 4, 5, 8, and 9 should be removed so that maximum insulation is provided for pins No.6 and 7.

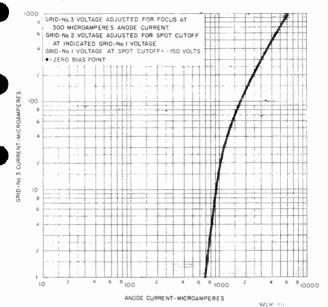
#### REFLECTIVE OPTICAL SYSTEM

Arrangement of Typical Optical System and Air-Cooling System for Television Projector Using Reflective Optical Principles.

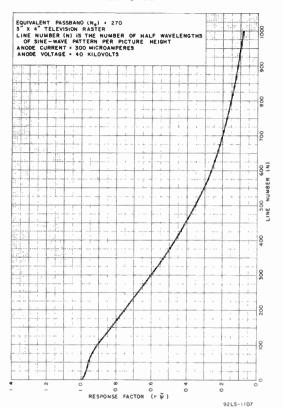


92LS - 2952

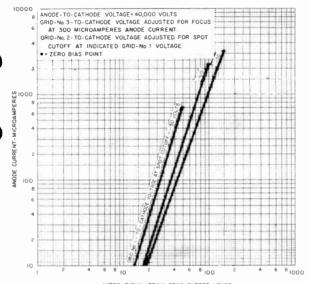
#### TYPICAL GRID-No.3 CURRENT CHARACTERISTIC



#### TYPICAL SINE-WAVE RESPONSE



## TYPICAL DRIVE CHARACTERISTICS GRID-DRIVE SERVICE

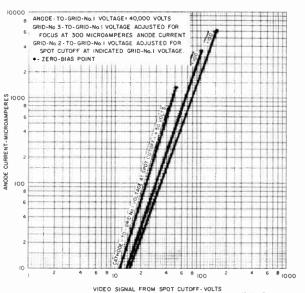


VIDEO SIGNAL FROM SPOT CUTOFF-VOLTS

921 M - 1112

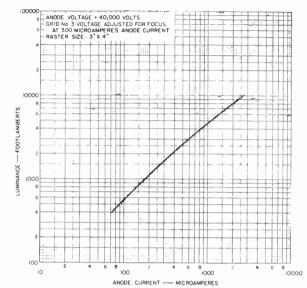


#### TYPICAL DRIVE CHARACTERISTICS CATHODE-DRIVE SERVICE



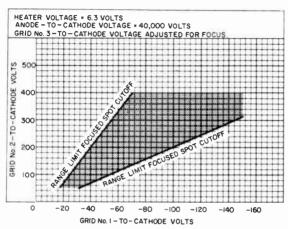
92LM III3

#### TYPICAL LUMINANCE CHARACTERISTIC



92LS - 2954

#### CUTOFF DESIGN CHART



92LS-2953



# SOPIA

Electrostatic

Electrostatic

## HIGH-VACUUM CATHODE-RAY TUBE

Heater, for Unipotential Cathode:	
Voltage 6.3 ± 10% ac or d	c volts
Current 0.6	. amp.
Direct Interelectrode Capacitances (Approx.):	
	. բևք
$\begin{bmatrix} DJ_1 & DJ_2 & \dots \end{bmatrix}$	<ul> <li>μμf</li> </ul>
DJ3, to DJ4 1.2	. դրք
	. µµf
	. μμf
DJ1 to All Other Electrodes except DJ2 . 8.0	. µµf
DJ $\bar{2}$ to All Other Electrodes except DJ $\bar{1}$ . 7.5	. μμf
DJ3 to All Other Electrodes except DJ4 . 10.0	. µµf
DJ4 to All Other Electrodes except DJ3 . 7.5	. μμί
	. No.1
Fluorescence	Green
Persistence	Medium

 Overall Length
 16-3/4" ± 3/8"

 Greatest Diameter of Bulb
 5-1/4" + 1/16"

 Minimum Useful Screen Diameter
 4-1/2"

Pin 3 - Deflecting

Electrode DJ1

Grid No. 2

B Pin 8 - Deflecting

Electr. DJ2

Pin 4- Anode No.1
Pin 5- Internal Con.

Electr.DJ2
Pin 9- Deflecting
Electr.DJ3

Do not use Pin 10 - Grid No.1
Pin 6 - Deflecting Pin 11 - Heater,
Electrode DJ4 Cathode

## $DJ_3$ and $DJ_2$ are nearer the screen $DJ_3$ and $DJ_4$ are nearer the base

With DJ $_{\parallel}$  positive with respect to DJ $_{2}$ , the spot is deflected toward pin 4. With DJ $_{3}$  positive with respect to DJ $_{4}$ , the spot is deflected toward pin I.

The angle between the trace produced by  ${\rm DJ}_3$  and  ${\rm DJ}_4$  and its intersection with the plane through the tube axis and pin I does not exceed 100.

The angle between the trace produced by DJ $_3$  and DJ $_4$  and the trace produced by DJ $_1$  and DJ $_2$  is 90°  $\pm$  3°.

General:

Focusing Method. . .

Deflection Method. . . .



#### HIGH-VACUUM CATHODE-RAY TUBE

(continued from preceding page)

- 1	, , , , , , , , , , , , , , , , , , , ,	١.
	Maximum Ratings, Absolute Values:	
	ANODE-No.2 & GRID-No.2 VOLTAGE 2200 max. volts	
	ANODE-No.1 VOLTAGE 1100 max. volts GRID-No.1 (CONTROL ELECTRODE) VOLTAGE:	
	Negative Value 125 max. volts	
	Positive Value 0 max. volts	ľ
	PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE 550 max. volts	
	lypical Operation:	
	Anode-No.2 & Grid-No.2 Voltage* 1500 2000 volts	
	Anode-No.1 Volt. for Focus at 75% of Grid-No.1 Volt. for Cutoff* . 337 450 volts	l (
	Grid-No.1 Volt. for Visual Cutoff#30 -40 volts	'
	Max. Anode-No.1 Current Range*. Between -50 and +10 µamp.	
	Deflection Sensitivity:	
	DJ <sub>1</sub> and DJ <sub>2</sub> 0.404 0.303 mm/v dc	
	D.I3 and D.I4	
	DJ3 and DJ4 0.446 0.334 mm/v dc Deflection Factor:**	
	DJ1 and DJ2 63 84 v dc/in.	1
	DJ3 and DJ4	
	DJ3 and DJ4 5/ /6 v dc/in.	
	*Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1500 volts.	
	● Individual tubes may require between +25% and -30% of the values shown	
	with grid-No.1 voltages between zero and cutoff.	
	${\it f}$ visual extinction of stationary focused spot. Supply should be adjustable to ${\it \pm}$ 50% of these values.	
	See curve for average values.	
	** Individual tubes may vary from these values by ± 17%.	

#### Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ and DJ2. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, I megohm each, connected to anode-No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

#### Maximum Circuit Values:

Grid-No.1 - Circuit Resistance . . . . . 1.5 max. megohms Impedance of Any Deflecting-Electrode

Circuit at Heater-Supply Frequency 1.0 max. megohm Resistance in Any Deflecting-

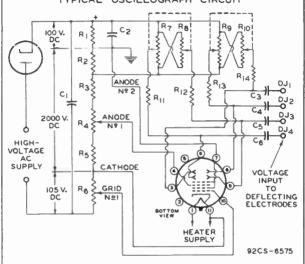
Electrode Circuit 5.0 max. megohms AA It is recommended that all deflecting-electrode-circuit resistances be approximately equal.



## SBPIA 5BPI-A

#### TYPICAL OSCILLOGRAPH CIRCUIT

HIGH-VACUUM CATHODE-RAY TUBE



C1: 0.1 µf C2: 1.0 µf

C3 C4 C5 C6: 0.05-uf Blocking

Capacitors\*

R1 R2: 2 Megohms

R3: 6 Megohms

94: 2-Megohm Potentiometer

R5: 1.0 Megohm R6: 0.5-Megohm

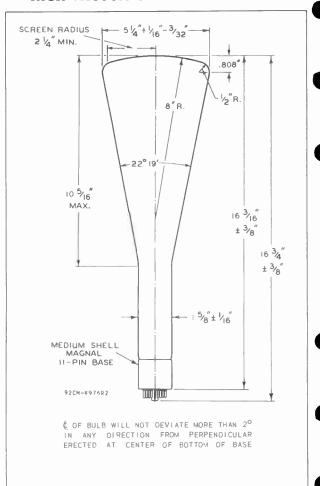
RS: 1.0 megonm R6: 0.5-Megohm Potentiometer R7 R8: Dual 5-Megohm Potentiometer R9 R10: Dual 5-Megohm Potentiometer R11 R12 R13 R18: 2 Megohms

When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

The license extended to the purchaser of tubes appears in the License Motice accompanying them. Information contained herein is furnished without assuming any obligations.



#### HIGH-VACUUM CATHODE-RAY TUBE



JULY 1, 1945

SBPIA

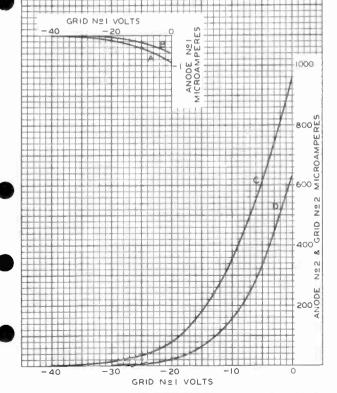


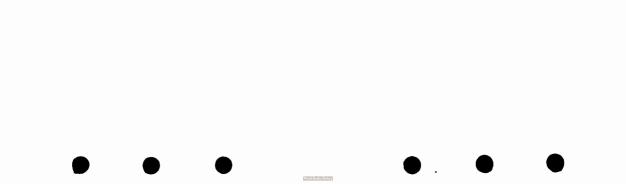
SAPIA

#### AVERAGE CHARACTERISTICS

-	3 VOLTS		O GIVE FOCUS
	CURVE	ELECTRODE CURRENT	GRID Nº2 VOLT
	А	ANODE Nº I	2000
		ANODE NOT	1500

+	CORVE	CURRENT	GRID Nº2 VOLTS
	А	ANODE Nº I	2000
F	В	ANODE Nº I	1500
	С	& GRID Nº 2	2000
	D	ANODE Nº 2 & GRID Nº 2	1500







#### OSCILLOGRAPH TUBE

POST-DEFLECTION ACCELERATOR

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

	DATA		
	General:		
	Heater, for Unipotential Cathode:		
	Voltage 6.3 ac or		
	Current 0.6		<ul> <li>amp</li> </ul>
	Direct Interelectrode Capacitances (Approx.):		
	Grid No.1 to All Other Flectrodes 8		. բբք
	Cathode to Al! Other Electrodes 9		. բբք
	$DJ_1$ to $DJ_2$		<b>.</b> µµf
	$\mathbb{D}_3$ to $\mathbb{D}_4$		. µµŤ
			. µµf
			. μμf
	DJ3 to All Other Electrodes 7		
	DJ to All Other Electrodes 8		. սևք
	Phosphor (For Curves, see front of this Section)		
	Fluorescence and Phosphorescence		
	Persistence of Phosohorescence		Medium
	Focusing Method Elect		
	Deflection Method Elect		
	Overall Length		
	Greatest Diameter of Bulb 5-1/4"	+	3/32"
	Minimum Useful Screen Diameter		
	Mounting Position	In	11-22)
	Base Medium-Shell Diheptal 12-Pin (JETEC No	. B	12-371
i	Basing Designation for BOTTOM VIEW		
	Pin 1 - Heater Pin 9 - Anod		
	Pin 2 - Cathode Grid		
	Pin 3-Grid No.1 Pin 10-Defl		
			.DJ2
	Do not use Pin 11 - Defl		
	Din b Anada No 1		
	Pin 7 - Deflecting Pin 12 - No C	יוו	
ı			tion
ı	Pin 8 - Deflecting Pin 14 - Heat		CION
ı	Electrode $D_A$ Cap - Anod		No 3
ı	Cap - Allou	C 1	10.)

 ${\it DJ}_1$  and  ${\it DJ}_2$  are nearer the screen  ${\it DJ}_3$  and  ${\it DJ}_4$  are nearer the base

With  $\mathcal{O}_1$  positive with respect to  $\mathcal{OJ}_2$ , the spot is deflected toward pin 5. With DJ3 positive with respect to DJ4, the spot is deflected toward pin 2.

The plane through the tube axis and each of the following items may vary from the trace produced by DU1 and DU2 by the following angular tolerances measured about the tube axis: Pin 5, 10°; Cap (on same side of tube as pin 5), 10°.

The angle between the trace produced by  $D_1$  and  $D_2$ the trace produced by DJ3 and DJ4 is  $90^{\circ} \pm 3^{\circ}$ .





#### 5CPI-A OSCILLOGRAPH TUBE

	Maximum Ratings, Design-Center Values:	1
	ANODE-No.3 VOLTAGE 4000 max. volts ANODE-No.2* VOLTAGE 2000 max. volts RATIO OF ANODE-No.3 VOLTAGE TO	- 1
	ANODE-No.2 VOLTAGE 2.3:1  ANODE-No.1 VOLTAGE 1000 max. volts GRID-No.1 VOLTAGE:	
	Negative bias value	1
	PEAK VOLTAGE BETWEEN ANODE No.2 AND ANY DEFLECTING ELECTRODE 500 max. volts	
	PEAK HEATER-CATHODE VOLTAGE:  Heater negative with respect to cathode. 125 max. volts  Heater positive with respect to cathode. 125 max. volts	
	Equipment Design Ranges: For any anode-No.3 voltage (Eb <sub>3</sub> ) between 2000° and 4000 volts and any anode-No.2 voltage (Eb <sub>2</sub> ) between 1500° and 2000 volts	
<b>→</b>	Anode-No.1 Voltage 18.7 to 34.5% of Eb <sub>2</sub> volts Grid-No.1 Voltage 1.5% to 4.5% of Eb <sub>2</sub> volts Anode-No.1 Current of any	
	Operating Condition15 to +10 μamp Deflection Factors:	
	When $Eb_3 = 2 \times Eb_2$	
	D1 & D2       39 to 53 v dc/in./kv of Eb2         D3 & D4       33 to 45 v dc/in./kv of Eb2	
	When $E_{b_3} = E_{b_2}$	
	$\mathbb{D}_1$ & $\mathbb{D}_2$	
	Examples of Use of Design Ranges:	
	For anode-No.3 voltage of. 2000 3000 4000 volts and anode-No.2	
	voltage of.     2000     1500     2000     volts       Anode-No.1 Volt.     375 to 690     280 to 515     375 to 690 volts       20 to 90     22 5 to 67     5     30 to 90 volts	- 1
<b>→</b>	Brid-No.1 voit 22.5 to 07.5 50 to - 50 voits	
	D <sub>1</sub> & D <sub>2</sub> 62 to 84 59 to 80 78 to 106 D <sub>3</sub> & D <sub>4</sub> 54 to 74 50 to 68 66 to 90	
	Maximum Circuit Values:	-
	Grid-No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting-Electrode Circuit 5.0 max. megohms	1
	•, ••, Å, Å, ##, @, □: See next page. → indicates a change	┛
	OCTOBER 1, 1951 TUBE DEPARTMENT DATA 1	



#### 5CPI-A OSCILLOGRAPH TUBE



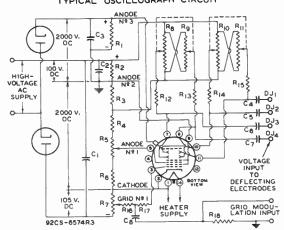
- Anode No. 2 and grid No. 2, which are connected together within tube, are referred to herein as anode No. 2.
- At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode-No. 2 input power to 6 watts.
- \*\*\* It is recommended that anode-No.3 voltage be not less than 3000 volts for high-speed scanning.
- Recommended minimum value of anode-No.2 voltage.
- for visual outerf of undeflected focused spot.
- □ Volts dc/in.
- ## with heater voltage of 6.3 volts, anode-Mo.3 voltage of #000 volts, anode-Mo.2 voltage of 2000 volts, anode-Mo.1 voltage adjusted to focus, grid-Mo.1 voltage adjusted to give spot that is just visible, each deflecting electrode connected through 1-megohim resistor to anode Mo.2, and tube shielded from all extraneous fields, the center of the undeflected, focused spot will fall within a circle having a 12.5-mm radius concentric with the center of the tube face.
  - It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

3091-1



#### 5CPI-A OSCILLOGRAPH TUBE

#### TYPICAL OSCILLOGRAPH CIRCUIT



C1: 0.1 µf, 2500 Volts 200 Volts 2500 Volts

C2: 1.0 µf, 200 Volts C3: 0.1 µf, 2500 Volt C4 C5 C6 C7; 0.05-µf,

C4 C5 C6 C7; 0.05-µr, Blocking Capacitors\* C8: 0.0001 µf, 2500 Volts R1: 50 Megohms (Five 10-Megohm, 1-Watt Resistors

in Series)

R2 R3: 2 Megohms, 0.5 Watt R4: 5.5 Megohms, 2 Watts

R5: 2-Megohm Potentiometer R6: 1.5 Megohms, 0.5 Watt R7: 0.5-Megohm Potentiometer R8 R9: Dual 5-Megohm Potentiometer R10 R11: Dual 5-Megohm Potentiometer R10 R11: Dual 5-Megohm Potentiometer R12 R13 R14 R15: 2 Megohms, 0.5 Watt R16: 0.5 Megohm, 0.5 Watt

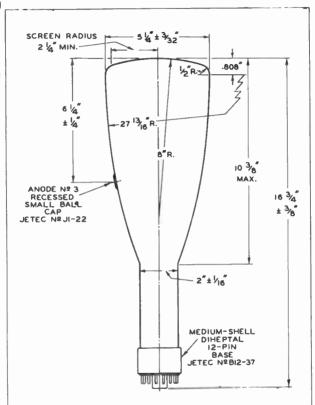
R17: Not less than 2000 ohms per volt of positive signal R18: 5 Megohms, 0.5 Watt

when cathode is grounded, capacitors should have high voltage rating (2500 volts); when anode No.2 is grounded, they may have low voltage rating (200 volts). For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

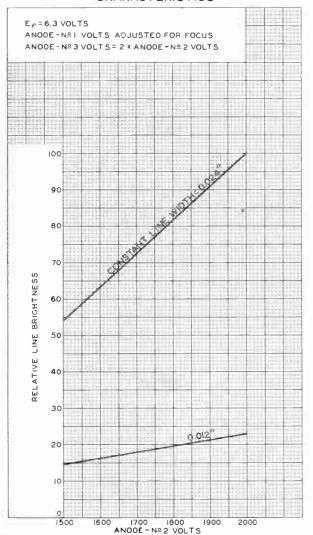
## OSCILLOGRAPH TUBE





¢ OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE 92CM-640BR4

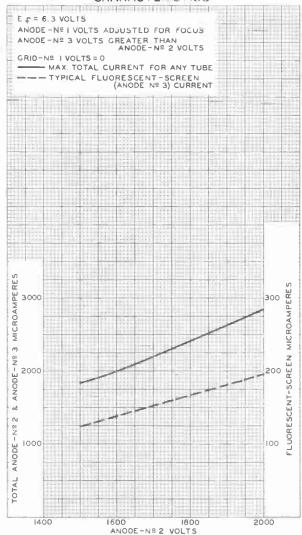






# SCDIA

#### CHARACTERISTICS







#### AVERAGE CHARACTERISTICS

GRID-Ne I VOLTS -60 -40 -20 0   1600 -20 W CWWDE W C   1200 -20 W C	E <sub>f</sub> =	6.3	VOLTS			JSTE					US			
B ANODE Nº 2 1500 1500-3000  C ANODE Nº 2 1500 3000  E ANODE Nº 3 2000 4000  F ANODE Nº 3 1500 3000  GRID-Nº 1 VOLTS  -60 -40 -20 0 -30 0 -30 0 0 0 0 0 0 0 0 0 0 0 0 0	CUI	RVE			Ε	AN			2	Α			23	1 - 1000 1 - 1000
C ANODE Nº 2 2000 4000  D ANODE Nº 2 1500 3000  E ANODE Nº 3 2000 4000  F ANODE Nº 3 1500 3000  GRID-Nº 1 VOLTS  -60 -40 -20 0 3000  ANODE Nº 3 1500 3000  1600  1200  SUMMANDE Nº 3 1500 3000  1600  ANODE Nº 2 1500 3000  1600  ANODE Nº 3 1500 3000  1600  ANODE Nº 3 1500 3000  IE ANODE Nº 3 1500 300  IE ANODE Nº 3 1500 300  IE ANODE Nº 3 1500 300		4	ANODE	No	1		20	00		2	2000	-40	00	
D ANODE Nº 2 1500 3000  E ANODE Nº 3 2000 4000  F ANODE Nº 3 1500 3000  GRID-Nº 1 VOLTS  -60 -40 -20 0  -20 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 100 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600  20 0 1600	E	3	ANODE	Nº	1		15	00		- 1	500	-30	00	
E ANODE Nº 3 2000 4000  F ANODE Nº 3 1500 3000  GRID-Nº 1 VOLTS  -60 -40 -20 0  -1 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2	iii c	;	ANODE	Nº	2		20	000			4	000		1111
F ANODE Nº 3 1500 3000  GRID-Nº 1 VOLTS  -60 -40 -20 0 -3		)	ANODE	Nº.	2		15	00			3	000		
GRID-Ne1 VOLTS -60 -40 -20 0 -20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	E		ANODE	N۵	3		20	000			4	000		HH
GRID-Ne1 VOLTS  -60 -40 -20 0  -20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0											3			
GRID-Ne 1 VOLTS  -60 -40 -20 0  -7 - 40 - 40 - 1600  -7 - 40 - 40 - 40 - 40 - 40 - 40 - 40 -											111			
100 M C SOAMPERES 100 M C SOAMPERES 2 M C SOAM	-e	GF	Nen-dis				)			H	H			::::
	-NE3 MICROAMPERES						_ S	MICROAMPE				,	80	ANODE - NR.2 MICROAMPERES

DEC. 26,1946

TUBE DEPARTMENT

92CM-6414R2

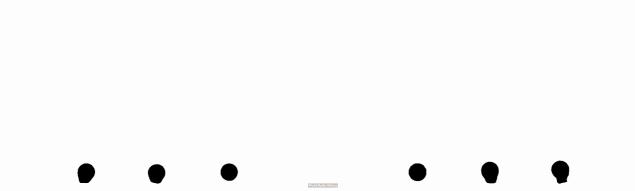


#### 5CPII-A OSCILLOGRAPH TUBE

SCOII.A POST- DEFLECTION ACCELERATOR ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

The 5CP11-A is the same as the 5CP1-A, except that it has a screen of the short-persistence, blue-fluorescence type designated P11. Its highly actinic fluorescent spot of unusually high brightness makes the 5CP11-A particularly useful for photographic recording. Because its improved phosphor has exceptional brightness for a blue screen, the 50P11-A is also quite upoful for visual observation of phenomena.

The SPECTRAL-ENERGY EMISSION CHARACTERISTIC. as well as the PERSISTENCE CHARACTERISTIC for the P11 PHOSPHOR are shown at the beginning of this Section.



## View-Finder Kinescope

MAGNETIC FOCUS	MAGNETIC DEFLECTION
GENERAL DATA	
Electrical:	
Direct Interelectrode Capacitimens: Cathode to all other electrone Grid No.1 to all other electrodes Heater Current at 6.3 volts	5 pf
Optical:	
Photobor (rundwistern from af tris section of the s	White white white hort whort was made as a second with the second with the second was made as a second with the second was a second
Mechanical:	
Overall Length	4-15/16" ± 3/32" 4-1/4"
NC ANODE GI	
Pin 1 - No Internal Connection  Pin 2 Heater Pin 3 - Grit No.2 Pin 4 - Same 15 Pin 1 Pin 5 - Grid No.1	Fin 6 - Same is Pin 1 Pin 7 - Cathode Pin 8 - Heater C:p - Anode (Grid No.3, Collector)
Maximum Ratings, Design-Center Values:	
ANODE VOLTAGE	
Tegitive bias value  Positive bias value  Positive peak value  PEAK HEATER CATHODE VOLTAGE:	
Heater negative with respect to cathod Heater positive with respect to cathod	

### 5FP4A

#### Typical Operation:

Anode Voltage	∍ <sup>b</sup> ,					 . 6000	volts
Gric-No.2 Vo	tage					 . 250	volts
Grid-No.1 Vo	tage for	Visu?	al Exti	noti	on		
of Undefle	ited Focu	sed Sr	ot			 -25 to -70	volts
Focused-Coil							

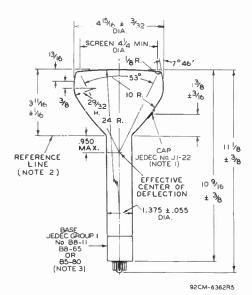
#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance. . . . . . . 1.5 max. megohms

 $<sup>\</sup>boldsymbol{a}$  The product of anode voltage and average anode current should be limited to 6 watts.

Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.

c For specimen focusing coil similar to JEDEC Focusing Coil No.106 positioned with air gap toward kineascope screen, and center line of air gap 3-1/4" from Reference Line (see Outline Drawing). The indicated current is for condition with combined grid-No.1 biss voltage and videosignal voltage adjusted to produce a nightlight brightness of 10 footlamberts on a 3-7/8" x 2-7 8" picture area Jharply focused at center of screen.



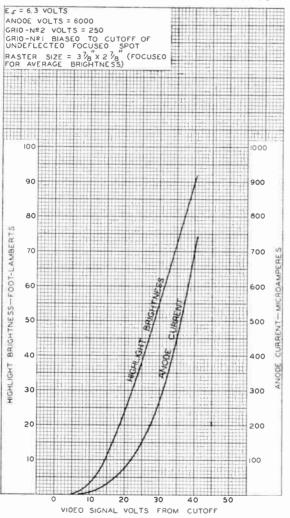
#### DIMENSIONS IN INCHES

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 100. ANOOE TERMINAL IS ON SAME SIDE OF TUBE AS PIN 5.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" +.003" -000" INSIDE DIAMETER AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 2º IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

#### **AVERAGE GRID-DRIVE CHARACTERISTICS**



92CM - 6683RI



# 5FP7-A

# SEDITA

# OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

,	DATA	7
	General:	
	Heater, for Unipotential Cathode:  Voltage 6.3	~
	Maximum Ratings, Design-Center Values:	
)	ANODE VOLTAGE 8000 max. volts GRID-No.2 VOLTAGE	
	Positive bias value* 0 max. volts Positive peak value 2 max. volts PEAK GRID—No.1 DRIVE FROM CUTOFF 65 max. volts PEAK HEATER—CATHOUL VOLIAGE:	
)	Heater negative with respect to cathode. 125 max. volts Heater positive with respect to cathode. 125 max. volts	1
	Typical Operation:	
	Anode Voltage** 4000 7000 volts Grid-No.2 Voltage 250 250 volts	1
•	<ul> <li>At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.</li> <li>Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.</li> </ul>	

Indicates a change.

5F.P.7.A

# OSCILLOGRAPH TUBE

Grid-No.1								-25			volts
Grid-No.2		٠	٠	•	-15	to	+15	-15	to	+15	tramo

ocusing—Coll Current (DC, approx.)# . . . 96 ± 15% 128 + 15% ma Spot Position. . . . . . \*\*

### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . . 1.5 max. megohms

- For visual extinction of undeflected focused spot.
- For specimen focusing coil Similar to JETEC Focusing Coil No.106 positioned with air gap toward face plate, and center line of airgap 2-3/% inches from Reference Line (see Outline Drawing), and total anode current of 200 microamperes.
- ## The center of the undeflected, unfocused spot will fall within a circle having 9-mm radius concentric with center of tube face.

#### OPERATING NOTES

The 5FP7-A utilizes a long-persistence, cascade (two-layer) screen which exhibits bluish fluorescence of short persistence and greenish-yellow phosphorescence.

Because of its long persistence, the 5FP7-A is particularly useful where either low-speed non-recurring phenomena or high-speed recurring phenomena are to be observed. Furthermore, two or more phenomena can be observed simultaneously on the screen by means of a suitable switching arrangement.

The persistence is such that the 5FP7-A without filter can be operated with scanning frequencies as low as 30 cycles per second without excessive flicker. When used with yellow filter, such as Wratten No.15 (G), the 5FP7-A can be operated with much lower scanning frequencies.

In general, operation of the 5FP7-A at an anode voltage below 4000 volts will not give persistence of useable brightness.

> OUTLINE DIMENSIONS for Type 5FP7-A are the same as those for Type 5FP4-A

AVERAGE CHARACTERISTIC CURVE for Type 5FP7-A is the same as that shown for Type 7BP7-A

-> Indicates a change.





# OSCILLOGRAPII TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

The 5FP14 is the same as the 5FP7-A except that it utilizes a medium-long-persistence, cascade (two-layer) screen which exhibits purple fluorescence of short persistence and orange phosphorescence which persists for alittle over a minute under conditions of adequate excitation and low ambient light.

Because of its medium—long persistence, the 5FP14 is particularly useful where either low—and medium—speed non-recurring phenomena or high—speed recurring phenomena are to be observed. Furthermore, two or more phenomena can be observed simultaneously on the screen by means of a suitable switching arrangement.

The persistence is such that the 5FP14 without filter can be operated with scanning frequencies as low as 30 cycles per second without excessive flicker. When used with yellow filter, such as Wratten No.15 (G), the 5FP14 can be operated with much lower scanning frequencies.

In general, operation of the 5FP14 at an anode voltage below 4000 volts will not give persistence of useable brightness.

THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC and the PERSISTENCE CHARACTERISTIC of the P14 Phosphor are shown at the front of this Section.



•



# 5UPI OSCILLOGRAPH TUBE

SUPI

ELECTRUSTATIC FOCUS FLECTROSTATIC DEFLECTION

EEEC TOO TATE TOO TO THE TOTAL THE TOTAL TO THE TOTAL TOT
General:  Heater, for Unipotential Cathode:  Voltage 6.3 ± 10%
DJ2 to All Other Electrodes 8.0 $\mu\mu$ f
DJa to All Other Electrodes 8.0 · · · μμf
Fluorescence
Overall Length
Minimum Useful Screen Diameter 4-1/2"
Mounting Position
Pin 1 – Heater Pin 8 – Anode No.2, Pin 2 – Grid No.1 Grid Vo.2
Pin 3 - Cathode Pin 4 - Anode No. 1
Pin 5 - Internal Con.  Do Not Use  Pin 10 - Deflecting Electrode DJ1
Pin € - Deflecting Pin 11- Internal Con. Electrode DJ3 KEY Do Not Use
Pin 7 - Deflecting Pin 12- Heater Electrode DJ <sub>4</sub>

# $DJ_1$ and $DJ_2$ are nearer the screen $DJ_2$ and $DJ_d$ are nearer the base

With DJ; positive with respect to DJ2, the spot is deflected toward pin 4. With DJ3 positive with respect to DJ4, the spot is deflected toward pin 1.

The angle between the trace produced by DJ $_1$  and DJ $_2$  and its intersection with the plane through the tube axis and pin I does not exceed 10 $^\circ$ .

The angle between the trace produced by DJ3 and DJ4 and the trace produced by DJ1 and DJ2 is  $90^{\circ}~\pm~3^{\circ}.$ 

SUPI



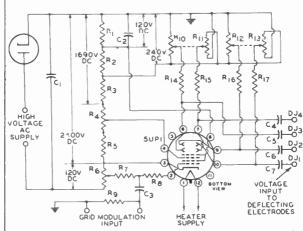
laximum Ratings, Design-Center Values:		
NODE-No.2 VOLTAGE	2500 ma 1000 ma	
Aegative bias value	200 ma 0 ma	
Peak positive value	2 ma	x. volts
AND ANY DEFLECTING ELECTRODE PEAK HEATER-CATHODE VOLTAGE:	500 ma	x. volts
Heater negative with respect to cathode. Heater positive with respect to cathode.	125 ma 125 ma	
quipment Design Ranges:		
for any anode-No. 2 voltage (Eb <sub>2</sub> ) between 1		500 volts
Anode-No.1 Voltage 17% to 32% of fax. Grid-No.1 Voltage	- 2	. volts
for Visual Cutoff 4.5% of E <sub>b2</sub> Anode—No.1 Current for		. volts
Any Operating Condition -15 to +10 Deflection Factors:		microamp
DJ <sub>1</sub> & DJ <sub>2</sub> 28 to 38.5 DJ <sub>3</sub> & DJ <sub>4</sub> 23 to 31	v dc/in. v dc/in.	/kv of E <sub>b2</sub>
xamples of Use of Design Ranges:		
0. 0	2000_	volts
Anode-No.1 Voltage 170 - 320 3 'ax. Grid-No.1 Voltage		
for Visual Cutoff -45 Deflection Factors:		. volts
	56 – 77 vol 46 – 62 vol	
laximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms
Resistance in Any Deflecting Electrode Circuit <sup>o</sup>	5.0 max.	meyohms
* Recommended minimum value.		
It is recommended that the deflecting-electron be approximately equal.  Anode yo.2 and grid yo.2, which are connected		1
Anode 40.2 and grid 40.2, which are connected are referred to herein as anode 40.2.	together w	



# OSCILLOGRAPH TUBE







92CM-6819

R1 R2: 2.5 Megohms, 0.5 Watt R3: 6 Megohms, 3 Watts R4: 2-Megohm Potentiometer R5: 1 Megohm, 0.5 Watt R6: 0.5-Megohm, 0.5 Watt R7: 0.5-Megohm, 0.5 Watt R8: NOt 1ess than 2000 Ohms per R9: 5-Megohms, 0.5 Watt

R10 - R11, R12 - R13: Dual Poten-tiometers, R10, R11, R12, R13: 0.5 Megohm

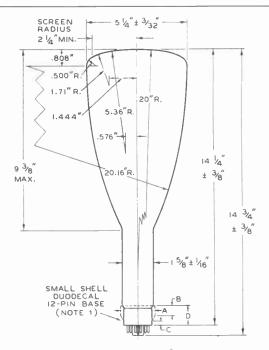
R14 R15 R16 R17: 2.2 Megohms, 0.5 Watt

C1: 0.1 µf, 2500 Volts C2: 1 µf, 200 Volts C3: 0.0001 µf, 2500 Volts C4 C5 C6 C7: 0.1 µf, 600 Volts

The license extended to the purchaser of tubes appears in the License voltice accompanying them, information contained herein is furnished without assuming any obligations.







C OF BULE WILL NOT DEVIATE MORE THAN 20 IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.

NOTE 1: THIS BASE MAY BE SUPERSEDED BY AN ALTERNATE BASE WHICH WILL FIT THE SAME SOCKET BUT WHICH WILL HAVE A FLAFEC SHELL INDICATED BY THE DASHED LINES AND DIMENSIONED APPROXI-MATELY AS FOLLOWS:

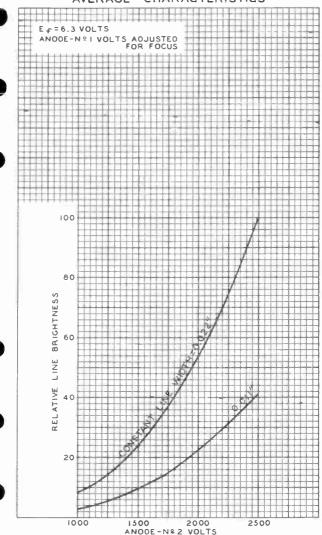
A = 1.85" MAX., B = 0.500", C = 0.200" MIN., D = 0.925".

92CM-6763



# SUR

# AVERAGE CHARACTERISTICS

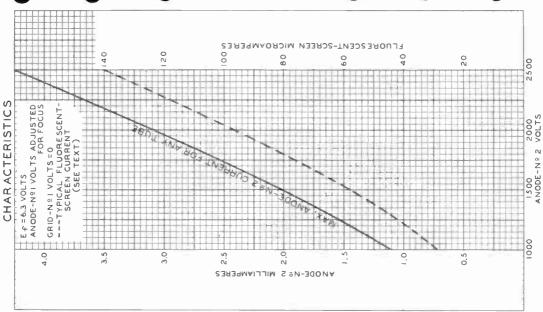


NOV. 7,1946

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA HARRISON NEW JERSEY

92CM-6808

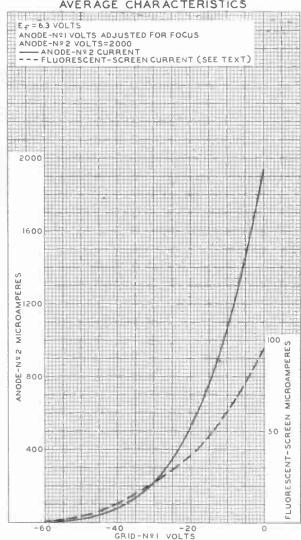






# SUD

## AVERAGE CHARACTERISTICS





# Oscillograph Tube

ELECTROSTATIC DEFLECTION

ELECTROSTATIC DEFLECTION

. . . Medium-Short<sup>C</sup> (Approx. 38 µsec)

Phosphor (For curves, see front of this section) P7  Luarescince
5UP11
Oscillograph Tube
ELECTROSTATIC FOCUS  For Photographic Recording and Visual Observations  The 5DP11 is the same as the 5DP1 except for the following items
GENERAL  Phosphor (For curves, see front of this section) PII Fluore con
5UP31
Oscillograph Tube

For Extremely Low-Speed Recurrent, or Medium-Speed Non-Recurrent Image Displays The 5UP7 is the same as the 5UP1 except for the following items

ELECTROSTATIC FOCUS

For Low- or Medium-Speed Non-Recuiring Image Displays.
The SUP31 is the same as the SUP1 except for the following items.

GENERAL

b Time for initial brightness to decay to 10% point.

Phosphor (For curves see type 7VP31)

ELECTROSTATIC FOCUS

Prophor - no.

 $<sup>{\</sup>bf a}$  Persistence of useable brightness can be obtained with an anode-No.2 voltage of as low as 1500 volts.

C Phosphorescence may have a useful brightness for over a minute under conditions of adequate excitation and low-ambient illumination.





# SHAII

# TRANSCRIBER KINESCOPE

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA	
neral:	
Cathode to All Other Electrodes	amp  puf  puf  puf  puf  P11  Blue  short  atic  cetic  500  3/8"  1/8"  Any  vity  -Pin  12C  2
Do Not Use 2 (1) ximum Ratings, Design-Center Values:	olts
	olts
	olts
ID-No.1 VOLTAGE:	
negative bias value	volt:
FOSITIVE DIAS VALUE	volt volt
Positive peak value 2 max. \ AK HEATER-CATHODE VOLTAGE:	VO 1 L
Heater negative with respect to cathode:	
During equipment warm-up period not	
exceeding 15 seconds 410 max. v	volt
After equipment warm-up period 125 max.	volt
Heater positive with respect to cathode. 125 max.	volt
ning! Conntion:	
pical Operation:	volt
node-No.2 Voltage"	voit
See next page.	

FEB. 1, 1949

TENTATIVE DATA 1





## TRANSCRIBER KINESCOPE

Anode-No.1 Voltage Range for					
Anode-No.2 Current of 20 µamp		4200	to	5400	volts
Grid-No.2 Voltage"			200		volts
Grid-No.1 Voltage for Visual Cutoff		-42	to	-98	volts
Anode-No.2 Current			20		µamp
Max. Anode-No.1 Current			25		$\mu$ amp
Grid-No.2 Current Range		-15	to	+15	µamp

### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms

#### Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous shortcircuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance .				180	min	ohms
Grid-No.2-Circuit Resistance .				390	min.	ohms
Anode-No.1-Circuit Resistance.					min.	
Anode-No.2-Circuit Resistance.	. •	٠		30000	min.	ohms!

The resistors used should be capable of withstanding the voltages involved.

## Components:

	Deflecting Yoke	RCA Type No. 201D11
i	Hor. Deflection Output Transformer:	
	For use with 6AS7-G booster scanning tube	
	and separate high-voltage supply	RCA Type No. 204T1
	Foruse with single high-voltage tripler	DO1 7 11 014TO
	supply employing 3 183-GT/8016's	RCA Type No. 211T2
ļ	Ver. Deflection Output Transformer	RCA Type No. 204T2

- Brilliance and definition decrease with decreasing anode voltages. In general, anode-No.2 voltage should not be less than 15000 volts.
- \*\* Subject variation of ± 40% when grid-No.1 voltage cutoff is desired at

#### OPERATING NOTES

Soft x-rays are produced when the 5WPII is operated with an anode-No.2 voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

Resolution of better then 700 lines at the center of the reproduced picture can be produced by the 5WPII. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, it is necessary to use video amplifier having aband-width of at least 10 megacycles.

# TRANSCRIBER KINESCOPE

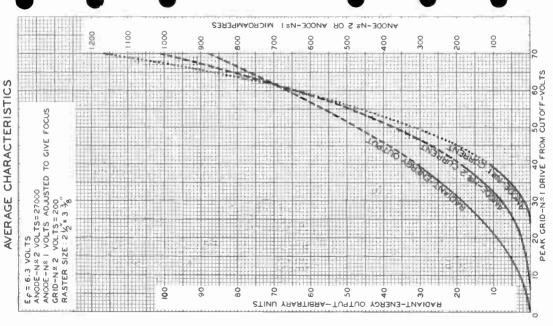
The screen of the 5WPII has highly actinic blue radiation, and is particularly effective for photography. The presistence of the radiation is sufficiently short to prevent "carry over" from one frame to the next. The persistence is dependent to some extent on the current density in the focused spot, and decreases with current density.

Operation of the SWPII results in gradual browning of the face. The rate of browning increases markedly with increase in angue-No. 2 voltage, is proportional to beam current, and is inversely proportional to the scanned area. The browning is most noticeable during initial operation; thereafter, a gradual increase in the amount of browning will be observed during the life of the tube.

> OUTLINE DIMENSIONS for the 5WP11 are the same as those for the 5WP15



# ERISTIC





# 5ZPI6

# STATE

# FLYING-SPOT CATHODE-RAY TUBE

HIGH RESOLUTION CAFABILITY ALIMINIZED SCREEN
ELECTROSTATIC FOCUS MAGNETIC DEFLECTION
For use as soanner in high-quality flying-snot video-signal generators

TO use as school in aga-partity papers of objects generators  DATA
General:
Heater, for Unipotential Cathode:  Voltage
Fluorescence—  visible radiation
Tube Dimersions:  Overall length  Greatest diameter of bulb  Minimum Useful Screen Diameter  Weight (Approx.)  Operating Position  Cap  Recessed Small Cavity (JETEC No.J1-21)  Socket  See Operating Considerations  Base  Small-Shell Duodecal 7-Pin (JETEC No.B7-51)  Basing Designation for BOTTOM VIEW
Pin 1 - Heater Pin 2 - Grid No.1 Pin 6 - Grid No.3 Pin 7 - Internal Connection Do Not Use Pin 10 - Grid No.2 Pin 11 - Cathode  Pin 12 - Heater Cap - Ultor (Grid No.4, Collector) C - External Conductive Neck Coating
Maximum Ratings, Design-Center Values:         ULTOR VOLTAGE.       27000 max. volts         GRID-No.3 VOLTAGE.       7000 max. volts         GRID-No.2 VOLTAGE.       350 max. volts
→ Indicates a change.





# FLYING-SPOT CATHODE-RAY TUBE

GRID-No.1 VOLTAGE:  Negative bias value  Positive bias value  Positive peak value		150 max. 0 max. 2 max.	volts volts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect			
During equipment warm—up p exceeding 15 seconds		410 max.	volts
After equipment warm-up be			volts
Heater positive with respect		150 max.	volts
quipment Design Ranges:			
For any ultor voltage $(E_{C,\downarrow})$ Grid-No.3 Voltage for focus	between 20000	o and 27000 t	volts
with ultor current of 25 µa or less	20.5% to 20	5.5% of E <sub>C4</sub>	volts
extinction of undeflected focused snot when circuit design utilizes fixed grid—No.1 voltage Srid—No.1 voltage for visual extinction of undeflected focused spot when circuit	2 to 5 t	imes Ec <sub>l</sub>	volts
design utilizes fixed grid-No.2 voltage Grid-No.2 Current	-20% to -5 -15 t	50% of E <sub>C2</sub>	volt:
xamples of Use of Design Rang	es:		
For ultor voltage of Grid-No.3 Voltage for focus	20000	27000	volt:
with ultor current as indicated	100 to 5300	5500 to 7100	volts
design utilizes fixed grid-No.1 voltage of -70 volts	140 to 350	140 to 350	volt
Grid-No.1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed			
grid-No.2 voltage of 200 volts	→10 to -100 25	-40 to -100	volt μ
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance .		1.5 max. m	ne gohm:
* Brilliance and definition decrea general, the ultor voltage should			



# FLYING-SPOT CATHODE-RAY TUBE

#### OPERATING CONSIDERATIONS

X-Ray Warning. X-ray radiation is produced at the face of the 5ZPI6 when it is operated at its normal ultor voltage. These rays can constitute a health hizard unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure that it provides the raquided provention maginat personal injury.

The base pins of the 52PI6 fit the Duodecal I2-contact socket. The socket contacts corresponding to the vacant pin positions (pin positions 3,4,5,8, and 9) should be removed in order to provide the maximum insulation for the high-voltage pins 6 and 7. The socket should be made of high-grade, arcresistant, insulating material and should preferably be designed with baffles.

Resolution of better than 1000 lines at the center of the reproduced picture can be produced by the 5ZP16 when it is operated with 27,000 volts on the ultor. At lower ultor voltages, the resolution capability decreases. To obtain high resolution in the horizontal direction, it is necessary to use a video amplifier having a bandwidth of about 20 megacycles.

The ultraviolet output of the 5ZPI6 is a linear function of the ultor current. For any particular value of ultor current, the ultraviolet output is approximately 50 per cent higher when the 5ZPI6 is operated with 27,000 volts on the ultor than when operated with 20,000 volts.

Underscanning over a protracted period should be avoided because an underscanned area of the screen will be burned and thus give diminished radiation when the raster is again scanned to full size and be slightly noticeable in the reproduced picture. Furthermore, it is inadvisable to permit a modulated stationary pattern to remain more than a few minutes on the face of the tube. If it remains for a longer time, the phosphor will be burned unevenly over the pattern area.

Never allow the beam to remain stationary, even momentarily, because the high peak energy in the beam will scriously damage the screen. Provision should be made to prevent such a possibility. Provision should also be made in equipment design to insure that the ultor voltage will drop as fast as the scanning current when the equipment is turned off; or to bias grid No. I to beam-current cutoff when the equipment is turned off.

Indicates a change.

52016



# FLYING-SPOT CATHODE-RAY TUBE

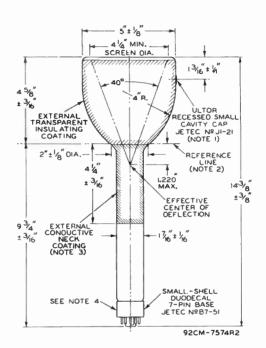
#### BLOCK DIAGRAM OF FLYING-SPOT VIDEO-SIGNAL GENERATOR SYSTEM FOR SLIDE TRANSPARENCIES HORIZON) AL HIGH-VOLTAGE POWER SUPPLY VERTICAL & HORIZONTAL SAW TOOTH GENERATORS OUTPUT VERTICAL OUTPUT AMPLIFIER VERTICAL HORIZONTAL SCANNING SCANNING MULTIPLIER-HIGH POWER SUPPLY VOLTAGE ULTOR VIDEO AMPLIFIER то GRID Nº I OBJECTIVE ! EQUALIZATION TYPE DEFLECTING P2I LENS YOKE TYPE SLIDE 5ZPI6 CONDENSER LENSES SYNCHRONIZING MIXED BLANKING TO LINE SIGNAL BLANKING AMPLIFIER **AMPLIFIER** GENERATOR SIGNAL 92CS-7597R2

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.



# STATE

## FLYING-SPOT CATHODE-RAY TUBE



NOTE  $^{\dagger}$ : THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION  $^3$  MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY AN ANGULAR TOLERANCE  $^{\dagger}$ ME/SURED ABOUT THE TUBE AXIS  $^{\dagger}$  OF  $^{\pm}$   $^{\dagger}$ O $^{\circ}$ . THE ULTOR TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION  $^{\dagger}$ O.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC No.110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY INTERSECTION ON PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

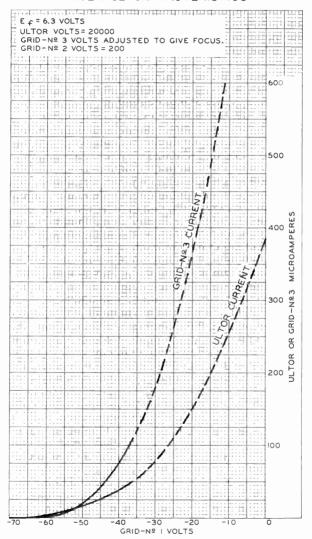
NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

NOTE 4:  $\$  OF BULB WILL NOT DEVIATE MORE THAN  $2^{\rm O}$  IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

52916



## AVERAGE CHARACTERISTICS



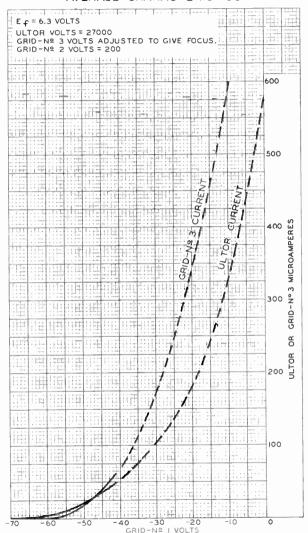
ELECTRON TUBE DIVISION

92CM-7575RI



# STOJE

## AVERAGE CHARACTERISTICS



ELECTRON TUBE DIVISION

92CM-7576RI





# 7BP7-A OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

Heater, for Unipotential Cathode:   Voltage
Voltage
Pin 1 - No Connection Pin 2 - Heater Pin 3 - Grid No. 2 Pin 4 - No Connection Pin 5 - Grid No. 1  Maximum Ratings, Design-Center Values:  ANODE® VOLTAGE GRID-No. 2 VOLTAGE GRID-No. 1 VOLTAGE: Negative bias value.  125 max. volts
ANODE® VOLTAGE
ANODE® VOLTAGE
Positive bias value 0 max. volts Positive peak value 2 max. volts PEAK GRID-No.1 DRIVE FROM CUTOFF 65 max. volts PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode. 125 max. volts Heater positive with respect to cathode. 125 max. volts Typical Operation:
Anode Voltage*

1887-1



#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms

#### Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

ı	Grid-No.1-Circuit	Resistance				150	min.	ohms
ı	Grid-No.2-Circuit	Resistance				820	min.	ohms
ı	Anode-Circuit Res	istance				9100	min.	ohms.

The resistors used should be capable of withstanding the voltages involved.

#### Components:

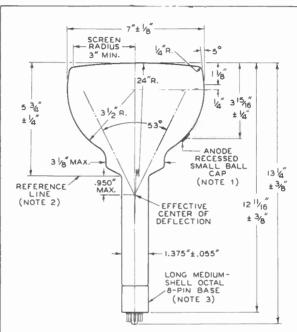
RCA Focusing Coil...... RCA Type No. 202D1

- Anode and grid No.3, which are connected together within tube, are referred to herein as anode.
- At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
- \* Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 4000 volts.
- For visual extinction of undeflected focused spot.
- For JETEC Focusing Coil No.106, or equivalent, with center line of air gap approximately 2-3/4\* from referenceline (see Outline Drawing), and total anode current of 200 microamperes.
- # The center of the undeflected, unfocused spot will fall within a circle having 12 mm radius concentric with the center of the tube face.



# 7BP7-A OSCILLOGRAPH TUBE





- NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN NO.5 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°, ANODE TERMINAL IS ON SAME SIDE OF TUBE AS PIN NO.5.
- NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + .003" .000" I.D. AND 2" LONG WILL REST ON BULB CONE.
- NOTE 3: & OF BULB WILL NOT DEVIATE MORE THAN 20 IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

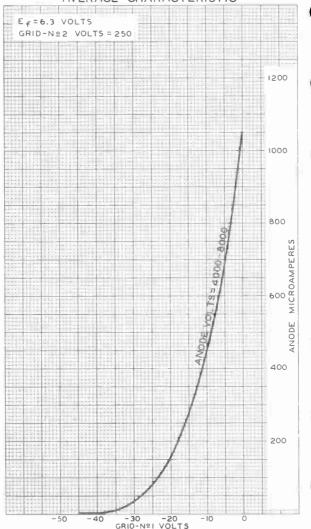
92CM-6367R3

# 1897-A



## 7BP7-A

# AVERAGE CHARACTERISTIC



MAR.22,1948

TUBE DEPARTMENT

A COLORAT COLORA AND A COLORA HARD WELL Y

World Radio History

92CM-6373RI



# 7CPI OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS, MAGNETIC DEFLECTION

_	ELECTROSTATIC FOCUS, MAGNETIC DEFLECTION	_
G	eral:	
D P FDSOGMC	ter, for Unipotential Cathode:  (oltage 6.3 ± 10%	on uf uf ico
М	imum Ratings, Design-Center Values:	
A A G	DDE-No.2 VOLTAGE	ts ts ts
T	oical Operation:	
G	ode-No.2 Voltage*	ts ts
	See next page.	

1co



# OSCILLOGRAPH TUBE

- Brilliance and definition decrease with decreasing anode-40.2 voltage. In general, the anode-40.2 voltage should not be less than 4000 volts.
- O Individual tubes may require between -30% and +20% of the values shown with grid-wo.1 voltages between zero and cutoff.
- \*\* Visual extinction of undeflected focused spot. Supply should be adjustable to  $\pm\,50\,\mathrm{s}$  of indicated value.

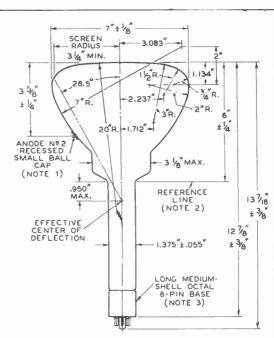
May Laura	Circuit	Values

Grid-No.1-Circuit Resistance. . . . . 1.5 max. megohms





# OSCILLOGRAPH TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN NO.2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE NO.2 TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. ANODE NO.2 TERMINAL IS ON SAME SIDE OF TUBE AS PIN NO.2.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE GAUGE 1.430" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

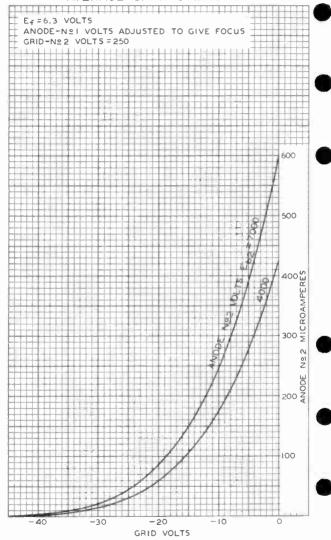
NOTE 3: COF BULB WILL NOT DEVIATE MORE THAN 20 IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.

92CM-6364R2

108)



# AVERAGE CHARACTERISTICS



AUG. 23, 1946

TUBE DEPARTMENT

PADIO CORPORATION OF AMERICA, MARRISON NEW JERSEY

World Radio History

920-6424



# **7DP4**

KINESCOPE

	MINESCOPE	
,	ELECTROSTATIC FOCUS MAGNETIC DEFLECTION	,
	DATA	
	General:	ı
)	Heater, for Unipotential Cathode:  Voltage 6.3 ac or dc volts:  Current 0.6 amp  Direct Interelectrode Capacitances (Approx.):  Grid No.1 to All Other Electrodes 6	
	External Conductive Coating to Anode No.2 1500 max. uuf	
	Phosphor IFor Curves, see front of this Section). No.4 Fluorescence and Phosphorescence. White Persistence of Phosphorescence. Medium Focusing Method. Electrostatic Deflection Method. Magnetic Deflection Angle (Approx.)	
	Pin 1 - Heater Pin 2 - Grid No.1 Pin 6 - Anode No.1 Pin 7 - Internal Con Do Not Use Pin 10 - Grid No.2 Pin 11 - Cathode Pin 12 - Heater Cap - Anode No.2. Grid No.3	
	Maximum Ratings, Design-Center Values:	
	ANODE-No.2® VOLTAGE	
	After equipment warm-up period 150 max. volts	4

a, e: See next page. ← Indicates a change. 150 max. volts ←

Heater positive with respect to cathode.





lΤ	yp i	ica	1 0	ре	ra	t	ion	:
----	------	-----	-----	----	----	---	-----	---

Anode-No.2 Voltage*	volts
Anode-No.1 Voltage for Focus <sup>o</sup> 1215 to 1645	
Grid-No.2 Voltage 250	volts
Grid-No.1 Voltage for Visual Cutoff**27 to -63	volts
Max. Anode-No.1 Current Range15 to +10	μатр

## Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . . 1.5 max.megohms

#### → Minimum Circuit Values:

The power supply should be of the limited—energy type with inherent regulation to limit the continuous short—circuit current to 5 ma. If the supply permits the instantaneous short—circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

1	Grid-No.1-Circuit Resistance .				150	min.	ohms
	Grid-No.2-Circuit Resistance .				470	min.	o hms
ı	Anode-No.1-Circuit Resistance.				2700	min.	ohms
	Anode-No.2-Circuit Resistance.				9100	min.	ohms

The resistors used should be capable of withstanding the volt-ages involved.

#### Components:

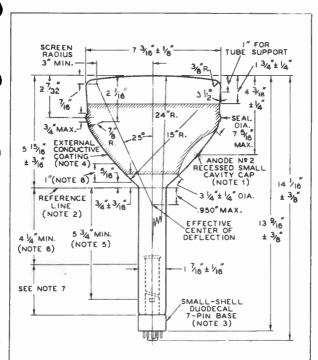
	Ion-Trap Magnet#							RCA Type No. 203D1
>	Deflecting Yoke*							RCA Type No. 201D12

- Anode No. 2 and grid No. 3, which are connected together within tube, are referred to herein as anode No. 2.
- The product of anode-No. 2 voltage and average anode-No. 2 current should never exceed 6 watts.
- Brilliance and definition decrease with decreasing anode-No. 2 voltage. In general, anode-No. 2 voltage should not be less than 5000 volts.
- with the combined grid-wo.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 12 foot-lamberts on a 4 " x 5-1/2" picture area.
- \*\* Visual extinction of undeflected focused spot.
- The dc current required by this magnet is approx. 70 ma. for the typical operating conditions shown.
- The horizontal deflecting-coil current required by this yoke to produce 5-1/2" picture width is approx. 410 ma. peak-to-peak under the typical operating conditions shown. The current varies directly as the square root of the anode-No. 2 voltage.

→ Indicates a change.







NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN PO-SITION No. 3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE No. 2 TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF IDO. ANODE No. 2 TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No. 3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .003" - .000" I.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: 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 CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DI-AMETER OF 1-7.8".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH



(continued from preceding page)

PIN NO.6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO PIN No.6 AND SOUTH POLE TO PIN No. 12.

- NOTE 6: LOCATION OF DEFLECTING YOKE MUST BE WITHIN THIS SPACE.
- NOTE 7: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.
- NOTE 8: FOR TUBE SUPPORT WHICH MUST NOT COVER SPECIFIED CLEAR AREA AROUND ANODE CAP.

92CM-6664R1





T		VOL.	T.S.	1	1	I	Ī	1			1		-		
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#### OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

1	DATA
ı	General:
	Heater, for Unipotential Cathode:  Voltage 6.3 ac or dc volts  Current 0.6 amp  Direct Interelectrode Capacitances (Approx.):
	Grid No.1 to All Other Electrodes.       6
	DJ3 to All Other Electrodes
	Fluorescence and Phosphorescence Greer Persistence of Phosphorescence
	Deflecting—Electrode Arrangement See Outline Drawing Overall Length
	Minimum Useful Screen Diameter
	Pin 1 - Heater Pin 9 - Anode No.2, Pin 2 - Cathode Grid No.2 Pin 3 - Grid No.1 Pin 10 - Deflecting
	Pin 4 - No Connection Pin 5 - Anode No.1 Pin 7 - Deflecting Electrode Electrode DJ2 Pin 11 - Deflecting Electrode DJ1
	Electrode DJ1 DJ3 Pin 8 - Deflecting Connection- Electrode Do Not Use
	NI <sub>4</sub> Pin 14 - Heater

#### $DJ_1$ and $DJ_2$ are nearer the screen $DJ_2$ and $DJ_d$ are nearer the base

With DJ<sub>1</sub> positive with respect to DJ<sub>2</sub>, the spot is deflected toward pin 5. With DJ3 positive with respect to DJ4, the spot is deflected toward pin 2.

The plane through the tube axis and pin 5 may vary from the trace produced by DJ1 and DJ2 by an angular tolerance (measured about the tube axis) of 10°. Angle between  $DJ_1 - DJ_2$  trace and  $DJ_3 - DJ_4$  trace is  $90^{\circ} \pm 3^{\circ}$ .





#### OSCILLOGRAPH TUBE

Maximum Ratings, Design-Center Values: ANODE-No.2 ● VOLTAGE□ . . . . . . . . . . . . .

ANODE-No.1 VOLTAGE . .

Negative bias value. . . .

GRID-No.1 VOLTAGE:

Destate the section	0 =	
Positive bias value	0 max. 2 max.	volts
PEAK VOLTAGE BETWEEN ANODE No. 2 AND	750	, ,
ANY DEFLECTING ELECTRODE PEAK HEATER-CATHODE VOLTAGE:	750 max.	VOITS
Heater menative with respect to cathode.	125 max.	volts
Heater positive with respect to cathode.	125 max.	volts
Equipment Design Ranges:		
For any anode-No.2 voltage (Eb <sub>2</sub> ) between 100		
Anode—No.1 Voltage 27% to 40% of E Max. Grid—No.1 Voltage	b2 · · · ·	volts
for Visual Cutoff 2.8% of Eb <sub>2</sub>		volts
Anode-No.1 Current for any		
Operating Condition. —15 to +10 Deflection Factors:	mi	croamp
DJ1 & DJ2	dc/in./kv	of Eb2
DJ3 & DJ4	/ dc/in./kv	of Eb2
Examples of Use of Design Ranges:		, ,
For anode-No.2 voltage of 2000 4000		volts
Anode-No.1 Voltage 540-800 1080-16 Max. Grid-No.1 Voltage		volts
for Visual Cutoff56 -112		volts
Deflection Factors: DJ <sub>1</sub> & DJ <sub>2</sub>	4 volts	dc/in.
DJ3 & DJ4 50–68 100–13		dc/in.
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max. r	negohms
Resistance in Any Deflecting—  Electrode Circuit <sup>o</sup>	5 0 may 1	meachms.
	J.O Hax.	negotiins
Minimum Circuit Values:		
The power supply should be of the limited inherent regulation to limit the continue	energy typ	e with
current to 5 milliamperes. If the sup	oply permi	ts the
instantaneous short-circuit current to ex	ceed 1 ampe	ere, or
is capable of storing more than 250 mi		
effective resistance in circuit between in and the output capacitor should be as follow		ect rode
Grid-No.1-Circuit Resistance		ohms
dira-no.1-offcult hesistance	220 111111	Ottinis
•, □, *, #, o: See next page.		
	and the country of the country of	D + 7 + 4

volts

volts

6000 max.

2800 max.

200 max. volts



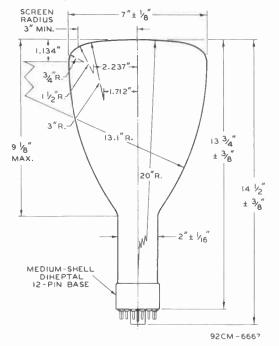
201

#### OSCILLOGRAPH TUBE

Anode-No.1-Circuit Resistance, 3000 min. ohms Anode-No. 2-Circuit Resistance. 6800 min. ohms

The resistors used should be capable of withstanding applied voltage.

- Anode No.2 and grid No.2, which are connected together within tube, are referred to herein as anode No.2.
- For operation at or near 0 volts on grid No.1 and with 4000 to 6000 volts on wonde Nn.2. It is assential that the effective resistance of the anode-Mo.2 supply be adequate to limit to anode-Mo.2 included the anode-Mo.2 inc power to 6 witts.
- rilliance and definition decrease with decreasing anodw-Mv.I .altage. A value as low as 1000 volts is recommended only for low-velocity deflection and low ambient-light levels.
- The center of the undeflected, focused spot will fall within a circle having a 10-mm radius concentric with the center of the tube face.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



C OF BULB WILL NOT DEVIATE MORE THAN 20 IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.





#### AVERAGE CHARACTERISTICS

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AUGUST 4, 1950

TUBE DEPARTMENT

92CM-752I



# 140,

#### **OSCILLOGRAPH TUBE**

MAGNETIC FOCUS

MAGNETIC DEFLECTION

1	DATA
	General:
	Heater, for Unipotential Cathode:  Voltage 6.3
	Pin 1 - Heater Pin 2 - Grid No. 1 Pin 10 - Grid No. 2  Pin 10 - Grid No. 2  Pin 12 - Heater Cap - Grid No. 3, Collector
	Maximum Ratings, Design-Center Values:
)	Ultor® VOLTAGE 8000 max. volts GRID-No.2 VOLTAGE: Positive Value (DC or Peak AC) 700 max. volts
	Negative Value (DC or Peak AC) 180 max. volts GRID-No.1 VOLTAGE: Negative bias value 180 max. volts
	Positive bias value# 0 max. volts
	Positive peak value
)	PEAK GRID-No.1 DRIVE FROM CUTOFF 65 max. volts   PEAK HEATER-CATHODE VOLTAGE:
	Heater negative with respect to cathode. 125 max. volts Heater positive with respect to cathode. 125 max. volts
)	In the 7M-types, grid No.3 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

At or near this rating, the effective resistance of the ultor supply should be adequate to limit the ultor input power to 6 watts.



 $\rightarrow$ 



### **OSCILLOGRAPH TUBE**

Tvpi	ical	Operation:
170	I C & I	Abel ar i Alli

.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						
Ultor Voltage*				4000	7000	volts
Grid-No.2 Voltage				250	250	volts
Grid-No.1 Voltage				-27 to -63	-27 to -63	volts
Grid-No. 2 Current					-15 to +15	µamp
Focusing-Coil Curr	-0	n t				

(DC Approx.) \*\* 64 ± 15% 85 ± 15% ma → Spot Position . . ##

#### Maximum Circuit Values:

Grid-No. 1-Circuit Resistance. . . . . . megohms 1.5 max. Brilliance and definition decrease with decreasing ultor voltage, general, the ultor voltage should not be less than 4000 volts.

For visual extinction of undeflected, focused spot-

For specimen focusing coil similar to JETEC Focusing Coil Mo.109 positioned with air gap toward faceplate and center line of air gap 2-3/4\* from Reference Line (see Outline Drawing) and unlor current of 200 microamperes.

## The center of the undeflected, unfocused spot will fall within a circle having 12-mm radius concentric with the center of the tube face.

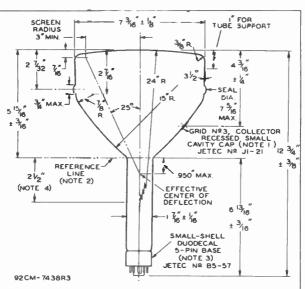
→ Indicates a change

DATA



#### 7MP7 OSCILLOGRAPH TUBE



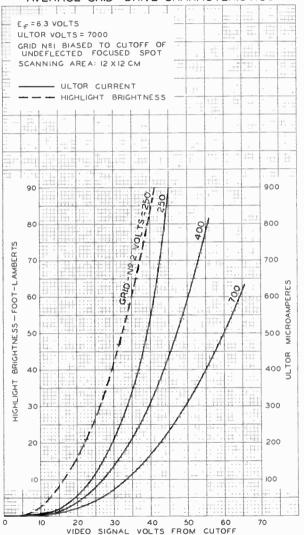


- NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 10°. BULB TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.
- NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE—LINE GAUGE (JETEC No.112) 1.500 + .003"—.000" 1, 0, ANO 2" LONG WILL REST ON BULB COME.
- NOTE 3: SUCKET FOR THIS BASE SHOULD NOT BE RIGIOLY MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULR AXIS AND HAVING DIAMETER OF 1-7/8".
- NOTE 4: LOCATION OF DEFLECTING YOKE MUST BE WITHIN THIS SPACE.





#### AVERAGE GRID-DRIVE CHARACTERISTICS





#### 7MPI4

ARIA

#### OSCILLOGRAPH TUBE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

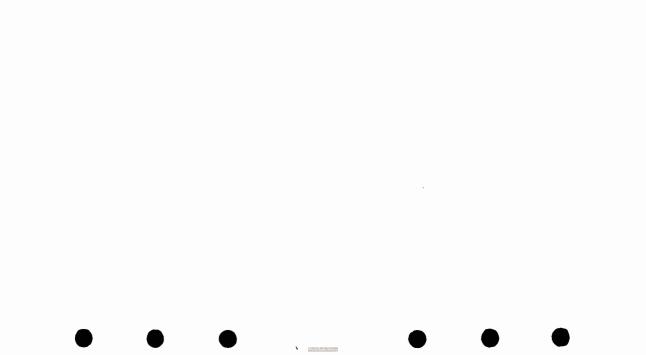
The 7MP14 is the same as the 7MP7 except that it utilizes a medimum-long-persistence, cascade (two-layer) screen which exhibits purple fluorescence of short persistence and orange phosphorescence which persists for a little over aminute under conditions of adequate excitation and ambient light.

Because of its medium—long—persistence, the ;MP14 is particularly useful where either low— and medium-speed non-recurring phenomena or high—speed recurring phenomena are to be observed. Furthermore, two or more phenomena can be observed simultaneously on the screen by means of a suitable switching arrangement.

The persistence is such that the 7MP14 without filter can be operated with scanning frequencies as low as 30 cycles per second without excessive flicker. When used with yellow filter, such as Wratten No.15 (G), the 7MP14 can be operated with much lower scanning frequencies.

In general, operation of the 7MP14 at an ultor voltage below 4000 volts will not give persistence of useable brightness.

THE SPECTRAL-ENERGY EMISSION CHARACTERISTIC and the PERSISTENCE CHARACTERISTIC of the P14 Phosphor are shown at the front of this Section



#### **Projection Kinescopes**

FORCED-AIR COOLED ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION 20 FT. x 15 FT. PROJECTED PICTURES

For Black-and-White Projection Systems in Theater and Closed-Gircuit Television Applications

#### ELECTRICAL

Heater, for Unipotential Cathode
voltage (AC or DC) 6.6 $\pm$ 5% $\setminus$
arrent
Focusing Method Electrostation
Deflection Method Magnetic
Deflection Angle (Approx.)
Direct Interelectrode Capacitances (Approx.)
Catnose to all other electros
Cition to in other electron b
OPTICAL
Faceplate Spherical, Non-Browning Glass
Quality Rectangle of Faceplate
(See Dimensional Outline) 5 x 3-3/4 ir
Refractive Index of Faceplate 1.469
Projection-Throw Distance for
20 ft x I5 ft Picture 60 feet
Phosphor Aluminized P4-Silicate-Sulfide Type
Luminescence
Persistence
MECHANICAL
Air Flow to Face
The specified air flow should be delivered perpendicularly
from a nozzle having a diameter of about 2 inches onto the
face of the tube while it is in operation. See REFLECTIVI
OPTICAL SYSTEM. In a typical system with air filter, the
total system static pressure is approximately 0.25 inch o
water. The cooling airmust not contain water, dust, or other
foreign matter. The air-cooling system should be electrically
interconnected with the anode power supply to prevent operation of the tube without cooling.
· · · · · · · · · · · · · · · · · · ·
Cooling of the tube by a tangential flow of air across its
face is not recommended because the temperature gradient
produced across the face may result in immediate ordelased
cracking of the face.
Operating Position Any
Tube Dimensions
0. rall Length
$\{(1,1),(n) \mid (0,n) \in \mathbb{N} \} $
Cap Medium (JEDEC No.CI-5)
Base Plastic Filled, Small-Shell Diheptal 14-Pin,
(JEDEC No. BI4-15)
( ,-,,

#### TERMINAL DIAGRAM (Bottom View)

Pin	1 - Heater	
Pin	2 - Cathode	Gal
Pin	3 - Grid No.1	NC NC /CL ANODE
Pin	4 - Grid No.2	NC 6 9 G3
Pin	5 - No Connection	NC CV
Pin	6 - No Connection	Tank tone
Pin	7 - No Connection	G <sub>2</sub> (4) (11)NC
Pin	8 - No Connection	
Pin	9 - Grid No.3	GI ZIZNC
Pin	10 - No Connection	k(S) (13) (C
Pin	11 - No Connection	W - (1) (14) - 16
Pin	12 - No Connection	пп
Pin	13 Internal Connection	14N

Do Not Use Pin 14 -Heater Cap -Anode (Grid No.4, Collector)

Note: Socket contacts for Pins No.5, 6, 7, 8, 10, 11, 12, and 13 should be removed so that maximum insulation is provided for Pin No.9.

### CATHODE-DRIVE SERVICE Absolute-Maximum Ratings

Anode-to-Grid-No.! Voltage <sup>b</sup> Grid-No.3-to-Grid-No.! Voltage							V
Grid-No.2-to-Grid-No.1 Voltage							v
Cathode-to-Grid-No.   Voltage	•	•	•	•	•	1300	
Positive bias value						250	¥
Negative bias value						0	V
Peak negative value	•			•		2	v
reak negative varue.	•	•	•	•	•	_	
Average Anode Current <sup>b</sup>						2	mA
Peak Heater-Cathode Voltage							
Heater negative with respect to cathod-							
During equipment warm-up period not							
exceeding 15 secons		٠				410	V
After equipment warm-up period						150	V
Heater positive with respect to cathod-						150	Ý
reater positive with respect to estimos.	•			•		150	

#### Equipment Design Ranges

With any anode-to-grid-No.1 voltage ( $E_{c4g1}$ ) between 70000° and 80000 volts and grid-No.2-to-grid-No.1 voltage ( $E_{c2g1}$ ) between 400 and 850 volts

CZZI		
Grid-No.3-to-Grid-No.1		
Voltage for Focus	20% to 22.6% of E <sub>c4al</sub>	٧
Grid-No.2-to-Grid-No.1 Voltage	C+gi	
for Visual Extinction of Focused	1	
Raster when Circuit Design		
Utilizes Fixed Cathode-to-Grid-		
No.1 Voltage (E <sub>kg </sub> )		٧
- Ngi	2.58 to 3.87 times E <sub>kgi</sub> plus E <sub>kgi</sub> voltage	

Cathode-to-Grid-No. I Video Drive
from Raster Cutoff (Black Level)
to White-Level Value. . . . Same values as fixed cathode-

to-grid-No. | voltage except video drive is a negative voltage

- Indicates a change.



Grid-No.3 Current
Examples of Use of Design Ranges
For anode-to-grid-No.1 roltage of 75000 V
Grid-No.3-to-Grid-No.  Voltage for Focus 15000 to 17000 V Grid-No.2-to-Grid-No.  Voltage for
Visual Extinction of Focused Raster when Circuit Design Utilizes Fixed Cathode-to-Grid-No.! Voltage (Ekgl) of 125 V
Level Value125
Maximum Circuit Value
Grid Mo.I Circuit Resistance 1.5 megohms
GRID-DRIVE® SERVICE
Absolute-Maximum Ratings
Anode-to-Cathode Voltageb.         80000         V           Grid-No.3-to-Cathode Voltage         20000         V           Grid-No.2-to-Cathode Voltage         1050         V           Grid-No.1-to-Cathode Voltage         V         V
Positive bias value
Heater meastion with respect to athod:  During riphement with abspring not moveding it seconds
Equipment Design Ranges
With any anode voltage $(E_{c,2k})$ between $70000^{\circ}$ and $80000$ roles and grid-No.2 roltage $(E_{c,2k})$ between 400 and 600 roles.
Grid-No.3 Voltage for Focus 20% to 22.6% of E <sub>CUk</sub> V Grid-No.2 Voltage for Visual Extinction of Focused Raster when Circuit Design Utilizes
Fixed Grid-No.1 Voltage (E <sub>Clk</sub> ) 2.58 to 3.87 times E <sub>Clk</sub> V Grid-No.1 Video Drive from Raster Cutoff (Black Level) to
White-Level Value Same value as fixed grid-No.t voltage except video drive is a positive voltage
Grid-No.3 Current See footnoted Grid-No.2 Current15 to -15A

#### Examples of Use of Design Ranges

For anode voltage	75000	V
Grid-No.3 Voltage for Focus	15000 to 17000	٧
Grid-No.2 Voltage for Visual		
Extinction of Focused Raster when		
Circuit Design Utilizes Fixed		
Grid-No.1 Voltage (E <sub>clk</sub> ) of		
-155 V	400 to 600	¥
Cathode-to-Grid-No.1 Video Drive from		
Raster Cutoff (Black Level) to White-		
Level Value	155	٧
Maximum Circuit Val	ue	

Maximum Circuit Value

Grid-No.1 Circuit Resistance . . . . 1.5 megohms

d Grid-No.3 current will be approximately 10% to 5%, or less, of anode current. However, a grid-No.3 leakage current of up to 15 μA may be present.

e Grid drive is the operating condition in which the video signal varies the grid-No.1 potential.

#### GENERAL CONSIDERATIONS

The high-voltages at which this type is 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 enclosing 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.

In the use of this tube, it should always be remembered that high voltages may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections, and that the tube surface maintains a static charge for some time after the power has been turned off. Therefore, before any part of the circuit or the tube is touched, the power-supply switch should be turned off, both terminals of high-voltage capacitors should be grounded, and the terminals of the high-voltage power supply should be grounded. After these steps have been taken and before touching the tube, discharge the anode terminal, the surface of the faceplate, and the coated surface of the cone by use of a suitable wand which is connected to ground. It is to be noted that the entire surface of the cone and of the faceplate will not be discharged by touching the wand to a single point on either surface, because the surfaces have high resistance. Therefore, to discharge each surface, it will be necessary to sweep over the entire surface with the wand.

The fluorescent screen, utilizing phosphor No.4 of the silicate-sulfide type, is aluminized. The white fluorescence of the screen has a color temperature of approximately  $-6300^{\rm o}$  k.



a (athode drive is the operating condition in which the video signal varies the cathode potential.

b The product of anode-to-grid-No.1 voltage, or anode-to-cathode voltage, and average anode current should be limited to 160 watts.

<sup>6</sup> Brilliance and definition decrease with decreasing anode-to-grid-No.1 voltage or anode-to-cathode voltage. In general, the anode-to-grid-No.1 voltage or the anode-to-rathode voltage should not be less than 70000 volts.

The spectral energy emission characteristic is shown in Spectral-Energy Emission Characteristic of Phosphor No. 4. The portistence of the phosphorescence is such that its brightness does not exceed 7 per cent of the peak value in 33 milliseconds after excitation is removed.

Darkening of face occurs during normal operation of the tubes with resulting decrease in the light transmitted by the face. The rate of darkening increases rapidly with increase in anode voltage, is proportional to the beam current, and is inversely proportional to the scanned area. The derening develops rapidly during initial operation; thereafter, a gradual increase in the amount of Markening will be observed during the life of the tube.

The anode connection is made to the medium cap on the side of the bulb. The anode connector should have aball-type corona shield with a diameter of about 1-1/2 inches in order to prevent corona.

#### OPERATING HINTS

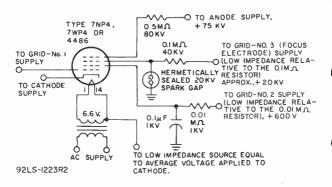
- 1. Never apply power input to the screen suddenly because immediate or delayed cracking of the face may result. Always increase or decrease the anode current gradually.
- 2. Never exceed the rated maximum anode current of 2 milli-amperes,  ${\color{black} 2}$
- Never overscan the screen because the beam will strike the neck and liberate occluded gas which may cause internal arcing.
- 4. Never fail to operate this tube in its equipment at intervals of about 2 months to keep the tube in condition.

For y-ralition shielding considerations, see sheet

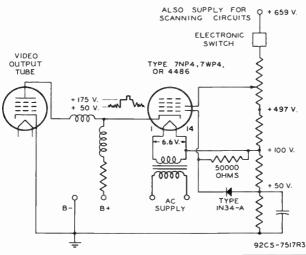
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES

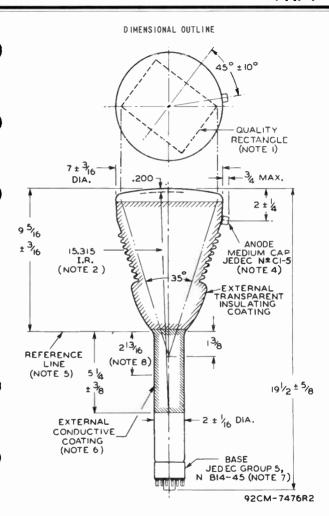
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#### SCHEMATIC DIAGRAM OF CIRCUIT SHOWING PROTECTIVE ELEMENTS EMPLOYED TO PREVENT TUBE DAMAGE



#### SCHEMATIC DIAGRAM SHOWING PRINCIPLES OF CATHODE DRIVE AS WELL AS METHOD FOR AUTOMATICALLY PROTECTING THE TUBE AGAINST OVERDRIVE AND SCANNING FAILURE





DIMENSIONS IN INCHES

See Notes on next page.



**Note 1:** When viewed from the face of the tube, the minor axis of the 5 x 3-3 4 inch quality rectangle is located 45°  $\pm$  10° in a counter-clockwise direction from a plane through the anode terminal and the tube axis.

Note 2: Inside surface of faceplate within the quality rectangle may vary  $\pm~0.006$  from the spherical surface having a 15.315 inch radius.

Mote 3: Inside surface of faceplate within the quality rectangle may vary ± 0.006 inch from the spherical surface having a 20.3 inch radius (Type 7WP4 only).

**Note 4:** The plane through Base Pin No.9 and the tube axis may vary from the plane through the anode terminal and the tube axis by an angular tolerance (measured about the tube axis) of  $\pm$  10°. The anode terminal is on same side as Pin No.9.

Note 5: Reference line is determined by position where gauge  $2.100\pm0.001$  inch L.D. and 3 inches long will rest on bulb cone.

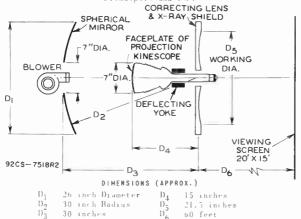
Note 6: External conductive coating must be grounded.

Note 7: Socket for this base should not be rigidly mounted, it should have flexible leads and be allowed to move freely. Socket contacts for Pins 5, 6, 7, 8, 10, 11, 12, and 13 should be removed in order to provide maximum insulation for Pin No.9.

Note 8: Effective deflecting field must be within this space.

#### REFLECTIVE OPTICAL SYSTEM

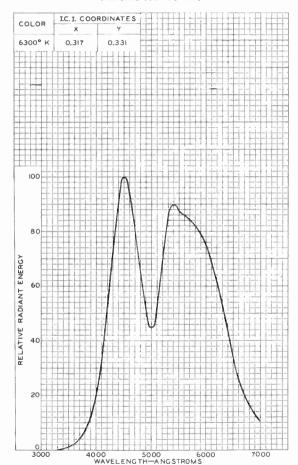
Arrangement of Typical Optical System and Air-Cooling System for Theater-Television Projector Using Reflective Optical Principles and 7NP7





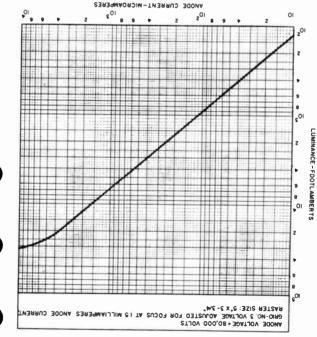
# Spectral-Energy Emission Characteristic of Phosphor No.6

SILICATE-SULFIDE TYPE



92CM - 7458RI

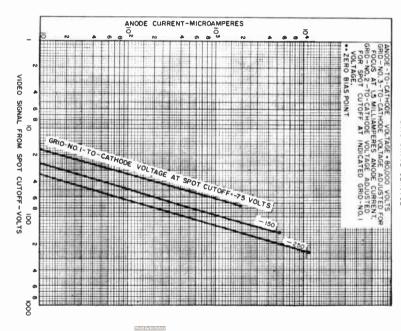
World Radio History



851-M-1562

# Typical Drive haracteristics

GRID-DRIVE SERVICE



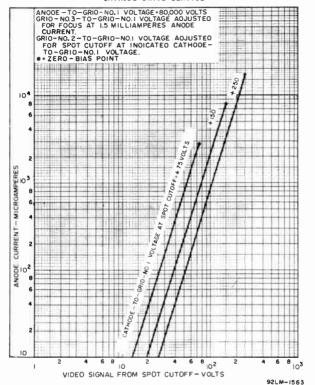


Components and Devices

CORPORATION

#### Typical Drive Characteristics

CATHODE-DRIVE SERVICE





# TO P

#### MONITOR KINESCOPE

MAGNETIC FOCUS

MAGNETIC DEFLECTION

	DATA
	General:
	Heater, for Unipotential Cathode:  Voltage 6.3
	Pin 1 - Heater Pin 2 - Grid No.1 Pin 10 - Grid No.2 Pin 10 - Grid No.2 Pin 10 - Grid No.2
)	Maximum Ratings, Design-Center Values:  ANODE VOLTAGE*
)	Typical Operation: Anode Voltage**
	<ul> <li>The product of anode voltage and average anode current should be limited to 6 watts.</li> <li>Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 6000 volts.</li> </ul>





#### MONITOR KINESCOPE

Grid-No.2 Voltage		300	volts	ľ
tion of Undetlected Focused Spot Focusing-Coil Current (DC, approx.)*			volts ma	
Field Strength of Single-Field Ion-Trap Magnet <sup>o</sup>			gausses	l

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . . 1.5 max. megohms

#### Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 milliamperes. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance incircuit between indicated electrode and the output capacitor should be as follows:

ı	Grid-No.1-Circuit	Resistance				150	min.	ohms
ı	Grid-No.2-Circuit	Resistance				470	mir.	ohms
l	Anode-Circuit Resi	istance				11000	min.	ohms

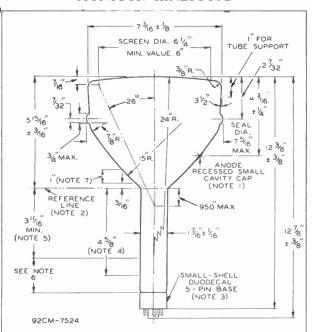
The registors used should be capable of withstanding the applied voltage.

- For specimen focusing coil similar to JETEC Focusing Coil No.109, positioned with air gap toward kinescope screen, and center line of air gap 3 inches from Reference Line (see Dulline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of ab foot-lamperts on a 5-3/8\* x u\* picture area sharply focused at center of screen.
- Measured at center of field with General Electric Gauss Meter, Cat. No. 40 9 x 51.



# TOR W

#### MONITOR KINESCOPE



- NOTE I: THE PLANE THROUGH THE TUPE AXIS AND VACANT PIN POSITION NOTE MAY VARY FROM THE PLANE THROUGH THE TUPE AXIS AND ANODE TERMINALLY AN ANGULAR TOLERANCE (MEASURED AFOUT THE TUPE AXIS) OF 10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION NOT3.
- NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.500" + .003" .000" i.D. AND 2" LONG WILL REST ON BULB CONE.
- NOTE 3: SOCKET FOR THIS EASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF EASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".
- NOTE 4: DISTANCE FROM REFERENCE LINE FOR LOCATING CENTER OF ION—TRAP MAGNETIC FIELD. DIRECTION OF FIELD OF THE ION—TRAP MAGNET SHOULD LE SUCH THAT NORTH POLE IS ADJACENT TO VACANT PIN POSITION NO.8 AND SOUTH POLE TO PIN NO.2.

10PA



#### MONITOR KINESCOPE

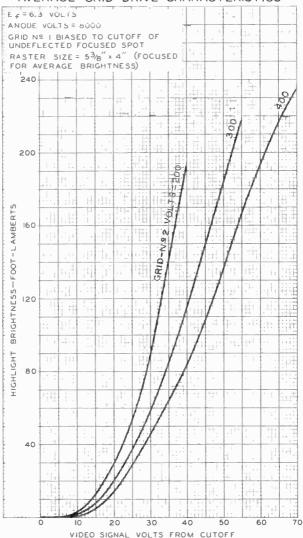
NOTE 5: LOCATION OF DEFLECTING YOKE MUST BE WITHIN THIS SPACE.

NOTE 6: KEEP THIS SPACE CLEAR FOR SINGLE-FIELD, ION-TRAP MAGNET.

NOTE 7: FOR TUBE SUPPORT WHICH MUST BE KEPT AT LEAST 2"
AWAY FROM ANODE CAVITY CAP.



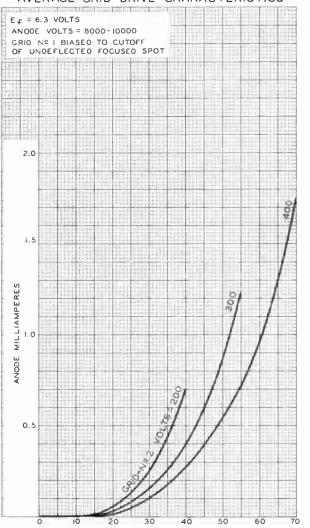
#### AVERAGE GRID-DRIVE CHARACTERISTICS







#### AVERAGE GRID-DRIVE CHARACTERISTICS



VIOEO SIGNAL VOLTS FROM CUTOFF



## MONITOR KINESCOPE

METAL-BACKED SCREEN

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

DATA
General:
Heater, for Unicetential Cathorie:  Voltage 6.3 ac or dc volts Current 0.6
BOTTOM VIEW

Pin 1 - Heater Pin 2 - Grid No.1 Pin 6 - Grid No.3 Pin 10 - Grid No. 2

Pin 11 - Cathode



Pin 12 - Heater

Cap - Grid No. 4, Collector (Ultor)

	Maximum Ratings, Design-Center Values:	
1	ULTOh® VOLTAGE 12000 max. volts	
	GRID-No.3 VOLTAGE 2000 max. volt.	
	GRID-No.2 VOLTAGE 410 max. volts	
	GPID-No.1 VOLTAGE:	
	Negative bias value 125 max. volts	
	Positive bias value	

For curves, see front of this Section.

Positive peak value .

In the TTP4, grid No.4 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

? may. volts



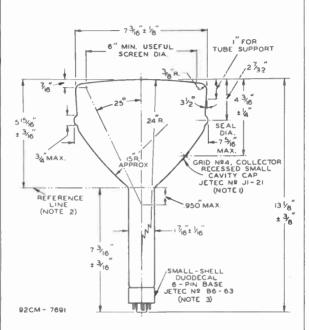


After equipment warm-up period		
For any ultor voltage $(E_{\rm u})$ between 10000° and 12000 volts and grid-No.2 voltage $(E_{\rm C2})$ between 150 and 410 volts Grid-No.3 Voltage for Focus with Ultor Current of 100 $\mu$ amp 11.6% to 15.8% of E $_{\rm u}$ volt Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot 11% to 25.7% of E $_{\rm C2}$ volt Grid-No.3 Current15 to +15 $\mu$ am Field Strength of Adjustable Centering Magnet 1000 gausse Examples of Use of Design Ranges: For ultor voltage of 10000 volt and grid-No.2 voltage of 200 volt Grid-No.3 Voltage for Focus with Ultor Current of 100 $\mu$ amp . 1160 to 1580 volt Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot	Heater negative with respect to cathode:  During equipment warm-up period not exceeding 15 seconds After equipment warm-up period	volts
and grid-No.2 voltage (E <sub>C2</sub> ) between 150 and 410 volts  Grid-No.3 Voltage for Focus with Ultor Current of 100 μamp 11.6% to 15.8% of E <sub>U</sub> volt  Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot 11% to 25.7% of E <sub>C2</sub> Grid-No.3 Current* See Curves Grid-No.2 Current15 to +15 μam  Field Strength of Adjustable Centering Magnet 0 to 8 gausse  Examples of Use of Design Ranges: For ultor voltage of 10000 volt and grid-No.2 voltage of 200 volt  Grid-No.3 Voltage for Focus with Ultor Current of 100 μamp . 1160 to 1580 volt Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot		
Ultor Current of 100 μamp	and grid-No.2 voltage ( $E_{C2}$ ) between 150 and 410 vo	volts
Focused Spot	Ultor Current of 100 $\mu$ amp 11.6% to 15.8% of E $_{ m U}$ Grid-No.1 Voltage for Visual	, volts
Field Strength of Adjustable Centering Magnet 0 to 8 gausse  Examples of Use of Design Ranges:  For ultor voltage of 10000 volt and grid-No.2 voltage of 200 volt  Grid-No.3 Voltage for Focus with Ultor Current of 100 µamp . 1160 to 1580 volt Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot22 to -52 volt  Maximum Circuit Values:	Focused Spot 11% to 25.7% of Ecc Grid-No.3 Current** See Curves	volts µamp
For ultor voltage of 10000 volt and grid-No.2 voltage of 200 volt Grid-No.3 Voltage for Focus with Ultor Current of 100 µamp . 1160 to 1580 volt Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot22 to -52 volt Maximum Circuit Values:	Field Strength of Adjustable Centering Magnet 0 to 8	gausses
and grid-No.2 voltage of 200 volt Grid-No.3 Voltage for Focus with Ultor Current of 100 µamp . 1160 to 1580 volt Grid-No.1 Voltage for Visual Extinction of Undeflected Focused Spot22 to -52 volt Maximum Circuit Values:	· · ·	
Ultor Current of 100 µamp		volts
Focused Spot22 to -52 volt  Maximum Circuit Values:	Ultor Current of 100 μamp	volts
		volts
Grid-No.1-Circuit Resistance 1.5 max. megohm	Maximum Circuit Values:	
	Grid-No.1-Circuit Resistance 1.5 max.	megohms
* Brilliance and definition decrease with decreasing ultor voltage. I general, the ultor voltage should not be less than 10000 volts. • Grid-Ho.3 Current increases as the ultor voltage is decreased.	Brilliance and definition decrease with decreasing ultor volt general, the ultor voltage should not be less than 10000 volt Grid-No.3 Current increases as the ultor voltage is decreased.	age. In S.



#### MONITOR KINESCOPE

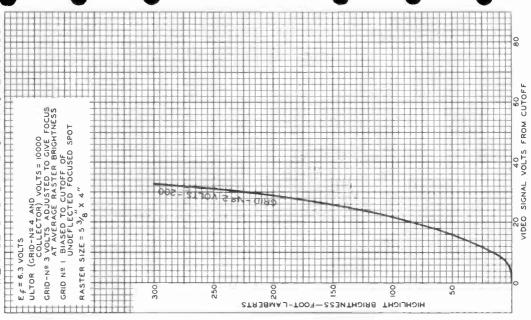




- NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN NO.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND BULB TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS OF \$\delta\$ 10°. BULB TERMINAL IS ON SAME SIDE AS PIN No.6.
- NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No.112) 1.500" + 0.003" 0.000" I.D. AND 2" LONG WILL REST ON BULB CONE.
- NOTE 3: 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 CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".



## S TIC RIS Ш AC α CH GRID-DRIV AVERAGE



CT. 3, 1951

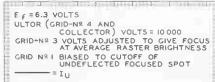
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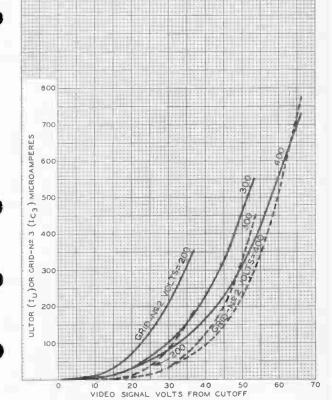
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DIC CORPORATION OF AMERIC



#### AVERAGE GRID-DRIVE CHARACTERISTICS







.





#### **OSCILLOGRAPH TUBE**

ELECTROSTATIC FOCUS

ELECTROSTATIC DEFLECTION

	DATA
ı	General:
	Voltage 6.3
	Mounting Position

#### $DJ_1$ and $DJ_2$ are nearer the screen $DJ_2$ and $DJ_d$ are nearer the base

With DJ1 positive with respect to DJ2, the spot is deflected toward pin 5. With DJ3 positive with respect to DJ4, the spot is deflected toward pin 2.

The plane through the tube axis and pin 5 may vary from the trace produced by DJ<sub>1</sub> and DJ<sub>2</sub> by an angular tolerance (measured about the tube axis) of  $\pm 10^{\circ}$ . Angle between DJ<sub>1</sub> - DJ<sub>2</sub> trace and DJ<sub>3</sub> - DJ<sub>4</sub> trace is  $90^{\circ} \pm 3^{\circ}$ .

See next page.



NOV. 1, 1952



#### **OSCILLOGRAPH TUBE**

TENTATIVE DATA 1

Maximum Ratings, Design-Center Values:

Maximum Katings,	vesign-cent	er vatues	•		
ULTOR® VOLTAGE . GRID-No.3 VOLTAG GRID-No.1 VOLTAG	ε			max. volts	
Negative bias			200	max. volts	
Positive bias			0	max. volts	_
Positive peak			2	max. volts	K
PEAK VOLTAGE BET ANY DEFLEC	WEEN ULTOR A		750	max. volts	
PEAK HEATER-CATH					
Heater negativ Heater positiv				max. volts	
Equipment Design	Ranges:				4
For any ultor	voltage (E	i) between	1000# and 4	ooo volts	4
Grid-No.3 Voltag Maximum Grid-No. for Visual Ext	1 Voltage	27% to 40	0% of Eu	volts	
Undeflected Fo		2.8%	nf F	volts	
Grid-No.3 Curren		-15 t		μamp	
Deflection Facto	rs:				
DJ1 & DJ2				in./kv of Eu	
DJ3 & DJ4 Spot Position .		25 ti		in./kv of Eu	
Examples of Use	of Design R	anges:			
For ultor volta	ge of	1500	3000	volts	
Grid-No.3 Voltag					
for Maximum Grid-No. age for Visual tion of Undefl	1 Volt- Extinc-	00 to 600	800 to 1200	volts	
Focused Spot .	ected	-42	-84	volts	4
Deflection Facto	rs:				1
DJ & DJ DJ & DJ		17 to 62 38 to 51	93 to 123 75 to 102	volts dc/in.	
Maximum Circuit	Values:				
Grid No.1-Circui			1.5 m	ax. megohms	_
Resistance in An			F 0		4
	Electrode (	rcuit	5.0 m	ax. megohms	•
•	ublab ba		function orid	No. 2 and col-	
In the 7VP1, grid lector are connec ferred to collect is the electrode additional elect applied the highe beam prior to its	ted together wated together was "ultower the electrodes connected to the deflection."	ithin the tor." The "ithin the tor." The "ithin to trode in coled within to for accele	ube and are coultor in a cal intor in a cal imbination with the tube to it rating the ele	noveniently re- hode-ray tube h one or more to which is ctrons in the	4
* At or near this r should be adequate	ating, the ef to limit the	fective res ultor input	istance of the power to 6 wa	ultor supply tts.	٦
#,##, <sup>O</sup> : See next pa	ige.				

TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY World Radio History



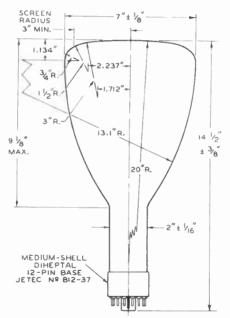
#### OSCILLOGRAPH TUBE

Brilliance and definition decrease with decreasing ultor voltage. A value as low as 1000 volts is recommended only for low-velocity deflection and low amblent-light levels.

with ultor voltage of 1500 volts, the center of the undeflected focused spot will fall within a circle having a 10-mm radius concentric with the center of the tupe face.

It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

> The TVP1 can be used as a direct replacement for the 7JP1 in all equipment where the high-voltage supply does not provide more than 4000 volts.



92CM-6667RI

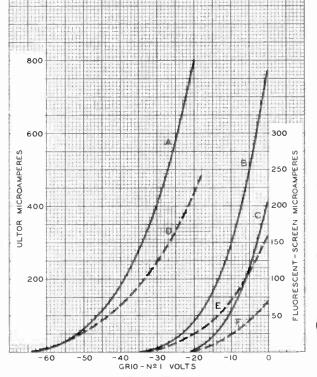
C OF BULB WILL NOT DEVIATE MORE THAN 2º IN ANY DIREC-TION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF BOTTOM OF THE BASE.





#### AVERAGE CHARACTERISTICS

	VOLTS	OR FOC
CURVE	CURRENT	ULTOR VOLTS
Α	ULTOR	3000
В	ULTOR	1500
С	ULTOR	1000
0	FLUORESCENT SCREEN	3000
E	FLUORESCENT SCREEN	1500
F	FLUORESCENT SCREEN	1000



#### Oscillograph Tube

#### ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

MEDIUM-SHORT-PERSISTENCE SCREEN
HIGH DEFLECTION SENSITIVETY

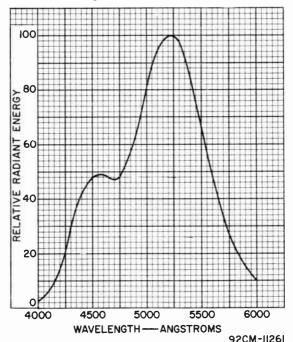
The 7VP is the same as the 7VP i except for the following items:

#### General:

Phospitic (See ac o	~p.	٠.	٠ ،	~ 4	r,~							1 - 1
Fluoresaence												arein
Thosphort scence.												
Parsistance .					V	1 ,70	and	rtb	- 25	cr	 265	us. C.

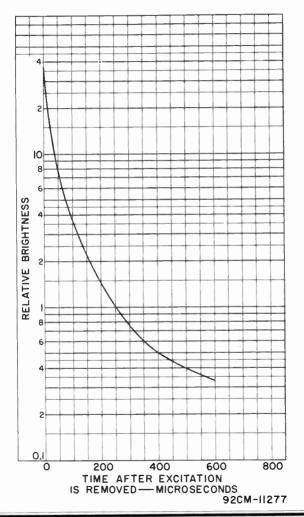
a roma to district mention of the control of the

#### SPECTRAL-ENERGY EMISSION CHARACTERISTIC OF PHOSPHOR P31



b Phosphore can emay tive a uniful brightine's for over a minute under condition of lifeduite on itation and I weartiert ill ministrom.

#### PERSISTENCE CHARACTERISTIC OF PHOSPHOR P31





#### **Projection Kinescope**

FORCED-AIR COOLED ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION 20 FT. x i5 FT. PROJECTED PICTURES

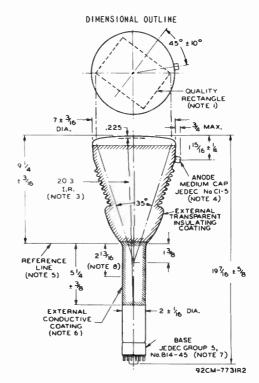
For Black-and-White Projection Systems in Theater and Closed-Gircuit Television Applications

The 7WP4 is the same as the 7NP4 except for the following items:

OPTICAL

Projection-Throw Distance for 20 ft x 15 ft Picture. . .80 ft  $\,$ 

MECHANICAL



DIMENSIONS IN INCHES

See notes on other side.



Note 1: When viewed from the face of the tube, the minor axis of the 5 inch x 3-3 4 inch quality rectangle is located 45° ± 10° in a counter-clockwise direction from a plane through the anode terminal and the tube axis.

Note 2: Inside surface of faceplate within the quality rectangle may vary ±0,006 inch from the spherical surface having a 15,315 inch radius (Type 7NP4 only),

Note 3: Inside surface of faceplate within the quality rectangle may vary ± 0.005 inch from the spherical surface having a 20.3 inch radius,

Note 4: The plane through base Pin No.9 and the tube axis may vary from the plane through the anode terminal and the tube axis by an angular tolerance (measured about the tube axis) of ± 70°. The anode terminal is on same side as Pin No. 9.

Note 5: Reference line is determined by position where gauge 2.100 inch ± 0.001 inch 1.D, and 3 inch long will rest on bulb cone.

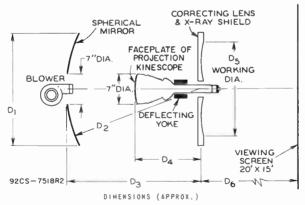
Note 6: External conductive coating must be grounded,

Note 7: Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely, Socket contacts for Pins 5, 6, 7, 8, 10, 11, 12, and 13 should be removed in order to provide maximum insulation for Pin No.9.

Note 8: Effective deflecting field must be within this space.

#### REFLECTIVE OPTICAL SYSTEM

Arrangement of Typical Optical System and Air-Cooling System for Theater-Television Projector Using Reflective Optical Principles and 7WP4



D<sub>1</sub> 27 inch Diameter

D<sub>1</sub> 20 inches Do 40 inch Radius D<sub>5</sub> 24.5 inches

D<sub>6</sub> 80 feet Da 40 inches





#### PICTURE TUBE

EMALL, COMPACT, RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

Heater, for Unipotential Cathode:  Voltage. 6.3 ac or dc volts Current. 0.6 ± 10% amy Capacitance between Internal Conductive Coating and Ultor. 250 min. 44  Faceplate, Spherical Fording and Ultor. 250 min. 44  Faceplate, Spherical Fording and Ultor. Filterglass Phosphor (For curves, see front of this Section) P4—Sulfide Type Deflection Angles (Approx.):  Diagonal 90' Horizontal 85' Vertical 68' Electron Gun 10n-Trap Type Requiring Externa Single-Field Magne  Tube Dimensions: Overall length 7-7/8" + 1/16" - 1/32' Greatest width 7-7/8" + 1/16" - 1/32' Diagonal 8-7/16" + 1/16" - 1/32' Diagonal 8-7/16" + 1/16" - 1/32' Diagonal 8-7/16" + 1/16" - 1/32' Createst height 6-1/16" + 1/16" - 1/32' Createst width 6-1/16" + 1/16" - 1/32' Diagonal 8-7/16" + 1/16" - 1/32' Createst width 7-3/16 Greatest width 7-3/16 Gr	DATA
Voltage. 0.6 ± 10% ami Capacitance between External Conductive Coating and Ultor [350 max. put (250 min. p	eneral:
Faceplate, Spherical Filterglass: Phosphor (for curves, see front of this Section) . P4—Sulfide Typo Deflection Angles (Approx.): Diagonal	Voltage 6.3 ac or dc volt:  Current 0.6 ± 10% am  apacitance between [Aternal Conduct  [350 max. 444
Vertical Electron Gun	aceplate, Spherical Filterglas hosphor (For curves, see front of this Section) - P4—Sulfide Type (seflection Angles (Approx.):  Diagonal
Overall length	Vertical
(External surface)  Screen Dimensions (Minimum):  Greatest width  Greatest height  Diagonal  Projected area  Operating Position  Cap.  Recessed Small Cavity (JETEC No.J1-21  Base . Dwarf-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-158  Basing Designation for BOTTOM VIEW  Pin 1-Heater  Pin 2-Grid No.1  Pin 3-Grid No.4  Pin 10-Grid No.2  Pin 11- Cathode  Pin 12- Heater  Values:  ULTOR VOLTAGE  GRID-No.4 (FOCUSING) VOLTAGE:  Positive value  Soo max. volt	Overall length       10-7/16" ± 5/16         Greatest width       7-7/8" + 1/16" - 1/32         Greatest height       6-1/16" + 1/16" - 1/32         Diagonal       8-7/16" + 1/16" - 1/32         Neck length       6-1/10" ± 3/16
Operating Position	(External surface)
Pin 2-Grid No.1 Pin 3-Grid No.4 Pin 10-Grid No.2 Pin 11-Cathode Pin 12-Heater  Maximum Ratings, Design-Center Values:  ULTOR VOLTAGE. Positive value Negative value  (Grid No.3, Grid No.5, Collector) C-External Conductive Coating	perating Position Ar Carating Position Recessed Small Cavity (JETEC No.J1-21 Sase . Dwarf-Shell Duodecal 6-Pin (JETEC Group 4, No.B6-158
ULTOR VOLTAGE	Pin 2-Grid No.1 Pin 3-Grid No.4 Pin 10-Grid No.2 Pin 11-Cathode Pin 12-Heater  (Grid No.3, Grid No.5, Collector) C-External Conductive
Positive value 500 max. volt Negative value 500 max. volt	JLTOR VOLTAGE 8000 max. volt
	Positive value 500 max. volt

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BOPA



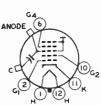
#### PICTURE TUBE

GRID-NO.1 VOLIAGE:	
Negative-peak value 130 max.	volts
Negative-bias value 100 max.	volts
Positive-bias value 0 max.	volts
Positive-peak value 2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode. 180 max.	volts
Heater positive with respect to cathode. 180 max.	volts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

#### Monitor Kinescope

71.01
NO INN-TRAP MAGNET REQUIRED RECTANGULAR GLASS TYPE ALUMINIZED SCREEI LOW-VOLTAGE ELECTROSTATIC FOCUS 90° MAGNETIC DEFLECTION
Electrical:
Direct Interelectrode Capacitances:  Cathode to all other electrodes
letter Current at 6.3 volts 600 ± 60 m Electron Gun Tyre Arquiring No Tor-Trac Magne
Optical:
Phosphor (For Curves, son front of this Section)F4—Sulfide Type
Aluminize
Faceplite
Mechanical:
Weight (Approx.)       2.5 lb         Overall Length       9.94" ± .31         Neck Length       6.00" ± .19         Projected Area of Screen       .36 sq. in         External Conductive Coating:
Type Regular-Ban
Contact area for grounding Near Reference Lin For Additional Information on Coatings and Dimensions:
For Additional Information on coatings and time $0.000$ . See Picture-Tube Dimensional-Outlines and Bulb $J67-1/2$
sheets at front of this section
Cap Recessed Small Cavity (JEDEC No.J1-21 Base
Basing Designation for BOTTOM VIEW
Pin 1 - Heater Fin 2 - Grid No.1





Maximum and Minimum Ratings, Absolute-Maximum Values:	
Unless otherwise specified, voltage val-	
ues are positive with respect to cathode	
Anode Voltage	volts
Positive value	
Negative value	
Grid-No.2 Voltage	volts
Negative peak value	volts
Negative bias value 155 max.	volts
Positive bias value, 0 max.	
Positive peak value 2 max.	volts
Heater Voltage $\{6.9 \text{ max.}\}$	volts
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	volts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode	
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage val-	
ues are positive with respect to cathode	
Anode Voltage	volts
Grid-No.4 Voltage 0 to 300	volts
Grid-No.2 Voltage	volts
Grid-No.1 Voltage for visual extinction of focused raster28 to -72	
Maximum Circuit Value:	
	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



#### Monitor Kinescope

NO ION-TRAP MAGNET REQUIRED

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 90° MAGNETIC DEFLECTION

#### Electrical:

	1.1	** :				
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		11 -++, ,				5.1
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79.7	i irm— ir	Time Chair	ijel	 		ord

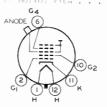
#### Optical:

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Recor		ae'	711				. ,		127	) I I	701		E +									1.00

tur i. - Heater

Anode Voltage . .



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

Unless otherwise specified, voltage valnes are fositive with respect to cathode

.... 22000 mix. volts

Gr. : Mr. : Voltage								
Po it va value.							1100 max.	volts
# Itilve value.							- 100 mili	volts
Gri: No.2 Veltur							(the mark	. • c

0-1-1-4-71				[200 m	in.	volts
Griu-'.n.1 Voltage:				, 2C m	3	. 01+6

Negative bias value . . .

#### **8NP4**

Positive bils value	
Peak Heater-Cathode Voltage: Heater negative with respec* to cathode: During equipment warm-up period	
not excepling 15 seconds	volts
Combined AC and DC Voltage 200 max. DC Component	
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to cathode	
Anode Voltage	volts volts volts
extinction of focused raster28 to -72	volts

#### Maximum Circuit Value:

Grid-No.1 Circuit Resistance . . . . . . . 1.5 max. megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



The grid-No. wolfage required for optimum focus of any individual tube will have a value anywhere between 0 to #400 volts.

#### Test Picture Tube

NO ION-TRAP MAGNET REQUIRED

RECTANGULAR GLASS TYPE ELECTROSTATIC SELF FOCUS	900	ALUMINIZED SCREEN MAGNETIC DEFLECTION
Electrical:		
Direct Interelectrode Capacitances: Cathode to all other electrodes. Grid No.1 to all other electrodes. Heater Current at 6.3 volts Electron Gun		6 pf
Optical:	2111110	y no ron-rrap magnet
Phosphor (For Curves, see front of this Sec-	tion) .	
Faceplate		AluminizedFilterglass 80%
Mechanical:		
Weight (Approx.) Overall Length Neck Length Projected Area of Screen External Conductive Coating For Additional Information on Dimensi See Picture-Tube Dimensional-Out sheets at front of this section Cap	ions: lines Cavi	11.44" ± .31" 7.50" ± .19" 36 sq. in. None and Bulb J67-1/2A ity (JEDEC No.J1-21) Shell Duodecal 5-Pin
Basing Designation for BOTTOM VIEW.		C Group 4, No.B5-57)
Pin 1 - Heater Pin 2 - Grid No.1 Pin 10 - Grid No.2, Grid No.4 Pin 11 - Cathode Pin 12 - Heater Cap - Anode (Grid No.3, Grid No.5, Screen, Collector)	G <sub>1</sub>	ANODE  123  10 G2  11 K  H  H
Maximum Ratings, Design-Maximum Value		
Unless otherwise specified, ues are positive with respe		
Anode Voltage		
Negative peak value		220 max. volts 155 max. volts 0 max. volts 2 max. volts

Heater neg respect During e not ex After ed Heater pos	Cathode Volta pative with to cathode: equipment warm cceeding 15 se quipment-warm- sitive with to cathode	n-up period econds -up period.		. 200 n	nax. voli	ts
Typical Oper	ating Conditi	ons for Ca-	thode-l	Drive Se	rvice:	
,,				,,,,,		
Un	less otherwis	e specified	d. vol	tage val	-	
Un ue Anode Voltag Grid-No.2 ar Cathode Volt	less otherwises are positive ge nd Grid-No.4 \	e specified with response	d, volu	tage val Grid No.	-	

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

. . . 1.5 max. megohms

Grid-No.1-Circuit Resistance. . . .

#### **Test Picture Tube**

NO ION-TRAP MAGNET RFOILIRED RECTANGULAR GLASS TYPE ALUMINIZED SCRE ELECTROSTATIC SELF FOCUS IIOº MAGNETIC DEFLECTI	
Electrical:	
Direct Interelectrode Capacitances:  Cathode to all other electrodes	of pf ma net
Optical:	
Phosphor (For curves, see front of this section) P4—Sulfide Type Alumini.	e,
Faceplate	988
Mechanical:	
External Conductive Coating	31" 19" in. one 2 B
Screen, Collector)  Maximum Ratings, Design-Maximum Values:	
Unless otherwise specified, voltage values	
are positive with respect to cathode  Anode Voltage	lts
Grid-No.2 and Grid-No.4 Voltage 550 vo	lts
Negative bias value	lts lts lts lts

#### **8YP4**

After equipment-warm-us period 200	volts volts volts
Typical Operating Conditions for Cathode-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to Grid No. 1	
Anone Voltage. 16000 Grid-No.2 and Grid-No.4 Voltage 400 Cathode oltage for isual expinction of tocused raster. 42 to 78	volts
of tocused raster. 42 to 78  Maximum Circuit Value: Grid-No.1-Circuit Resistance 1.5 me	

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



### QAP P

#### KINESCOPE

•		1111111111111		
Hoa	iter (	nated Uninotential	Cathode	
V	oltage	2.5		a-c or d-c volts
	urrent	2.1		amp.
Foo	us			Electrostatic
Def	lection			Magnetic
Pho	sphor			No.4
F1ı	orescence			White
Per	sistençe			Med i um
Dir	ect Interelect	rode Ĉapacitance:		
0	irid No.1 to Al	Other Electrodes		9 µµf
Ove	erall Length			21" ± 3/8"
Día	meter			9" ± 1/8"
Bul	b			J-72
Cap	j .			Medium Metal
Bas	e			Medium 6-Pin

#### MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS

Maximum Ratings Are Based on a Line-Voltage Design Center of 117 Volts
High-Voltage Electrode (Anode No. 2) Volt. 7000 max. volts
Focusing Electrode (Anode No. 1) Volt. 2000 max. volts
Accelerating Electrode (Grid No. 2) Volt. 250 max. volts
Control Electrode (Grid No. 1) Volt. Never positive
Fluorescent Screen Input Power/sa cm:

Fixed Pattern 2.5 max. mw
Moving Pattern 5.0 max. mw
Grid Circuit Resistance 1.5 max. megohms
Typical Operation:

Cathode

Cathode

Anode No. 2 Voltage

Anode No. 1 Voltage

Grid No. 2 Voltage

Grid No. 1 Voltage

Grid No. 1 Voltage

Grid No. 1 Signal-Swing Volt. 25

Z5 approx. volts

Grid No. 1 Signal-Swing Volt. 25

Z5 approx. volts

Z5 approx. volts

Z5 approx. volts

NOTE: Brilliance and definition decrease with decreasing anode voltages. In general the anode No.2 voltage should not be less than 5000 volts.

Supply should be adjustable to  $\pm$  20% of the value shown. Approximately 35% of Grid No.2 voltage is required for current cutoff when, in some applications, it is necessary to use the maximum
neurosciple grid-current resistance.

permissible grid-circuit resistance.

Peak-to-peak value for good brilliance with good resolution. For greater brilliance, up to twice this value should be available.

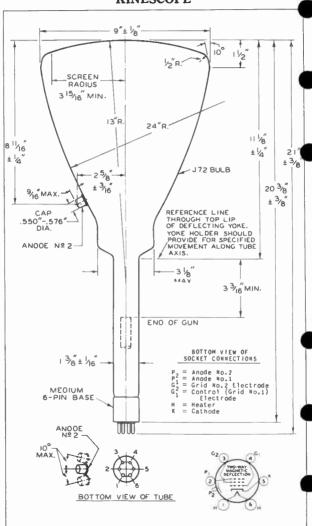
The Characteristic Curves for the 9AP4 are the same as those for the 12AP4.

- Indicates a change.





#### KINESCOPE



Jan. 30, 1942

92C-6015R1

#### Picture Tube

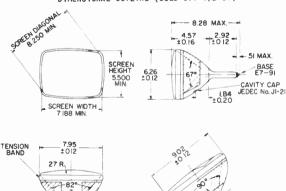
	i iciole Tobe
***	Þ≬⊮=Û=bſÁ tAbĒ
90° MAGNETIC DEFLECTION	LOW-GRID-No.2 VOLTAGE
	ELECTRICAL
Direct Interelectrode Ca	Periode 5 pF Plecinoses 6 pF
Heater Current at 12V Heater Warm-Up Time (Ave	
	OPTICAL
Faceplate	P4—Sulfide Type, Aluminized or this section Filterglass
ula i ali A. (A a a u a u A	MECHANICAL
Neck Length Projected Area of Screen External Conductive Coat	ing <sup>a</sup>
TYDE (See CRT OUTLINES 1 a	t front of this section) Regular-Rand
Con	Near Reference Line
Base	ecessed Small Cavity (JEDEC No.JI-21) Small-Button Special Miniature 7-Pin (JEDEC No.E7-91)
TERMINAL (	DIAGRAM (Bottom View)
710 - 213 1 .1 P10 110a P10 3-70r	ANODE ANODE
Pin A - Houter  Pin b - Chia No. 2  Pin b - Chia No. 2	H 3 6 62
Pin 7 - Grid No.4 p - Grid No.5, Jrid No.5, Screen, (	x2 7 G <sub>4</sub>
Coating	offector Gi
MAXIMUM AND MINIMUM	RATINGS, DESIGN-MAXIMUM VALUES
	tive with respect to cathode
Anode Voltage	8000 min—12000 max V
Grid-No.4 Voltage	
Positive value	
Grid-No.2 Voltage	75 min-250 max V

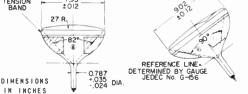
Grid-No.1 Voltage  Negative peak value	V V V
Heater negative with respect to cathode:  During equipment warm-up period ≤ 15 s  After equipment warm-up period . 200 max  Heater positive with respect to cathode:	۷
Combined AC & DC voltage 200 max DC component 100 max  TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	٧
Voltages are positive with respect to grid No.1	
Anode Voltage.       9000         Grid-No.4 Voltage.       0 to 300         Grid-No.2 Voltage.       100         Cathode Voltage.       32 to 50         For visual extinction of focused raster         Field Strength       0 to 8	V V V
Of required adjustable centerina magnet	u
MAXIMUM CIRCUIT VALUE	

a includes implosion protection hardware.

Grid-No. | Circuit Resistance

#### DIMENSIONAL OUTLINE (BULB J71-1/2 BI)





92CL-14672

MO

1.5 max



## TOBRY

#### KINESCOPE

KINESCOPE	
MAGNETIC FOCUS MAGNETIC DEFLECTION	
General:	- 1
Heater, for Unipotential Cathode:  Voltage 6.3 ac or do voltage 0.6	атр ццf
Cathode to All Other Flectrodes 5.0 External Conductive Coating to Anode No.2 2500 min.	ا عنزنز
Phosphor (For Curves, see front of this Section) Fluorescence and Phosphorescence	hite edium hetic 500 hetic tive 3/8" 1/8" x 8" Any
Pin 1 - Heater Pin 2 - Grid No.1 Pin 6 - No Connection Pin 7 - No Connection Pin 7 - No Connection Pin 8 - Anode, Grid No	
Maximum Ratings, Design-Center Kalues:	
ANODE VOLTAGE	olts olts
PEAK HEATER-CATHODE VOLTAGE:  Heater negative with respect to cathode:  During equipment warm-up period not  exceeding 15 seconds	olts olts olts





١	Тур	ical	Operation:	
---	-----	------	------------	--

Anode Voltage"						9000		volts
Grid-No.2 Voltage.						250		volts
Grid No. 1 Voltage						_27 to _	63	volte

#### Maximum Circuit Values:

Grid-No. 1-Circuit Resistance . . . . . . 1.5 max.megohms

#### Minimum Circuit Values:

When the output capacitor of the power supply is capable of storing more than 250 microcoulombs, and when the inherent regulation of the power supply permits the instantaneous short-circuit current to exceed 1 ampere, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

Grid-No.1-Circuit Resistance				150	min.	ohms
Grid-No.2-Circuit Resistance				470	min.	ohms
Anode-Circuit Resistance				11000	min.	ohms

The resistors used should be capable of withstanding the voltages involved.

#### Components:

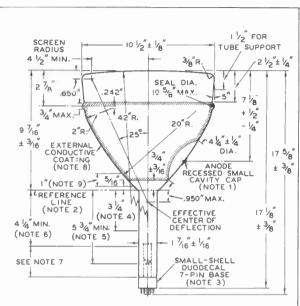
ion-Trap Magnet#							RCA	Туре	No.203D1
Deflection Yoke*							RCA	Type	No.201D1
Focusing Coil **.							RCA	Туре	No.202D1

- The anode and grid No. 3 which are connected together within tube are referred to herein as anode.
- Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 8000 volts.
- O visual extinction of undeflected focused spot.
- \* The dc current required by this magnet is approx. 109 ma. for the typical operating conditions shown.
- The horizontal deflecting-coil current required by this yoke to produce 8° picture width is approx. #70 ma. peak-to-peak under the typical operating conditions shown. The current varies directly as the square root of the anode voltage.
- The dc current required by this coil is approx. 115 ma, for the typical operating conditions shown and using combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 20 foot-lamberts on a 6" x 8" picture area. Distance from reference line (see Outline Drawing) to center line of air gap is approx. 3-1/4".

->Indicates a change.







- NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION NO.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.
- NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.5DD" + .003" .DDO" | .D. AND 2" LONG WILL REST ON BULB CONE.
- NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BERIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DI-AMETER OF I-7/8".
- NOTE 4: APPROX. DISTANCE TO CENTER OF FOCUSING-COIL AFR
- NOTE 5: DISTANCE TO INTERNAL POLE PIECES. PLANE THROUGH PIN NO. 6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF ION-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO PIN NO.6 AND SOUTH POLE TO PIN NO.12.

10874



(continued from preceding page)

NOTE 6: LOCATION OF DEFLECTING YOKE AND FOCUSING-COIL AIR GAP MUST BE WITHIN THIS SPACE.

NOTE 7: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

NOTE 8: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

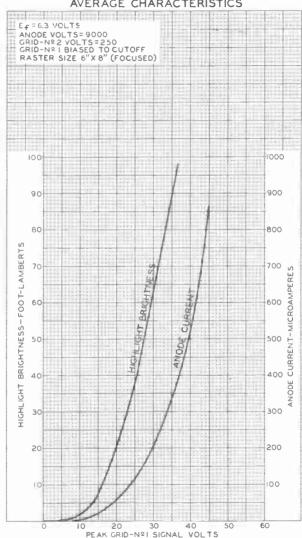
NOTE 9: FOR TUBE SUPPORT WHICH MUST NOT COVER SPECIFIED AREA AROUND ANODE CAP.

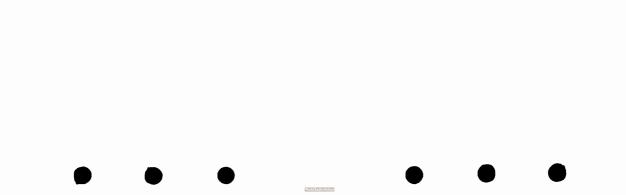
92CM-6663R2



### 108P.S

#### AVERAGE CHARACTERISTICS







#### IOSP4

#### MONITOR KINESCOPE

ALUMINIZED SCREEN

ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION

OSPA

ELECTROSTATIC POCOS MAGNE	
DATA	
General:	
deater, for Unipotential Cathode: Voltage	amp 6 μμτ 5 μμτ Filterqlass 76%
Maximum Ratings, Design-Center Values:	
ULTOR VOLTAGE	20000 max. volts 3000 max. volts 410 max. volts
Negative bias value. Positive bias value. Positive peak value. PEAK HEATER—CATHODE VOLTAGE:	125 max. volts 0 max. volts 2 max. volts
Heater negative with respect to cathode:  During equipment warm—up period  not exceeding 15 seconds	180 max. volts

OSPA



#### MONITOR KINESCOPE

#### Equipment Design Ranges:

For any ultor	voltage	(Ec , ) be	tween	10000	and 20	ooo volts
and grid-No	.2 voltag	e (Ec.)	betwee	n 150	and 41	volts
Grid-No. 3 Valt.						

focus with alter

current of  $100 \mu a$ . 11.7% to 15.9% of Ec. Gris-No.1 Voltage for visual extinction of

8" x f" rast⊷r . . . 9% to 24% of Eco volts

Maximum Grid-No.3 Current".....

See Curves

Grid-No.2 Current. . . . Field Strength of Asjustable Centering Vagnet . . . .

0 to 8

μа

Examples of Use of Design Ranges:

For ultor voltage of 12000 14000 volts and grid-No. 2 voltage of volts 200 200

Grid-No.3 Voltage for focus with ulter

current of 100  $\mu a$ . . . . . 1400 to 1900 1640 to 2225 volts Grid-No.1 Voltage for

visual extinction of

8" x 6" raster . . - - - - 18 to -48 -18 to -48 volts

#### Maximum Circuit Values:

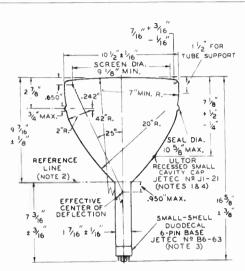
Grid-No.1-Circuit Resistance . . . . 1.5 max. megohms

Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10,000 volts. \*\* Grid-Nc.3 current increases as the ultor voltage is decreased.

> For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

> > - Indicates a change.

#### MONITOR KINESCOPE



92CM - 7729RI

NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TER-MINAL BY AN ANGULAR TOLERANCE IMEASURED ABOUT THE TUBE AXIS) OF + 100. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No. 112) 1.500" + 0.003" -0.000" I.D. AND 2" LONG WILL REST ON BULB CONE.

SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY NOTE 3: MOUNTED: IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/B".

NOTE 4: TUBE SUPPORT MUST BE KEPT AT LEAST 2" AWAY FROM BULB TERMINAL.



### RIS. H CHARAC GRID-DRIVE AVERAGE

FOCUS VOLTS = 12000 TS ADJUSTED TO GIVE I RASTER BRIGHTNESS. -NE3 VOLTS AVERAGE RA NEI BIASED ER SIZE = 8"x VOLTS (GRID-Nº TER E.p = 6.3 ULTOR COL GRID-1 GRID AS. 200 150 002 20 HIGHLIGHT BRIGHTNESS - FOOT-LAMBERTS

ELECTRON TUBE DIVISION

92CMCORPORATION OF AMERICA, HARRISON, NEW JESEY

CUTOF

TER

AS.

FROM R

SIGNAL VOLTS

VIDEO

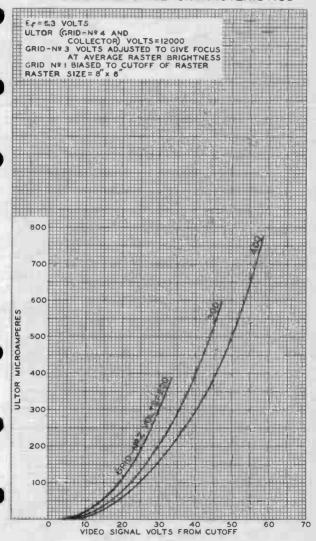
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### A COSO

#### AVERAGE GRID-DRIVE CHARACTERISTICS



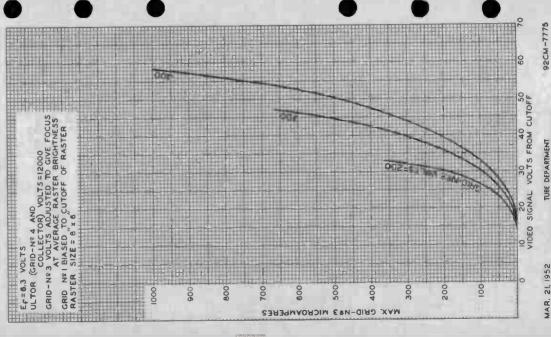
MAR. 21, 1952

TUBE DEPARTMENT
RADIO CONFORMTION OF AMERICA, HARRISON, NEW JIMES

92CM-7773



# S DRIVE



## Picture Tube

	Picture Tube
PAN-C	D-PLY TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS
Direct Interelectrode Capacit Cathode to all other electronic	
Grid No.1 to all other electi	
External conductive coating	
ater Current at 6.3 V	
leater Warm-Up Time (Average)	
Electron Gun	Type Requiring No lon-Trap Magnet
OF	PTICAL
Phosphor	P4—Sulfide Type, Aluminized
For curves, see front of th	
Faceplate	
	· ·
	CHANICAL
Weight (Approx.)	4 lb
leck Length	
rojected Area of Screen	60 sq in
xternal Conductive Coating <sup>a</sup>	·
lype (See CRT OUTLINES ) at front	of this section) Regular-Band
Contact area for grounding	Near Reference Line sed Small Cavity (JEDEC No.JI-21)
Base	- Small-Button Neoeightar 7-Pin,
	Arrangement I, (JEDEC No. B7-208)
TERMINAL DIAG	GRAM (Bottom View)
Pin 1 - Heater	ANODE
Pin 2-Grid No.1	G4 (4)
Pin 3-Grid No.2	
Pin 4 - Grid No.4 Pin 6 - Grid No.1	3/( <u>T</u> ===} <sup>N</sup> \60
Pin 7 Cat hode	
	d GIE 7K
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No.3, Gri No.5, Screen, Collec	ct or)
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No.3, Gri No.5, Screen, Collec C - External Conductive	ct or)
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Crid No.3, Gri No.5, Screen, Collec C - External Conductive Coating	ct or)
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No.3, Gri No.5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT	Ct or)  H  BHR  SHR  TINGS, DESIGN-MAXIMUM VALUES
Pin 7 - Cathode Pin 8 - Heater Cap · Anode {Grid No.3, Gri No.5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT Voltages are positive	Ctor)  BHR  SHR  SINGS, DESIGN-MAXIMUM VALUES  with respect to cathode
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No.3, Gri No.5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT Voltages are positive node Voltage	Ct or)  INGS, DESIGN-MAXIMUM VALUES
Pin 7 - Cathode Pin 8 - Heater Cap - Anode (Grid No. 3, Gri No. 5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT Voltages are positive inode Voltage. rid-No. 4 Voltage	TINGS, DESIGN-MAXIMUM VALUES with respect to cathode 8000 min—15000 max V
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No. 3, Gri No. 5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT Voltages are positive node Voltage. rid-No.4 Voltage Positive value.	TINGS, DESIGN-MAXIMUM VALUES with respect to cathode 8000 min—15000 max V
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No. 3, Gri No. 5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT Voltages are positive Anode Voltage Ositid-No. 4 Voltage Positive value Negative value	TINGS, DESIGN-MAXIMUM VALUES with respect to cathode 8000 min—15000 max V
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No.3, Gri No.5, Screen, Collec C - External Conductive Coating  MAXIMUM AND MINIMUM RAT  Voltages are positive node Voltage. rid-No.4 Voltage Positive value Negative value rid-No.2 Voltage rid-No.1 Voltage	TINGS, DESIGN-MAXIMUM VALUES  with respect to cathode  8000 min—15000 max V
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No.3, Gri No.5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT Voltages are positive Anode Voltage. Positive value Negative value Prid-No.2 Voltage Frid-No.1 Voltage Frid-No.1 Voltage Negative peak value Negative peak value.	TINGS, DESIGN-MAXIMUM VALUES  with respect to cathode  8000 min—15000 max V  1100 max V  200 min—550 max V  220 max V
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No.3, Gri No.5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT Voltages are positive Anode Voltage. Grid-No.4 Voltage Positive value Negative value Sirid-No.1 Voltage Grid-No.1 Voltage Negative peak value Negative peak value Negative bias value Negative bias value. Negative bias value.	TINGS, DESIGN-MAXIMUM VALUES  with respect to cathode  8000 min—15000 max V  1100 max V  200 min—550 max V  220 max V  155 max V
Pin 7 - Cathode Pin 8 - Heater Cap - Anode (Grid No. 3, Gri No. 5, Screen, Collec C - External Conductive Coating  MAXIMUM AND MINIMUM RAT  Voltages are positive Indoor Voltage Positive value Negative value Negative peak value Positive bias value	TINGS, DESIGN-MAXIMUM VALUES  with respect to cathode 8000 min—15000 max V
Pin 7 - Cathode Pin 8 - Heater Cap · Anode (Grid No.3, Gri No.5, Screen, Collec C - External Conductive Coating MAXIMUM AND MINIMUM RAT Voltages are positive Anode Voltage. Grid-No.4 Voltage Positive value Grid-No.2 Voltage. Grid-No.1 Voltage Negative peak value. Negative peak value. Negative bias value.	TINGS, DESIGN-MAXIMUM VALUES  with respect to cathode 8000 min—15000 max V

#### Peak Heater-Cathode Voltage

#### TYPICAL OPERATING CONDITIONS FOR GRID-DRIVE SERVICE

Voltages are positive with respect to cathode

Anode Voltage	 		12000 V
Grid-No.4 Voltage	 		0 to 400 V
Grid-No.2 Voltage Grid-No.1 Voltage	 	• •	400 V
For visual estimation of		٠.	-33 (0 -34 4

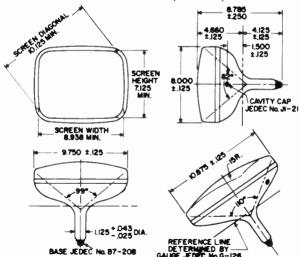
#### MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance . . . . . . . . 1.5 max M()

a Includes implosion protection hardware.

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section

#### DIMENSIONAL OUTLINE (BULB J87A)



DIMENSIONS IN INCHES

92CS-14055



# Picture Tube

	i idole lope
FILLED-I	RIM TYPE
110° MAGNETIC DEFLECTION	INTERMEDIATE-GRID-No.2 VOLTAGE
	des 5 pF rod⇒s 6 pF oanode <sup>a</sup> . 500 min—750 max pF #50 + 20 max
Phosphor	. P4—Sulfide Type, Aluminized
for curves, see front of this	section .
Faceplate	(Approx.)
MECHA	
M 1 1 1 1 1	··· - · · =
Overall Length	4.125 $\pm$ .125 in 60 sq in
Cap Recessed Base	Small-Button Neoeightar 7-Pin, rangement I, (JEDEC No.B7-208)
TERMINAL DIAGRA	M (BOTTOM VIEW)
Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode Pin 8 - Heater Cap - Anode (Grid No.3, Grid No.5, Screen, Collect C-External Conductive Coating  MAXIMUM AND MINIMUM RATIN	GS, DESIGN-MAXIMUM VALUES
Voltages are positive u	
Anode Voltage. Grid-No. 4 Voltage Positive v:lue Negative value Grid-No.2 Voltage.	1100 max V
Cathode Voltage  Negative peak value.  Negative bias value.  Positive bias value.  Po itive peak value.  Heater Voltage	0 max V

#### Peak Heater-Cathode Voltage

Heater negative with respect to cathode: During equipment warm-up period ≤ 15 s. . . . . 450 max V After equipment warm-up period . . . . . 300 max V Heater positive with respect to cathode:

200 max V Combined AC & DC voltage. . 100 max V DC component. . .

#### TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

Voltages are positive with respect to grid No.1

Anode Voltage									11000	٧	
Grid-No.4 Voltage										٧	
Grid-No.2 Voltage										٧	
Cathode Voltage									RI to US	V	

For visual extinction of focused raster

#### MAXIMUM CIRCUIT VALUE

Grid-No. | Circuit Resistance. . . . . . . . 1.5 max

a Includes implosion protection hardware.

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section

#### DIMENSIONAL OUTLINE - 8.785 ± .250 -- 9.562 ± .031 -4.660 - 4.125 ±.125 ±.125 1,500 ±.125 8.437 ±.016 7.062 SHELL ±031 OPENING 82 7.375 MIN. CAVITY ŧ٠ CAP JEDEC 15R: NQ J1-21 MINIMUM SCREEN DIAGONAL 10.250 GREATEST WIDTH GREATEST HEIGHT 9.000 12.500 7.016 10.188 ±.016-SHELL OPENING 9.250 MIN. - 99° -1.125 +.043 DIA 92LS-1573 REFERENCE LINE BASE JEDEC NO. DETERMINED BY GAUGE B7-208 JEDEC NO. G-126

DIMENSIONS IN INCHES

# Picture Tube

1141515	
PAN-O-PLY TYPE	
110° MAGNETIC DEFLECTION LOW-VOLTAGE ELECTROSTAT	FIC FOCUS
Direct Interelectrode Capacitances  Catron to all other fections 5  Gris to all other fections 6  Feternal on an tive costing to arose 500 min—75  Heater Current at 6.3 V	20 mA s ap Magnet
For curve, see front of this color	ullithized
Faceplate	terglass 52%
MECHANICAL	
Overall Length	125 in 60 sq in lar-Band ence Line 10.J1-21) ar 7-Pin,
Arrangement I. (JEDEC No	o. 87-208)
TERMINAL DIAGRAM (Bottom View)	
Pir 1 - Heiter  Lr Cril 1.0.1  Fir	С (6) С (7) К
MAXIMUM AND MINIMUM RATINGS. DESIGN-MAXIMUM VAL	UES
foliages are positive with respect to cathode	
Anode Voltage 9000 min—150	
Politive La	V .
Tentive perkule	( V
neater voltage 5.7 min—6.9	max V

#### Peak Heater-Cathode Voltage

Heater regation with respect to cathode:						
During equipment warm-up neriods ib s			 . 450	max	٧	
After equipment warm-up period	٠		 . 300	max	٧	
Heater positive with respect to cathour:						
Combined AC & DC voltage			 . 200	max	٧	
DC component						

#### TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

Voltages are positive with respect to grid No. 1

Anode Voltage													11000	٧
Grid-No.4 Voltage.													0	٧
Grid-No.2 Voltage.													150	٧
Cathode Voltage													31 to 49	٧
For visual metino	. ;	in	n /	3.1	11	20	. 0.	201	,					

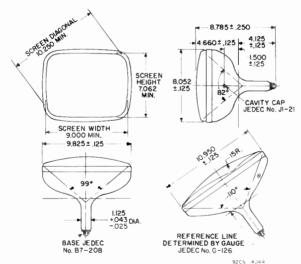
#### MAXIMUM CIRCUIT VALUE

Grid-No.I	Circuit	Resistance											1.5 max N	<b>4</b> )
-----------	---------	------------	--	--	--	--	--	--	--	--	--	--	-----------	------------

a Includes implosion protection hardware.

For testiation shiplifus con issurtions, section X-RADIATION PRECAUTIONS FOR CATHODE-RAY TURES of front of this section

#### DIMENSIONAL OUTLINE (BULB J87B)



DIMENSIONS IN INCHES





# 12AP4/1803-P4

#### KINESCOPE

	Heater	Coated	Unipot	tential	Cathode		
1	Voltage		- 1	2.5		a-c or d-c volts	
ł	Current			2.1		amp.	
1	Focus					Electrostatic	
-	Deflection					Magnetic	
	Phosphor					No.4	
I	Fluorescence					White	
1	Persistence					Medium	1
1	Direct Interel	ectrode C	apacıt	ance:			
1	Grid No.1 to	All Othe	r Elec	trodes		9 բբան	
1	Overall Length		Pofor	to draw	inac of	tube and sleeve	
1	Maximum Diamet	ter S	nerei	LU UIAW	ings of	tube and sieeve	
1	Bulb					J-96	
d	Cap					Medium Metal	
1	Base					Medium 6-Pin	

MAXIMUM RATINGS and TYPICAL OPERATING CONDITIONS Maximum Ratings Are Based on a Line-Voltage Design Center of 117 Volts High-Voltage Electrode (Anode No. 2) Volt. 7000 max. volts Focusing Electrode (Anode No.1) Volt. 2000 max. volts Accelerating Electrode (Grid No. 2) Volt. 250 max. Control Electrode (Grid No.1) Volt. Never positive Fluorescent-Screen Input Power/so cm: 2.5 max. Fixed Pattern Moving Pattern 5.0 max. mw 1.5 max. Grid Circuit Resistance megohms Typical Operation: Should be connected to one side for to mid-tap of heater winding Cathode 6000 7000 Anode No.2 Voltage Anode No.1 Voltage 0 1240 1460 approx. volts 250 Grid No. 2 Voltage 250 volts Grid No. 1 Voltage O Adjusted to give suitable luminous spot 25 Grid No. 1 Signal-Swing Volt. 25 approx. volts

NOTE: Brilliance and definition decrease with decreasing anode voltages. In general the anode No.2 voltage should not be less than 6000 volts.

Supply should be adjustable to ± 20% of the value shown.

Approximately 35% of Grid No.2 voltage is required for current cutoff when, in some applications, it is necessary to use the maximum

off when, in some applications, it is necessary to use the maximum permissible grid-circuit resistance.

Peak-to-peak value for good brilliance with good resolution. For greater brilliance, up to twice this value should be available.

Characteristic Curves of phosphor No.4 are shown at the be-

- Indicates a change.

4

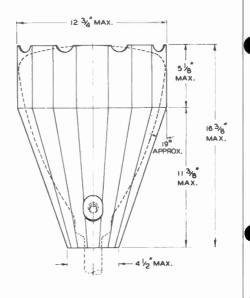
CAND A

12464



#### PROTECTIVE SLEEVE

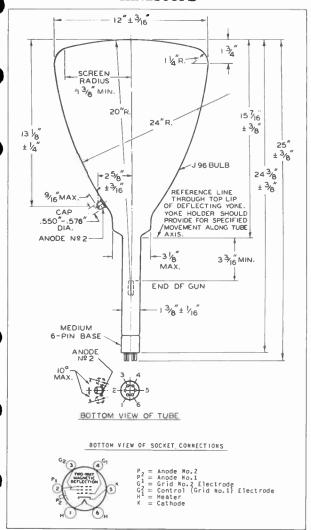
DO NOT REMOVE SLEEVE FROM KINESCOPE





# 2RAD

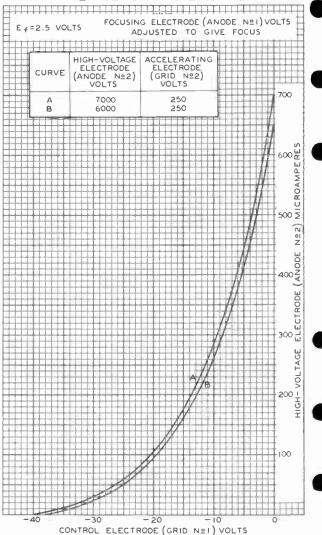
#### KINESCOPE







#### AVERAGE CHARACTERISTICS



# **12BNP4A**

## Picture Tube

_	Picture Tube
PAN-O-PLY TYPE NO ION-TRAP MAGNET REQUIRED	LOW-VOLTAGE ELECTROSTATIC FOCUS HIDO MAGNETIC DEFLECTION
Heater Current at 6.3 V Heater Warm-up Time (Average)	0:F
OF	PTIÇAL
Phosphor	=:14
MEC	HANTCAL
Weight (Approx.).  Overall Length.  Neck Length.  Projected Area of Screen.  External Conductive Coating	
Cap	sed Small Cavity (JEDEC No.JI-21) . Small-Button Neoeightar7-Pin, Arrangement i, (JEDEC No.B7-208) M VIEW
Pir 1 = Hester  Pir 3 = 1.61   No. 2  Pir 4 = 1.61   No. 2  Pir 5 = 1.61   No. 2  Pir 6 = 1.61   No. 2  Pir 7 = 1.61   No. 2  Pir 7 = 1.61   No. 1  Pir 8 = 1.61   No. 1  Pir 9 = 16.66	ANODE  C 17 - Arode  ( 17 - Ar
	INGS, DESIGN-MAXIMUM VALUES
	e with respect to cathode
Grid-No.4 Voltage	
legitive bis value	

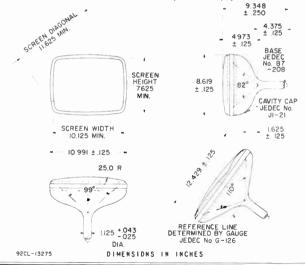
Heater Voltage 5.7 min - 6.9 max Peak Heater-Cathode Voltage Heater negative with respect to cathode:	٧
During equipment warm-upperiod≤15 sec. 450 max	٧
After equipment warm-up period 300 max	٧
Heater positive with respect to cathode:  Combined AC & DC voltage 200 max  DC component	٧
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	
Voltages are positive with respect to grid No. 1	
Anode Voltage	٧
Grid-No-4 Voltage <sup>b</sup> 100	٧
Grid-No.2 Voltage	A
Grid-No.2 Voltage	•
Grid-No.2 Voltage	Ý

#### MAXIMUM CIRCUIT VALUE

Includes implosion protection hardware.

b The grid-No.4 voltage required for optimum focus of any individual tube will have a value answhere between -100 and \*300 volts with the combined cathode voltage and video-signal voltage adjusted to give an anode current of 75 microamperes on a h-3/4-inch by 9-inch pattern from an BCA-2F21 monocope, or equivalent.

#### DIMENSIONAL OUTLINE (BULB J99C/E)





# 12LP4

KINESCOPE

MAGNETIC DEFLECTION



	MAGNETIC FOCUS MAGNETIC DEFLECTION
	DATA
	General:
٠	Heater, for Unipotential Cathode:  Voltage 6.3 ac or dc volts Current 0.6 amp Direct Interelectrode Capacitances (Approx.): Grid No.1 to All Other Electrodes 6
	Phosphor (For Curves, see front of this Section)   No.4
	Pin 1-Heater Pin 2-Grid No.1 Pin 6-No Connection Pin 7-No Connection Pin 10-Grid No.2 Pin 10-Grid No.3
	Maximum Ratings, Design-Center Values:  ANODE VOLTAGE*::::::::::::::::::::::::::::::::::::

Anode and grid No.3, which are connected together within tube, are rereferred to herein as anode.





Typical Operation:			
Anode Voltage*	9000	11000	volts
Grid-No.2 Voltage	250	250	volts
Grid-No.1 Voltage for Visual			
Extinction of Undeflected			
Focused Spot	-27 to -63	-27 to <b>-</b> 63	voits
Focusing-Coil Current			
(DC, Approx.)**.	115	125	ma
Ion-Trap Magnet Current (DC)#.	155	180	ma

#### Maximum Circuit Values:

Grid-No.1 - Circuit Resistance. . . . . . . 1.5 max. megohms

#### Minimum Circuit Values:

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 milliamperes. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output capacitor should be as follows:

The resistors should be capable of withstanding the applied voltages.

Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 9000 volts.

For JETEC Focusing Coil No.106, or equivalent, positioned with center line of air gap approximately 3-1/4" from Reference Line (See Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 25 foot-lamberts for 9000 volts, or 30 foot-lamberts for 1000 volts, on a 7-1/2" x 10" picture area.

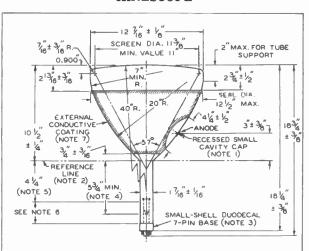
For JETEC ion-Trap Magnet No.108, or equivalent, located with main pole pieces longitudinally opposite internal pole pieces, and rotated to give good line focus with maximum brightness.

#### CURVES

The following Grid-Drive Characteristics Curves are for the condition with grid No.1 biased to give visual extinction of the undeflected, focused spot. In viewing television pictures, it will be found that the actual cutoff voltage corresponding to black in the picture is approximately 5 volts less negative than shown on the curves; similarly, the grid-No.1 drive to obtain a given anode current or light output is also about 5 volts less negative.







NOTE I: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $10^{\rm O}$ . ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.

NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE HINGED GAUGE 1.50D" + .003" - .D00" 1.D. AND 2" LONG WILL REST ON BULB CONE.

NOTE 3: 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 WILLFALL WITH-IN CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".

NOTE 4: DISTANCE DF INTERNAL POLE PIECES. PLANE THROUGH PIN NO.6 AND TUBE AXIS PASSES THROUGH LINE JOINING CENTERS OF POLE PIECES. DIRECTION OF PRINCIPAL FIELD OF 10N-TRAP MAGNET SHOULD BE SUCH THAT NORTH POLE IS ADJACENT TO PIN NO.6 AND SOUTH POLE TO PIN NO.12.

NOTE 5: LOCATION OF DEFLECTING YOKE AND FOCUSING-COIL MUST BE WITHIN THIS SPACE.

NOTE 6: KEEP THIS SPACE CLEAR FOR ION-TRAP MAGNET.

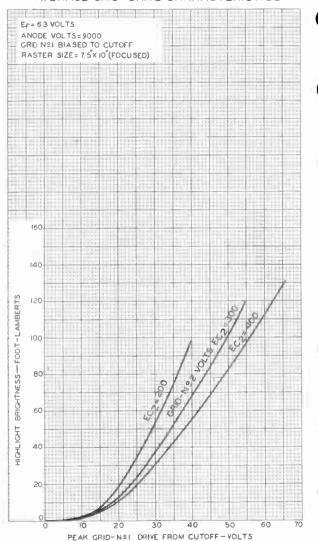
NOTE 7: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

92CM-7276



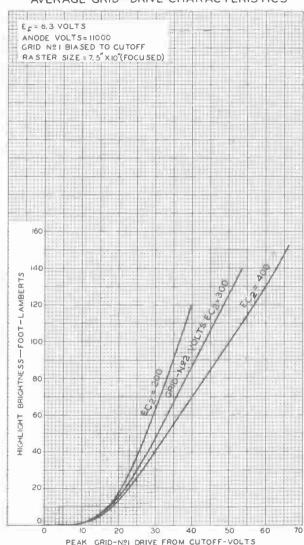


#### AVERAGE GRID-DRIVE CHARACTERISTICS





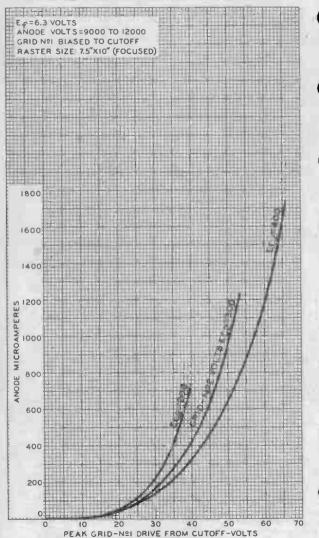
# 12 PA AVERAGE GRID-DRIVE CHARACTERISTICS







#### AVERAGE GRID-DRIVE CHARACTERISTICS



JUNE 23,1949

TUBE DEPARTMENT 92CM-7306



# OSCILLOGRAPH TUBE

ELECTROSTATIC FOCUS

VAGNETIC DEFLECTION

1889

)	DATA
	General:
	Heater, for Unipotential Cathode:  Voltage 6.3
	Pin 1 - Heater Pin 2 - Grid No.1 Pin 10 - Grid No.2 Pin 10 - Grid No.2 Pin 10 - Grid No.2
	Maximum Ratings, Design-Center Values:
	ANODE VOLTAGE
,	Positive value (DC or Peak AC) 410 max. volts Negative value (DC or Peak AC) 180 max. volts GRID-No.1 VOLTAGE:
	Negative bias value 180 max. volts
	Positive peak value 2 max. volts
)	PEAK GRID—No.1 DRIVE FROM CUTOFF 65 max. volts PEAK HEATER—CATHODE VOLTAGE:
	Heater negative with respect to cathode. 125 max. volts Heater positive with respect to cathode. 125 max. volts
	Typical Operation:
	Anode Voltage" 9000 volts Grid-No.2 Voltage
,	At or near this rating, the effective resistance of the anode supply should be adequate to limit the anode input power to 6 watts.
	<ul> <li>Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 8000 volts.</li> </ul>





#### OSCILLOGRAPH TUBE

Grid-No.1 Voltage for Visual Extinction	
of Undeflected Focused Spot27 to -63	volts
Grid-No.2 Current15 to +15	$\mu$ amp
Focusing-Coil Current (DC)** 107 ± 10%	ma
Spot Position **	

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . 1.5 max. megohms

\*\* For specimen focusing coil similar to JETEC No.106 with airgap toward
tube face, center line of air gap 3-1/4\* from Reference Line (see
Outline Orawing), and total anode current of 200 microamperes.

## The center of the undeflected, unfocused spot will fall within a circle having 18-mm radius concentric with the center of the tube face.

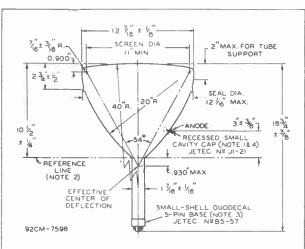
#### OPERATING NOTES

X-Ray Warning. When operated at or below the maximum ratings shown in the tabulated data; the 125P7 does not produce any harmful x-ray radiation. All types of cathoderay tubes may be operated at voltages (if ratings permit) up to 16 kilovolts (absolute value) without personal injury on prolonged exposure at close range. Above 16 kilovolts, special shielding precautions for x-ray radiation may be necessary.



# 12507

#### OSCILLOGRAPH TUBE

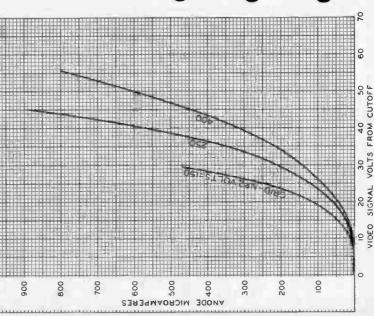


- **MOTE I:** THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.3 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY AN ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm$  10°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.3.
- NOTE 2: REFERENCE LINE IS DETERMINED BY POSITION WHERE REFERENCE-LINE GAUGE (JETEC No.112) 1.500" + .003" -.000" 1.D. AND 2" LONG WILL REST ON BULB CONE.
- NOTE 3: 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 CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING DIAMETER OF 1-7/8".
- NOTE 4: TUBE SUPPORT MUST BE KEPT AT LEAST 2" AWAY FROM ANODE CAP.



# RISTIC L Ü đ HAR GRID





92CM-

### Picture Tube

MA	GNE	TIC	FD	CHO

#### RECTANGULAR GLASS TYPE

70° MAGNETIC DEFLECTION

#### GENERAL DATA

#### Electrical:

	Direct Interelectrode Capacitances:	
_	Cathode to all other electrodes 5	pf
	Grid No.1 to all other electrodes 6	pf
		ηf
	750 min.	ρŧ
	Heater Current at 6.3 volts 600 $\pm$ 30	та
	Electron Gun Ion-Trap Type Requir	i ng
	External Single-Field Magn	net

#### Optical:

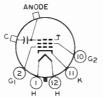
•	Phosphor (For Curves,	see	fr	ont	o f	thi	5	Sec	cti	on	).	. [	94-	-:	Su	f	ide	T	уре
	Faceplate, Spherical	١													F	i 1	ter	، ا پ	ass
	Light transmission	n (/	4pp	rox	(.).													. (	56%

#### Mechanical:

Weight (Approx.).																	TÜ	10	S
Overall Length												1	6	-15	/32	10	±	3/8	11
Neck Length													7	31	16"	+	3.	/16	()
Projected Area of	Sc	ree	n.												, 9	16	sq.	in,	
External Conductiv	/e (	Coa	tir	ng:															
Туре											,	,		, R	egu	ıla	r-1	Ban	d
Contact area for	r g	rou	nd	ing							Νe	ear	F	Ref	ere	no	e l	_in	е
For Additional In	fon	mat	ioi	1 0	n I	Car	at i	ng:	s 3	and	] [	) i m	er	ısi	ons				
See Picture-Tube	e D	ıme	ns	lon	al.	-0ı	itl	ını	e s	ar	ıd	Ви	lb	J	109	- 1	12	A/	С
sheets at front	of	th	is	SE	c t	ior	٦												

. . . . . . Recessed Small Cavity (JFDFC No.J1-21) Base. . . Small-Shell Duodecal 5-Pin (JFDEC Group 4, No.85-57) 

Pin 1-Heater Pin 2-Grid No.1 Pin 10 - Grid No. 2 Pin 11 - Cathode Pin 12 - Heater



Cap - Anode (Grid No.3, Screen, Collector) C - External Conductive Coating

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

Unless	otherwise	specified.	voltage values
are po	sitive wi	th respec	t to cathode

ANODE VOLTAGE						15500	max.	volts
GRID-No.2 VOLTAGE					,	450	max.	volts

# 14EP4

### GRID-No.1 VOLTAGE:  Negative bias value	volts volts	•
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period		
not exceeding 15 seconds		
Combined AC and DC voltage 165 max. DC component 100 max.		
Typical Operating Conditions for Grid-Drive Service:	(	
Unless otherwise specified, voltage values are positive with respect to cathode	•	•
Anode Voltage 12000	volts	
Grid-No.2 Voltage 300 Grid-No.1 Voltage for visual extinction of focused raster28 to -72	volts	
Maximum Circuit Value:	VOILS	
Grid-No.1-Circuit Resistance 1.5 max.	megohms	
dilu-no.1-circuit nesistance 1.J max.	megonins	

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section





#### KINESCOPE

RECTANGULAR GLASS TYPE MACHETIC DEFLECTION

MAGNETIC FOCUS	MAGNETIC DEFLECTION
DATA	
General:	
Heater, for Unipotential Cathode: Voltage 6.3	amp 6 μμf 5 μμτ μ μ μ μ μ μ μ μ μ μ μ μ μ μ μ μ μ μ
Face Plate (With about 66% light transmiss Phosphor (For Curves, see front of this Set Fluorescence and Phosphorescence Persistence of Phosphorescence Focusing Method.  Deflection Method.  Deflection Angles (Approx.):  Diagonal Vertical Persistence Focusing Method.  Inn-Trap Gun Requires Exter Overall Length Greatest Diagonal of Tube at Face.  Greatest Width of Tube at Face.  Greatest Height of Tube at Face.  Screen Size.  Mounting Position.  Cap. Recessed Small Sase Small—Shell Duodeca BOTTOM VIEW	retion) P4—Sulfide Type
Die 1 Heater G	Pin 12 - Heater

Pin 1-Heater Pin 2-Grid No.1 Pin 10 - Grid No. 2 Pin 11 - Cathode

ANODE VOLTAGE



Pin 12 - Heater Cap - Anode

C - External Conductive Coating

14000 may volts

#### Maximum Ratings, Design-Center Values:

ANUDE VOI																		
GRID-No. 2	2 V(	DLTAC	GE .												410	max.	volts	ı
GRID-No.:	L V	DLTA	GE:															l
Negativ	ve l	bias	val	ue													volts	
Positiv	ve i	bias	val	ue													volts	
Positiv	ve i	peak	val	ue											2	max.	volts	l
PEAK HEA	ΓER-	-CAT	HODE	. V(	DL1	ΓΑ	GE:	:										ı
Heater	ne	nat i	VP W	vi tl	hι	rei	sne	PC1	١.	t n	Ċ:	at l	ho	de:				l

During equipment warm-up period not exceeding 15 seconds .

410 max. After equipment warm-up period. . . . 150 max. volts volts Heater positive with respect to cathode 150 max.





#### KINESCOPE

Typical Operation:		
Anode Voltage*	12000 300	volts volts
Extinction of Undeflected Focused Spot. Focusing-Coil Current (DC, approx.).		volts ma
Field Strength of Single-Field Ion-Trap Magnet (Approx.)#	35	gausses

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms

- Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 10000 volts.
  - For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward kinescope screen and center line of air gap 3 inches from Reference Line (see Jutline Drawing). The indicated current is for condition with combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 35 foot-lamberts on an 11-3/8\* x 8-1/2\* picture area sharply focused at center of screen.
- # Measured at center of field with General Electric Gauss Meter, Cat. No.409X51.

#### OPERATING NOTES

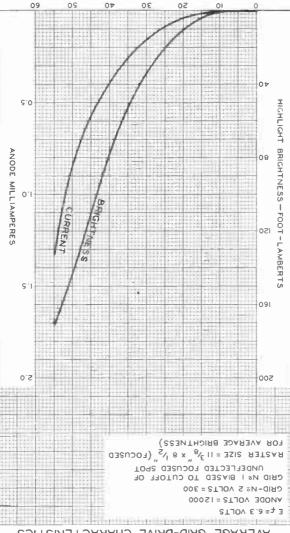
X-Ray Warning. When operated at or below the maximum ratings shown in the tabulated data, the I4CP4 does not produce any harmful x-ray radiation. All types of picture tubes may be operated at voltages (if ratings permit) up to 16 kilovolts (absolute value) without personal injury on prolonged exposure at close range. Above 16 kilovolts, special shielding precautions for x-ray radiation may be necessary.

Direction of the field of the ion-trap magnet should be such that the north pole is adjacent to vacant pin position No.8 and the south pole to pin No.2.





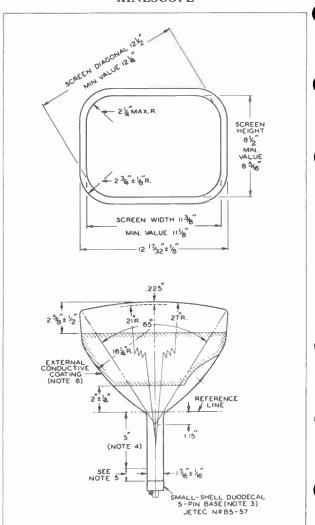
#### AVERAGE GRID-DRIVE CHARACTERISTICS



VIDEO SIGNAL VOLTS FROM CUTOFF

JAC QA

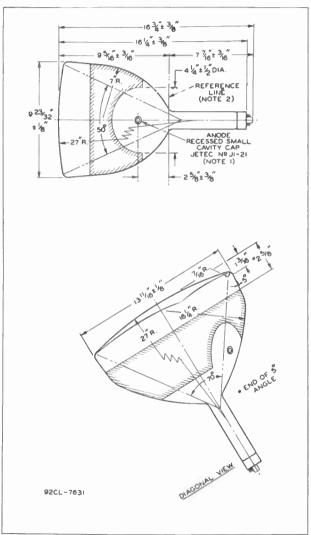








# KINESCOPE



YV CSV



- NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION No.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF 1 3D°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION No.6.
- NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC NO.IID (SHOWN AT FRONT OF THIS SECTION) 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 3: 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 2-1/2".
- NOTE 4: LOCATION OF DEFLECTING YOKE AND FOCUSING DEVICE MUST BE WITHIN THIS SPACE.
- NOTE 5: KEEP THIS SPACE CLEAR FOR SINGLE-FIELD, ION-TRAP MAGNET.
- NOTE 6: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

### Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 70° MAGNETIC DEFLECTION

#### Electrical:

inect interelectron (anacit och :	
( trade trall other electrode 5	rf
Grid No. 1 to all otter ilectrodes 6	pf
Grid No. 1 to all otter inctroder 6  [1000 mix.] hode is a structure of 600 mix.	pf
1 600 mm.	r f
He dir urred at 6 a colt 600 ± 60	m 4
Heater Warmely Time (Alcredi)	reconds
Fiertron Gun Tyre Ferriring No Ton-Trap	1,5duut

#### Optical:

Phosphor (For	Curves, see from	on th	his Section)	.P4—Sulfide Type,
				Aluminized
				Filterqlass
Light tran	mission (Approx	.) .		76%

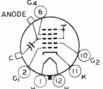
#### Mechanical:

Weight (Approx.)			. ,							10 lbs
Overall Length .										16-1/32" ± 3/8"
heck renath										6-7/8" + 5/16"
Proje 'er are o'		€.								96 a. ir.
External Conduct	VI	. (	n a f	in	1.					

Ser Picture-Tube Pimensional-Outlines and Bulb Jiog-1/2 A/C

Cap. . . . . . . . . . . Rece sed Small Cavity (HDEC No.J1-21) (JEDEC Group 4, No. B6-63)





(3c - Arode (Grid No.3. Grid No.5. Screen. C - External Conductive Costina

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

Unless otherwise specified, voltage values are positive with respect to cathode

Anode Voltage. . . . . . . 12000 max. volts

# **14QP4B**

frank No. 1. If an and Volta and	
(r d=Nr.1 (Focus no) Voltage: Poritive value	volt volt volt
Negstive near value) max. Negative him value	volts volt .olts volt volts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 secons	
After equipment wirm-up period	volt
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to cathode	
Anode Voltage	volts volts volts
Maximum Circuit Value:	VO 113
Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



## Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 90° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

#### Electrical:

Direct Interelectrode Capacitances:	
Cathode to all other electrodes 5	pf
Grid No.1 to all other electrodes	pt.
External conductive coating to anode {1200 max. 800 min.	pf
\ 800 min.	pf
Heater Current at 6.3 volts 600 $\pm$ 30	ma
Heater Warm-Up Time (Average) 11	seconds
Electron Gun Type Requiring No Ion-Trac	Magnet

#### Optical:

Phosphor (For curve:	s, see	e fr	ont	of	this	s se	cti	on)	P4	ļ	-Si	al f	ide	T	ype,
															ized
Faceplate, Spheric															
Light transmissi	on (	App	rox	.).											78%

#### Mechanical:

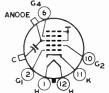
weight (Approx.)										8.5 lbs	
Overall Length.										13-3/16" ± 5/16"	
Neck Length										. 5-1/2" ± 3/16"	
Projected Area o	f	Sc	re	en.						104 sq. in.	
External Conduct	iv	е і	0	ati	ng	:					
Type										Regular_Rand	

Type. . . . . Near Reference Line For Additional Information on Coatings and Dimensions:

See Picture-Tube Dimensional-Outlines and Bulb Ji12 A/B sheets at front of this section Cap . . . . . . . . . . . . . . . . Recessed Small Cavity (JEDEC No.J1-21)

Bases (Alternates): Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-63) Short Small-Shell Duodecal 6-Pin (JEDEC No.B6-203)

Pin 1 - Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10 - Grid No. 2 Pin 11 - Cathode Pin 12 - Heater



Cap - Anode (Grid No.3. Grid No.5. Screen. Collector C - External Conductive Coating

# 14WP4

Maximum and Minimum Ratings, Design-Maximum Values:	
Unless otherwise specified, voltage val-	1
ues are positive with respect to cathode	
ANODE VOLTAGE	volts
GRID-No. 4 (FOCUSING) VOLTAGE:	volts
Positive value	volts
Negative value	volts
GRID-No. 2 VOLTAGE	volts
Negative peak value	volts
Negative bias value 200 max.	volts
Positive bias value 0 max.	volts
Positive peak value 2 max.	volts
HEATER VOLTAGE	volts
PEAK HEATER-CATHODE VOLTAGE:  Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts volts volts
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to cathode	
Anode Voltage	volts
Grid-No.4 Voltage	volts
Grid-No.2 Voltage 300 Grid-No.1 Voltage for visual extinction of	volts
focused raster28 to -72	volts
Maximum Circuit Value:	

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section

Grid-No.1-Circuit Resistance . .



1.5 max. megohms

# Color Picture Tube

# This data sheet is to be used in conjunction with data for RCA-15NP22

For general data, maximum and minimum ratings, equipment design ranges, limiting circuit values, and terminal diagram of the 15AEP22, refer to 15NP22 except as noted below.

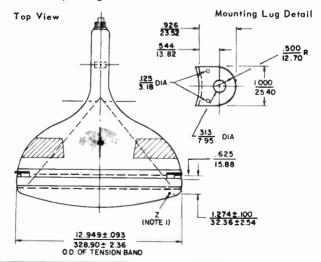
#### MECHANICAL

Tube Dimensions (excluding mounting lugs):

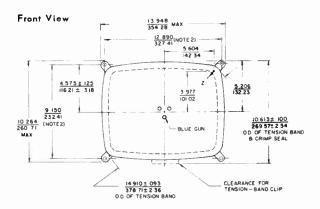
•	
Diagonal 14	.910 ± .093 in (378.21 ± 2.36 mm)
Greatest width 12	.949 ± .093 in (328.90 ± 2.36 mm)
Greatest height (including ten	sion- .613 ± .100 in (269.57 ± 2.54 mm)
night (Anney)	11 2 lb /E 1 kg/

#### DIMENSIONAL OUTLINE

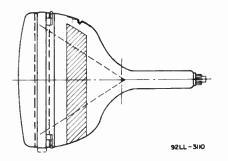
Dimensions shown are only those which are different from the corresponding dimensions for the 15NP22.



#### DIMENSIONAL OUTLINE (Cont'd)



#### Front Side View



Dimensions in Inches unless otherwise noted.

Note 1: "Z" is located on the outside surface of the faceplate, on the screen diagonal at a point .094 in (2.39 mm) beyond the minimum screen. This point is used as a reference for the mounting lugs.

Note 2: The tolerance of the mounting lug holes will accommodate mounting screws up to 0,250 in (6,35 mm) in diameter when positioned on the true hole centers.



# 1640p.

#### OSCILLOGRAPH TUBE

METAL-SHELL ENVELOPE

MAGNETIC FOCUS MAGNETIC DEFLECTION

	DATA			
General:				
Heater, for Unipotential Ca Voltage Current Direct Interelectrode Capac Grid No.1 to All Other El Cathode to All Other Ele Faceplate, Spherical Light Transmission (Appro Phosphor (For Curves, see fron Fluorescence Persistence Persistence Persistence Persistence Pocusing Method Deflection Method Deflection Angle (Approx.) Maximum Overall Length Greatest Diameter at Lip Minimum Useful Screen Diame Ultor® Terminal	6.3 0.6 itances (ectrodes trodes) x.)t of this s	Approx.)	Greenish  15-7/8"	μμη μμη terglass 66% P7 Blue Short n-Yellow Long Magnetic dagnetic 422" + 1/8" 14-3/8" hell Lipher Lipher 14-3/8"
Mounting Position	Duodeca TTOM VIEW	Pin Pin Pin	10 - Grid 11 - Catho 12 - Heate Cao - Ultor (Grid	No.2
Maximum Ratings, Design-Cen	ter Value			
ULTOR® VOLTAGE			14000 max	. volts
Positive value (DC or Pea Negative value (DC or Pea GRID-No.1 VOLTAGE:			410 max 180 max	
Negative bias value Positive bias value Positive peak value PEAK GRID-No.1 DRIVE FROM (			180 max 0 max 2 max 65 max	. volts
In the 16ADP7, grid No.3 which are connected together within to collectively as "ultor".	the tube .	and are c	onveniently	referred

In the 16ADP7, grid No.3 which has the ultor function, and collector are connected together within the tube and are conveniently referred to collectively as "ultor". The "ultor" in a cathode-ray tube is the electrode, or the electrode incombination with one or more additional electrodes connected within the tube to it, to which is applied the nighest dc voltage for acceleration the electrons in the beam prior to its deflection.

 $\phi$  At or near this rating, the effective resistance or the ultor supply should be adequate to limit the ultor input power to 6 matts.

FEB. 1. 1952

TENTATIVE DATA





	Heater negative with respect to cathode . 125 max. Heater positive with respect to cathode . 125 max.		
	Typical Operation:		
	Ultor Voltage*	volts	
	Grid-No.2 Voltage 250	volts	
	Grid-No.1 Voltage for Visual Extinction		
	of Undeflected Focused Spot27 to -63	volts	
1	Grid-No.2 Current15 to +15	μamp	

##

95 ± 15%

ma

#### Maximum Circuit Values:

Spot Position .

Focusing-Coil Current (DC)00. . . .

PEAK HEATER-CATHODE VOLTAGE:

Grid-No.1-Circuit	Resistance.		1.5 max.	megohms

Brilliance and definition decrease with decreasing ultor voltage general, the ultor voltage should not be less than 8000 volts. Ln

For specimen focusing coil similar to JETEC Focusing Coil No.109 positioned with air gap toward faceplate and center line of air gap 3-1/4" from Reference Line (see Outline Drawing) and ultor current of 00 200 microamperes.

## The center of the undeflected, unfocused spot will fall within a circle having 25-mm radius concentric with the center of the tube face.

#### PAN-O-PLY - INTEGRAL IMPLOSION PROTECTION

(Provided by Formed Rim and Welded Tension Bands around Periphery of Tube Panel --- No Separate Safety-Glass or Integral Protective Window Required) RECTANGULAR GLASS TYPE ALUMINIZED SCREEN LOW-VOLTAGE FLECTROSTATIC FOCUS 1140 MAGNETIC DEFLECTION NO LON-TRAP MAGNET REQUIRED

#### Electrical:

Optical:	
Electron Gun Type Requiring No Ion-Trap	Magnet
Heater Warm-Up Time (Average) 11 s	econds
Heater Current at 6.3 volts 450 ± 20	ma
1 800 min.	pf
External conductive coating to anode* . \{ 200 max. 800 min.	pf
Cathode to all other electrodes 5	pf
Grid No.1 to all other electrodes b	μſ
Direct Interelectrode Caparitançes:	
Liecti itai.	

Phosphor (For curves.	see from	t of this section)	P4-Sulf	ide Type
				uminized
Faceplate			Filt	terglass
Light transmissio	n at cen	iter (∆pprox.).		54%

#### Mechanical:

Weight (Approx.).						 			9.5 IDS
Overall Length						 			10.569" ± .242"
Neck Length									
Projected Area of									
External Conducti	ve	Co	at	ing	:				
T., 80									Popular Rand

Type.

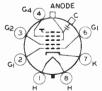
Contact area for grounding . . . . Near Reference Line

Dimensions and Deflec-For Additional Information on Coatings, Dimensions, and Deflection Angles, See Picture-Tube Dimensional-Outlines and Bulb Ji25 B sheets at front of this Section

. . Recessed Small Cavity (JEDEC No.J1-21) Cap . . . . . . . . Small-Button Neoeightar 7-Pin. Arrangement 1, (JEDEC No.87-208) Basing Designation for BOTTOV VIEW. . . . . . . . . . . . 8HR

Pin	1 - Heate	er
Pin	2-Grid	No.1
Pin	3-Grid	No.2
Pin	4 - Grid	No.4
Pin	6-Grid	No.1
Pin	7 - Catho	ode

Pin 8 - Heater



(Grid No.3, Grid No.5. Screen. Collector) C - External Conductive Coating

Cap - Anode

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

Unless otherwise specified, voltage values are positive with respect to cathode

Anode Voltage	20000 12000	max. min.	volts volts
Grid-No.4 Voltage: Positive value. Negative value. Grid-No.2 Voltage.	1100 550	max. max.	volts volts volts
Grid-No.1 Voltage:  Negative bask value  Positive bias value  Positive bias value  Positive peak value  Heater Voltage.	155 0 2	max. max. max. max. max.	volts volts volts volts volts
Peak Heater-Cathode Voltage: H-ater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds. After equipment warm-up period Heater positive with respect to cathode: Peak value. DC component.	300 200	max.	volts volts volts
	1		

#### Typical Operating Conditions for Cathode-Drive Service:

Unless otherwise specified, voliage values

are posteroe area respect to		
Anore Voltage	 16000 100	volts volts
Griu-'o.2 Voltage	 300	volts
of tocused raster	 28 to 60	volts
Field Strength of required adjustable centering magnet	 0 to 8	gauss

#### Maximum Circuit Values:

prid-No.1-Circuit Resistance. . . . . . 1.5 max. megohms

For \*-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section



a Includes implosion protection haroware.

b The grid-No.4 voltage required for optimum focus of any individual tube will ave avalue anywhere between -100 and +300 volts with the combined cathole voltage and video-signal voltage adjusted to live an anode current of 100 microamperes on a 9-inch by 12-inch pattern from an RCA-2F21 monoscope, or equivalent.

PAN-O-PLY TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS 1140 MAGNETIC DEFLECTION LOW GRID-No.2 VOLTAGE
Direct Interelectrode Capacitances    City   Control   C
OPTICAL
Phosphor
Ligro or note into the new term of the contract of the contrac
MECHANICAL
$ \begin{array}{llllllllllllllllllllllllllllllllllll$
THE CAR CAT DITLINE 1st front of this total Regular -Band
Cap
TERMINAL DIAGRAM (Bottom View)
Pri   1 = Mode   G4   ANODE   G4   ANODE   G4   ANODE   G5   G6   G7   G7   G7   G7   G7   G7   G7



(.c - Armse (Gristic 3. (r):
No.: Screen. Collector)
C-[::rn.] (onsintile

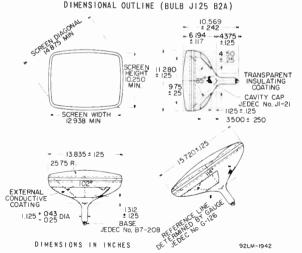
Anode Voltage					12000 min-20000 max	٧
Grid-No.4 Voltage	-					
Positive value.					1250 max	٧
Negative value.			•		400 max	٧
Cathode Voltage						
Vegative cest v	rl ur				2 max	٧
Negative bias v	il be				0 max	٧
Positive pias v	il ive				100 max	٧
Fositive reak v	: te				150 max	٧
						Ą

#### **16CHP4A**

Grid-No.2 Voltage 20 min- Heater Voltage 5.7 min- Peak Heater-Cathode Voltage		۷
in the translation with responsible to the second		
Uniciality of semantarias is	11.50	.,
	450 max	٧
itter wilmost a re- a perior	300 max	V
re termo it we with record too strop:		
mi si s colone	200 max	V
	100 max	v
		¥
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE	SERVICE	
Voltages are positive with respect to grid	\a_1	
Anode Voltage.	16000	٧
Grid-No.4 Voltageb	100	٧
Grid-No.2 Voltage	30	V
Cathode Voltage	22 to 45	V
for all all estinction of tocaled rather	22 10 45	•
	04.0	
Field Strength	0 to 8	G
On respiration to the centuring more to		
MAXIMUM CIRCUIT VALUE		
Grid-No.1 Circuit Resistance	1.5 max	М

a Includes implosion protection hardware.

## See A-RADIATION PRECAUTIONS at front of this section



b The grid-No. A voltage required for optimum for is of any individual tube will have avalue anywhere between \$100 and \$4.00 volts with the co-brind cathode voltage and video-grind voltage adjusted to griv a mode current of 100 microsuperes on a 9-inch by 12-inch pattern fro an BCA-2F21 monoscope, or equivalent.

## **16CMP4A**

## Picture Tube

PAN-O-PLY TYPE ELECTRICAL	1140 MAGNETIC DEFLECTION
Direct Interelectrode Capacitances  Color of the Capacitances  Color of the Capacitances  Color of the Capacitances  Heater Current at 6.3 V	6 PF . 1000 min—1500 max PF . 450 · 20 mA . Ii s
for curves, and trope of the most	Filterglass
Overall Length	Regular-Band Near Reference Line I Cavity (JEDEC No. JI-21 -Button Neoeightar 7-Pin, ment I. (JEDEC No.87-208)
TERMINAL DIAGRAM (Bot ANODE GA	6 <sup>6</sup> 1
MAXIMUM AND MINIMUM RATINGS, DE  Noltages are positive with r Anode Voltage	espect to cathode
Position The Grid-No.2 Voltage Grid-No.1 Voltage Hinton Code City Code Code Code Code Code Code Code Code	. 550 max V . 200 min—550 max V . 220 max V . 155 max V . 0 max V
2 61.1/2 12 4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	. 2 max V

Heater Voltage 5.7 min—6.9 max V Peak Heater-Cathode Voltage	
During quipment with repect to cothod:  During quipment with up period: 1:	
Comtines 40 % DC voltar	
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	
Voltages are positive with respect to grid Vo. 1  Anode Voltage	
Anode Voltage	
Grid-No.2 Voltage	
Cathode Voltage 28 to 60 V	
Field Strength 0 to 8 G	
MAXIMUM CIRCUIT VALUE	J
Grid-No-  Circuit Resistance	•
a Includes implosion protection hardware.	
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at trit of this lection	
DIMENSIONAL OUTLINE	
- 10.569 ± 242	
AND ONIA. 181 - 4375	
RIM-BAND ±125	
PIMENSIONAL OUTLINE  - 0569  - 242  - 242  - 375  - 125  - 125  - 126  - 127  - 127  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  - 128  -	
BASE JEDEC No.	
SCREEN	
HEIGHT II.270 85	
MIN. CAVITY CAP JEDEC No.JI-21	,
1.312 ± .125	
12.938 MIN.  RIM-BAND OPENING 13.141 MIN.  - 13.840 ± 125  (5.700 ± 125	
13.840 ± 125 - 5.10	
25.75 R.	
25.75 R.	
102°	
REFERENCE LINE	•
DETERMINED BY GAUGE JEDEC No. G-126	
92CL-14510 DIMENSIONS IN INCHES	
	_

MAGNET	LC.	FOCUS	

## NO ION-TRAP MAGNET REQUIRED 70° MAGNETIC DEFLECTION

#### ELECTRICAL

0irect	Intere	lectrode	Canaci	tances

·r . · · · · 1	9*** r = r	· · · · ·		5 pF
21 1 1 1 1 1	0	1;		6 pF
in the second second	*1,- 0 *	ing to an	0:	2000 max pF   750 min pF
Heater Current at	63 V			1 750 min pF
moderci odiliciti di	. 0.0 1			. 000 ± 30 ma
Electron Gun		Type I	Requiring N	o Ion-Trap Magnet

#### OPTICAL

rnospnor	 		٠		P4—Sulfide	Type,	Aluminized
.0		* ror *		- + '	• ' -		
Forestak-							

racepiate.	•	•											F 11	İtε	era:	lass	
Light Fr	-	per			 0 -	١.		٠	٠	•	٠					66%	

#### MECHANICAL

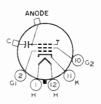
weight (Approx.)					٠		٠			· . 16	16
Overall Length .									18.750	± 0.375	in
Neck Length									7.500	± 0.188	in
Projected Area o	f Sc	reer	١.							139 sa	in
External Conduct	ive I	Coat	in	0							

Control of the second s . . . . . . . Regular-Band For Additional Information on Coatings and Oimensions

rePicture-Tube Dimensional-Outlines in (Bulb J129A B Sheets

Cap. . . . . . . . . . Recessed Small Cavity (JEOEC No.JI-21)
Base . . . Small-Shell Ouodecal 5-Pin (JEOEC Group 4. No.B5-57) 

Fin 1-Heitir Pin 10 - Grid No.1 Pin 10 - Grid No.2 Pin 10 - Grid No.2 Pin 12 - Grid Pin 12 - Grid Collertort



#### MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Inless otherwise specified, voltage values are positive with respect to cathode

Anode Volt Grid-No.2 Grid-No.1	Voltage.		•	•	:	:	:	:	:	:	:	:	:	:	:	17500 450	max max	۷
Term 1 to 1	ti va	11.														140	max	٧
1,0 c l . I A .	t as va	al i			٠											0	max	V
Po til	F → · × · ·	ıl.														2	may	V

#### **16RP4B**

Heater Voltage	٧	(
Furing eta pm-nt warm-up periot not etcesing the seconds. 450 max After equipment warm-up period	٧	
Combined A and DC voltage 165 max DC componer 100 max	٧	4
TYPICAL OPERATING CONDITIONS FOR GRID-DRIVE SERVICE Unless otherwise specified, voltage values		•
Anode Voltage	V V	(
MAXIMUM C!RCUIT VALUE  Grid-No.1-Circuit Resistance 1.5 max	MΩ	

For X-resistion shielding considerations, see sheet

X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES

at front of this section



RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
90° MAGNETIC DEFLECTION

#### GENERAL DATA

Electrical:	E١	ec	tr	ica	1:
-------------	----	----	----	-----	----

Direct Interelectrode Capacitances: Cathode to all other electrodes Grid No.1 to all other electrodes	5	pf pf
External conductive coating to anode	∫1500 max. 1000 min.	pf pf
Heater Current at 6.3 volts Electron Gun		

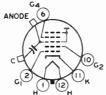
#### Optical

Phosphor (For Curves,	see	front	o f	thi	s	Se	cti	on),	٥4 -	_ (				Гуре, nized
Faceplate, Spherical Light transmission											Fi	1 t	ero	lass

Mechanical:	
Weight (Approx.)	15 lbs
Overall Length	
Neck Length	. 5-1/2" ± 3/16"
Projected Area of Screen	149 sq. in.
External Conductive Coating:	
Type	Regular-Band
Contact area for grounding Nea	r Reference Line
For Additional Information on Coatings and Div	mensions:
See Picture-Tube Dimensional-Outlines an	d Bulb J133 F/G
sheets at front of this section	_
Cap Recessed Small Cavity	(JEDEC No.J1-21)

Pin 1 - Heater Pin 2 - Grid No.1 Pin 6 - Grid No.4 Pin 10 - Grid No.2 Pin 11 - Cathode

Pin 12 - Heater



Cap - Anode (Grid No.3, Grid No.5, Screen, Collector) C - External Conductive Coating

- Indicates a change.



### 17BJP4

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

Unless otherwise specified, voltage values are positive with respect to cathode

ANODE VOLTAGE									{17500 11000	max. min.	volts
GRID-No.4 (FOCUSING) VO	ΣΕ ΤΔ	GE :							(		
Positive value									1100	max.	volts
Negative value										max.	volts
GRID-No.2 VOLTAGE										max.	volts
GRID-No.1 VOLTAGE:			•	٠	•	•	•	•	330	IIIdA.	VUIL5
									220		.1
Negative peak value.			•	٠	٠	•	٠	•		max.	volts
Negative bias value.				٠		٠				max.	volts
Positive bias value.										max.	volts
Positive peak value.										max.	volts
HEATER VOLTAGE									(6.9	max.	volts
HEATER VOLTAGE			•	•	•	•	•	٠	15.7	min.	volts
PEAK HEATER-CATHODE VOI	LTAGI	Ε:									
Heater negative with											
respect to cathode											
During equipment wa		un r	no r	inc	4						
not exceeding 15									450	max	volts
After equipment war	rm-ul	p p∈	erio	DC	•	•	٠	٠	200	max.	volts
Heater positive with											
respect to cathode:											
Combined AC and DC	vol	tage							200	max.	volts
DC component									100	max.	volts
Typical Operating Cond	i t i or	ne f	0.	G.		1_1	۱- ۱		Sarvio	٠.٠	

#### Typical Operating Conditions for Grid-Drive Service:

Unless otherwise specified, voltage values are positive with respect to cathode

Anode Voltage	14000	volts
Grid-No.4 Voltage		volts
Grid-No.2 Voltage	300	volts
Grid-No.1 Voltage for		
visual extinction of		
focused raster	-28 to -72	volts

#### Maximum Circuit Value:

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

- Indicates a change.



		TICIOIC TOBC
NO ION-TRAP MAGNET R RECTANGULAR GLASS TYPE MAGNETIC FOCUS	•	RED ALUMINIZED SCREEN MAGNETIC DEFLECTION
Electrical:		
Treet Interelyconomy (spacitances: Cathode to all other electrodes. Crid No.1 to all other electrodes. The reliconomic tipe rating to anomalise Corent at 6.2 wold.	e	6 of fill man. of 750 min. pf
0-11-11-		no ron-rrap wigner
Optical:		[1] Sultida Tuna
Pho phor (For Curves, we front of this Section of the Section of t		Aluminized
Mechanical:		
Meight Lapprox.). Ozerall Length. Neck Length. Firjecte: Are: of Scrier. Eiternal Conductive Costing:		19-3/16" ± 3/8" 7-1 2" ± 3/16"
ontact area for grounding.  For Additional Information on Coating See Picture-Tube Dimensional-Outline:	s and	hear Reterence Line d Dimensions:
at front of this section Cap	ſav a¹ -	ity (JEDEC No.J1-21) -Fin (UEDEC Grew 4, No.Bb-57)
Basing Designation for BOTTOM VIFW.		
Pin 1-Heater Pin 2-Grid No.1 Pin 10-Gr'd No.2 Pin 11-Cathode		Cap - Anole (Grid No.3, Screen, Collector)

(10)G2

( -External Conjuctive

Pin 12 - Heater

### 17BP4D

Maximum and Minimum Ratings, Design-Maximum Values:	
Unless otherwise specified, voltage val-	
ues are positive with respect to cathode	
Anode Voltage	volts volts
Grid-No.1 Voltage: Negative peak value	volts
Negative bias value	volts
Positive bias value 0 max.	volts
Positive peak value 2 max.	volts
Heater Voltage	volts
(0.7 111112	volts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts volts volts
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to cathode	
Anode Voltage	volts
Grid-No.2 Voltage	volts
Maximum Circuit Value:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section







RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN MAGNETIC DEFLECTION

	DATA
	General:
	Heater, for Unipotential Cathode:  Voltage (AC or DC) 6.3 volts  Current 0.6 ± 10% amp  Direct Interelectrode Capacitances:
	Grid No.1 to all other electrodes 6 μμf Cathode to all other electrodes 5 μμf External conductive coating to ultor
)	Faceplate, Spherical
	Fluorescence
	Deflection Angles (Approx.): Diagonal
	Overall length
	Screen Dimensions (Minimum):   Greatest width
)	Projected area
)	Basing Designation for BOTTOM VIEW

TCFPA



#### GRID-DRIVE SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum and Minimum Ratings, Design-Center Values:

			, ,										
ULTOR VOLTAGE											16000 12000	max. min.	volts
GRID-No.4 (FOCUSING) Positive value	V(	LT.	AGE	:							1000	max.	volts
Negative value GRID-No.2 VOLTAGE	:	:		:	:	:	:	:	:	:	500 500	max.	volts
GRID-NO 1 VOLTAGE:													

TO TO I TOLINGLY						
Negative-peak value					max.	volts
Negative-bias value						volts
Positive-bias value				0	max.	volts
Positive-peak value				2	max.	volts
EAR HEATED CATHODE VOLTAGE	E -					

PEAK HEA	TER-CATHOL	JE VOLTAGE:		
Heater	negative	with respect	to	cathode:

buring equipment warm-up period not			
exceeding 15 seconds	410	max.	volts
After equipment warm-up period	180	max.	volts
eater positive with respect to cathode.	180	тах.	volts

#### Equipment Design Ranges:

Grid-No.1 Video Drive

			voltage voltag			
Grid-	-No.4	Volta	ge for			

focus§.									-50	to	+350	vol	its
Grid-No.1	Vo	l ta	ige	f	or								
wienal.	av+	inc		00	_	£							

A I 2 Mail 6	EXCINCT.	OH	U	1					
focused	raster.						See	Raster-Cutoff-Range Char	t
								for Grid-Drive Servic	e

From Raster Cutoff
(Black level):
White-level value
(Peak positive) Same value as determined for

ı		positive voitage	
	Grid-No.4 Current25 to		
ı	Grid-No.2 Current15 to	+15 μa	
	Field Strength of Adjust—		
1	able Centering Magnet U to	garossa	

#### Examples of Use of Design Ranges:

With ultor voltage of and grid-No.2 voltage of	16000 300	volts volts
Grid-No.4 Voltage for focus . Grid-No.1 Voltage for	−50 to +350	volts
visual extinction of focused raster	28 to -72	volts



#### PICTURE TUBE

	l Video (Black	leve	1):									
White-	level v	alue.			•		٠	. 28	3 to	72		volt
Maximum (												
Grid-No.	l−Circu	it Res	sista	ince	•		•		. 1	5 m	ax. m	egohn
			CATHO	DE-	DR 11	VE	SE	RV I C	E			
	Unless					_				valu	e s	
	are po	) S 1 # 1 T	ie w	ı t h	re	s p e	c t	to	gr	d No.	. 1	
Maximum	and Min	imum 1	Ratir	ıgs,	De	sig	n-C	ente	er I	Talues	:	
ULTOR-TO	-GRID-N	lo.1 V	OLTA	ĜΕ.					.J:	16000	max.	volt
									1	2000	min.	volt
GRID-No.												1.
Positi	ve valu	e			•		٠		•	1000	max.	volt volt
GRID-No.	ve valu	IE	1 V/	ni TA	C.F.	• •	•		•	500 640	max.	volt
GRID-No.	2_TO_CA	THODE	, T A	TAGE	GL		•		•	500	max.	volt
CATHODE-	TO-GRID	-No. 1	VOI.	TAGE		٠.	•		•	500	······································	*011
	ve-peak									200	max.	volt
Positi	ve-bias	value	е							140	max.	volt
	ve-bias									0	max.	volt
	ve-peak									2	max.	volt
PEAK HEA												
	negati ng equi							hode	e:			
	t excee									410	max.	volt
	r equip									180	max.	volt
	positi									180	max.	volt
Equipmen	t Desig	n Rane	qes:									
	th any			rid	-No	. 1	vol	tap	e (1	i 1	betwe	en
12	000 a	nd 16	000	vol	ts	an	d I	rric	i – N	0.2-t	o-gri	d –
No	. 1 vol	tage	(Ec 2	8,1	b e	tw	een	22	о а	nd 64	o vol	ts
Grid-No.	1-to-Gr	id-No.	. 1									
	e for f							. 0	to	400		volt
Cathode-												
Voltag	e (E <sub>kg1</sub>	) for										
	extind					_	_				_	
	used ra	ister.			•	. Se					-Range rive S	
01 100	to-Grid	L-No. 1					Ţ	ori	atr	oae-v	rive 3	ervic
				_								
Cathode-	rive f	rom Ra	351PI									
Cathode- Video	Orive f (Black											
Cathode- Video Cutoff	(Black	leve										
Cathode- Video Cutoff White-		leve alue				. s	ате	va'	lue	as de	termin	ed fo
Cathode- Video Cutoff White-	(Black level v	leve alue				. S	ame ka.	va'	lue cept	vide	o driv	e is
Cathode- Video Cutoff White-	(Black level v negativ	leve value ve)				. S	ame kg <sub>1</sub>	ex	cept	vide	termin o driv tive v	e is

Grid-No.2 Current	-15 to +15	μα
able Centering Magnet*	0 to 8	gausses
Examples of Use of Design Ranges:		
With ultor-to-grid- No.1 voltage of	16000	volts
and grid-No.2-to-grid- No.1 voltage of	300	volts
Grid-No.4-to-Grid-No.1 Voltage for focus	0 to 400	volts
Cathode-to-Grid No.1 Voltage for visual extinction of focused raster Cathode-to-Grid-No.1 Video Drive from Raster	28 to 60	volts
Cutoff (Black level): White-level value	-28 to -60	volts
Maximum Circuit Values:		1

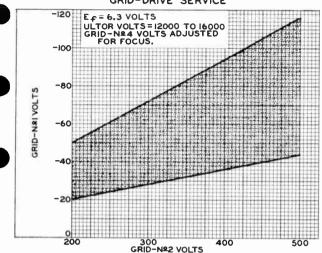
Grid-No.1-Circuit Resistance . . . . . . 1.5 max. megohms

- Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.
- This value is a working design-center minimum. The equivalent absolute minimum ultor- or ultor-to-grid-No.1 voltage is 10,800 volts, Delow which the serviceability of the 176FB will be impaired. The equipment which the serviceability of the IZE-FW Willoe Impaired. The equipment designer has the responsibility of determining a minimum design value vsuch that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor- or ultor-to-grid-Wo.l voltage is never less than 10,800 volts.
- The grid-No. w obtage or grid-No. To-orgid-No. I voltage required for focus of any individual tupe is independent of ultor current and will remain essentially constant for values of ultor voltage (or ultor-to-grid-No.) voltage) or grid-No. Voltage (or grid-No.) voltage) within design ranges shown for these items.
- Distance from Reference Line for suitable PM centering magnet should not exceed  $2-1/2^{\circ}$ . Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 5/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflections. tion of the spot from the center of the tube face.
- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

For I-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

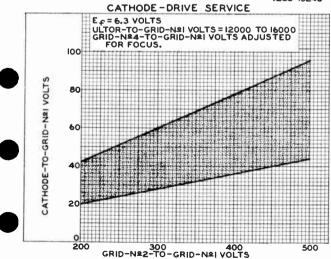
## (R<u>C</u>A) 17CF P4

## RASTER-CUTOFF-RANGE CHARTS GRID-DRIVE SERVICE



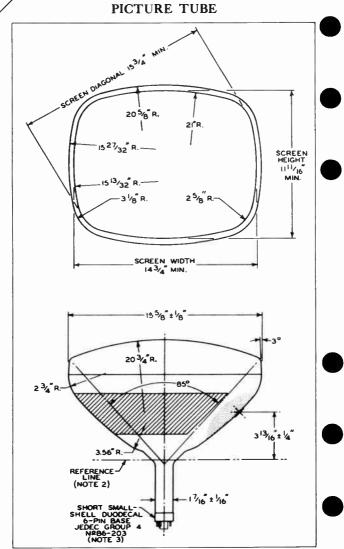


17CKPB



## 7CFPA

## RCA 17CFP4



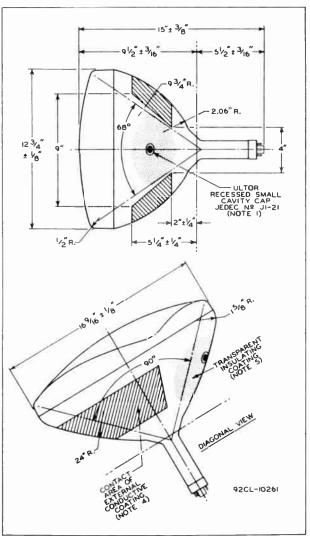
10-59

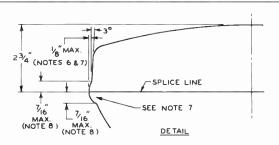
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-10261A









- NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS, PIN 6.
- NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNT-ED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUITRY CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".
- NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.
- **WOTE 5:** TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.
- NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.
- NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE IN-DICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/4", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/8" BE-YOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.
- NOTE 8: THE TUBE SHOULD BE SUPPORTED ON BOTH SIDES OF THE BULGE. THE MECHANISM USED SHOULD PROVIDE CLEARANCE FOR THE MAXIMUM DIMENSIONS OF THE BULGE.

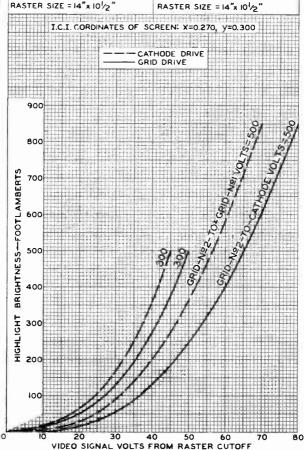


#### AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE Ef = 6.3 VOLTS ULTOR-TO-GRID-NºI VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº1 TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED

AT AVERAGE BRIGHTNESS.

GRID-DRIVE SERVICE  $E \neq = 6.3 \text{ VOLTS}$ ULTOR VOLTS = 16000 GRID Nº I BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. "כלוסו RASTER SIZE = 14"x וכלים



## 7CFP2

# CHARACTERISTICS DRIVE AVERAGE

CATHODE-DRIVE SERVICE

FF= 6.3 VOLTS

ULTOR-TO-CRID-NRI
VOLTS=IZO00 TO 16000

CATHODE BIASED POSITIVE WITH

RESPECT TO GRID NRI TO GIVE

FOCUSED RASTER CUTOFF.

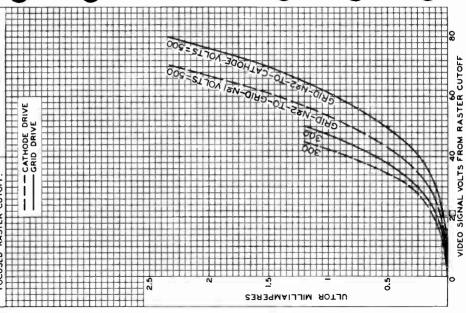
GRID-DRIVE SERVICE

E.F. = 6.3 VOLTS

ULTOR VOLTS = 12000 TO 16000

GRID NA! BIASED NEGATIVE WITH

RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.



ELECTRON TUBE DIVISION
SCORPORATION OF AMERICA HARBISON NEW SECEN

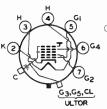
SHORT RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW GRID-No.2 VOLTAGE

ALUMINIZED SCREEN 1100 MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

	GENERAL DATA
Electrical:	
Heater Current at 6.3 Heater Marm Un Tim (A Direct Interelectrode	(vorige) 11 seconds
Grid No.1 to all oth Cathode to all other	relectrodes θ μμf
External conductive	coating to ultor $\begin{cases} 1700 \text{ max.} & \mu\mu\text{f} \\ 1200 \text{ min.} & \mu\mu\text{f} \end{cases}$
lectron Gun	Type Requiring No Ion-Trap Magnet
Optical:	
Light transmission (	Approx.]
Mechanical:	
Weight (Approx.) Overall Length Neck Length	
For Additional Informa See Picture-Tube Dim	Regular Band nunding Near Reference Line ation on Coatings and Dimensions: tensional-Outlines and Bulb Ji32-1/2 A/B
Base	of this section Recessed Small Cavity (JEDEC No.J1-21) Special 6-Pin (JEDEC No.B6-214) For BOTTOM VIEW

Pin 2 - Cathode Pin 3 - Heater Pin 4 - Heater Pin 5 - Grid No.1 Pin 6-Grid No.4 Pin 7-Grid No.2



Cap - Ultor (Grid No.3, Grid No.5. Collector) C - External Conductive Coating

## 17DQP4

Maximum Ratings, Design-Maximum Values:		
ULTOR-10-JRID-No.1 VOLTAGE 170	600 may.	volts
GRID-No.4-TO-ARID-No.1 (FOCUSING)	000	
VOLTAJE:		
Politive value	100 max.	volts
	550 max.	volts
GRID-No.2-10-GRID-No.1 VOLTAGE	70 max.	volts
CATHODE-IO-GRID-No.1 VOLTAGE:		
Positive bias value	150 max.	volts
Neastive bear value	2 max.	volts
PEAK HENTER-CHTHOLK JOLTAGE:		
Heiter negative with		
resorct to dithoga:		
During equipment warm-up perio:		
	150 max.	volts
	200 max.	volts
Henter positive with		1
respect to dathode	200 max.	volts
Typical Operating Conditions:		
With ultor-to-grid-No.1 voltage of	11500	volts
and grid-No.2-to-grid-No.1 voltage of	50	volts
Grid-No.4-to-Grid-No.1 Voltage		
	0 to +350	volts
for focus	/	
visual extinction of focused master.		volts
Maximum Circuit Values:		
Grid-No.1-('rouit Resistance	1.5 max. me	eachms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section

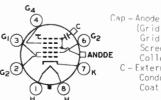


SHORT RECTANGULAR GLASS TYPE ALUMINIZED SCREEN LOW-VOLTAGE ELECTROSTATIC FOCUS 1100 MAGNETIC DEFLECTION INTERNAL MAGNETIC SHIELD

With Heater Having Controlled Warm-Up Time

The state of the s
GENERAL DATA
Electrical:
Direct Interelectrode Capacitances: Cathode to all other electrodes 3.65 pf Grid No.1 to all other electrodes 4.15 pf
External conductive coating to anode . $\begin{cases} 1400 \text{ max.} & \text{pf} \\ 900 \text{ min.} & \text{pf} \end{cases}$
Heater Current at 2.68 volts
Optical:
Phosphor (For curves, see front of this section). P4—Sulfide Type, Aluminized
Faceplate, Spherical
Mechanical:
Weight (Approx.)
Type Modified-Band Contact area for grounding Near Reference Line
for Additional Information on Coatings and Dimensions:
See Picture-Tube Dimensional-Outlines and Bulb Ji32-1/2 A/B sheets at front of this section
Cap Recessed Small Cavity (JFDEC No.J1-21) Base Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-208)
Basing Designation for BOTTOM VIFW
$G_{oldsymbol{\Delta}}$

Pin	1 - Heater
	2 - Grid No.2
Pin	3-Grid No.1
Pin	4 - Grid No.4
Pin	6-Grid No.2
Pin	7 - Cathode
Pin	8 - Heater



(Grid No.3, Grid No.5. Screen. Collector)

C-External Conductive Coating

### 17DRP4

Maximum and Minimum Ratings, Design-Maximum Values:	
Unless otherwise specified, voltage values	
are positive with respect to cathode	- (
ANODE VOLTAGE	volts
Positive value 950 max.	volts
Negative value 700 max.	volts
GRID-No.2 VOLTAGE	volts
Negative peak value 400 max.	volts
Negative bias value 155 max.	volts
Positive bias value 0 max.	volts
Positive peak value 2 max.	volts
HEATER VOLTAGE	volts
TEATER VOLTAGE	volts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts volts
Combined AC and DC voltage 200 max.	volts
DC component	
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to cathode	
	volts
Milode vortage : * * * * * * * * * * * * * * * * * *	volts
Grid-No.2 Voltage 300	volts
Grid-No.1 Voltage for visual extinction of focused raster35 to -72	volts
Maximum Circuit Value:	

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

Grid-No.1-Circuit Resistance. . . .



1.5 max. megohms



## 17DSP4 PICTURE TUBE

, OSB

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

With heater having controlled warm-up time

DATA
General:
Heater, for Unipotential Cathode:  Voltage (AC or DC)
Light transmission (Approx.)
Fluorescence
Neck Tength   A=1/8 f 1/8   Radius of curvature of faceplate (External surface)   20-3/4"   Screen Dimensions (Minimum)   14-3/4"   Greatest width   11-11/16"   Diagonal   15-3/4"   Projected area   155 sq. in.   Weight (Approx.)   10   bs Operating Position   Any Cap   Recessed Small Cavity (JEDEC No.J1-21)   Bulb   J132-1/2 A1/81   Socket   Ucinite Part No.115446, or equivalent





#### PICTURE TUBE

Base Small-Button Neoeightar 7-Pin, Arrangement 1,
Basing Designation for BOTTOM VIEW 8H
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode Pin 8 - Heater  Cap - Ultor (Grid No.3, Grid No.5, Collector) C - External Conductive Coating
GRID-DRIVE SERVICE
Unless otherwise specified, voltage val-
ues are positive with respect to cathode
Maximum and Minimum Ratings, Design-Center Values:
DULTOR VOLTAGE
GRID-No.4 (FOCUSING) VOLTAGE:
Positive value 1000 max. volt
Negative value 500 max. volt
GRID-No.2 VOLTAGE 500 max. volt: GRID-No.1 VOLTAGE:
Negative-peak value 200 max. volt
Negative-bias value
Positive-peak value 0 max. volt: Positive-peak value 2 max. volt:
PEAK HEATER—CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm—up period not exceeding 15 seconds 410 max. volt After equipment warm—up period 180 max. volt Heater positive with respect to cathode. 180 max. volt
Equipment Design Ranges:
With any ultor voltage (Ec5k) between 12000 and 18000 volt.
and grid-No.2 voltage $(E_{C2k})$ between 200 and 500 volts
Grid-No.4 Voltage for focus\$ 0 to 400 volt Grid-No.1 Voltage (Ec <sub>1k</sub> ) for visual extinction
of focused raster See Raster-Cutoff-Range Char for Grid-Drive Servic
Grid-No.1 Video Drive  from Raster Cutoff  (Black level):  White-level value
(Peak positive) Same value as determined fo
Ecik except video drive is

positive voltage



# 10sp

#### PICTURE TUBE

Grid-No.4 Current		25 to	+25		μâ
Grid-No.2 Current		15 to	+15		μĉ
ield Strength of Adjust-					
able Centering Magnet*		0 to	8	g	ausses
xamples of Use of Design Ran	ges:				
With ultor voltage of	16000		16000	,	volts
and grid-No. 2 voltage of	300		400		volts
rid-No.4 Voltage for					
	0 to 40	0	0 to 4	00	volts
rid-No.1 Voltage for					
visual extinction of					
	-38 to -	72	-45 to	-90	volts
rid-No.1 Video Drive					
from Raster Cutoff (Black level):					
	38 to 7	2	45 to	90	volt
will te-level value	)0 to 1	-	40 (0	00	
aximum Circuit Values:					
rid-No.1-Circuit Resistance			1.5 ma	ix. n	negohm
CATHODE-E	RIVE" SER	VICE			
Unless otherwise st	ecified,	volt	age vali	ies	
are positive with	respect	to	grid No	. 1	
Maximum and Minimum Ratings,	Design-Ce	nter	Values:		
JLTOR-TO-GRID-No.1 VOLTAGE .			18000		volt
			12000	min.	
GRID-No.4-TO-GRID-No.1 (FUCU)			(	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	volt
	311107		(		VOIC
VOLTAGE:			`		
Positive value			1000	max.	volt
Positive value			1000		volt volt
Positive value			1000 500	max. max.	volt volt volt
Positive value			1000 500 640	max. max. max.	volt volt volt
Positive value	GE		1000 500 640 500	max. max. max. max.	volt volt volt volt
Positive value	GE		1000 500 640 500 200 140	max. max. max. max. max.	volt volt volt volt volt
Positive value	GE		1000 500 640 500 200 140 0	max. max. max. max. max. max.	volt volt volt volt volt volt
Positive value	GE		1000 500 640 500 200 140	max. max. max. max. max.	volt volt volt volt volt volt
Positive value	GE		1000 500 640 500 200 140 0	max. max. max. max. max. max.	volt volt volt volt volt volt
Positive value	GE		1000 500 640 500 200 140 0	max. max. max. max. max. max.	volt volt volt volt volt volt
Positive value	GE	de:	1000 500 640 500 200 140 0	max. max. max. max. max. max. max.	volt volt volt volt volt
Positive value	GE	de:	1000 500 640 500 200 140 0 2	max. max. max. max. max. max.	volt volt volt volt volt volt volt
Positive value	t to cathod period ds	de:	1000 500 640 500 200 140 0	max. max. max. max. max. max.	volt volt volt volt volt volt volt

170584



#### PICTURE TUBE

Equipment Design Ranges:								
With any ultor-to-grid-No.1 and 18000 volts and grid-No. between 225	voltage (Ec. 2-to-grid-No and 640 volt	.i voltage	(Ec 28 1)					
Grid-No.4-to-Grid-No.1 Voltage for focus§ Cathode-to-Grid-No.1 Voltage (Ekg <sub>4</sub> ) for visual extinction of focused raster	. See Raster							
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)	. Same valu	ue as determ ept video dr	nined for					
Grid-No.4 Current Grid-No.2 Current Field Strength of Adjust- able Centering Magnet*	-25 to	+25 +15	μα μα gausses					
Examples of Use of Design Rang	jes:							
With ultor-to-grid- No.1 voltage of and grid-No.2-to-grid-	16000	16000	volts					
No. 1 voltage of	300	400	volts					
Grid-No.4-to-Grid-No.1  Voltage for focus	0 to 400	0 to 400	volts					
Voltage for visual extinction of focused raster Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level):	35 to 63	43 to 78	volts					
White-level value	−35 to −63	-43 to -78	volts					
Maximum Circuit Values:		1 E mau						
Grid-No.1-Circuit Resistance.  A Grid drive is the operating condi	tion in which	. 1.5 max. the video sign	J					
the grid-No.1 potential with resp  This value is a working design-ce  **sinimum ultor (or ultor-to-grid- which the serviceability of the 17  designer has the responsibility such that under the worst problem supply-voltage variation and equi ultor (or ultor-to-grid-No.1) vol The grid-No.4 (or grid-No.4) vol independent of ultor current and values of ultor (or ultor-to-grid No.2-to-grid-No.1) voltage within Mo.2-to-grid-No.1) voltage within	nter minimum. No.1) voltage DSP4 will be in of determining able operating pment variation	The equivalent is 11,000 volumpaired. The a minimum descenditions on the absolutions than the conditions on the absolutions.	involving e minimum					





#### PICTURE TUBE

Distance from Reference Line for suitable PM centering magnet should not exceed  $2-1/8^{\circ}$ . Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 5/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

#### OPERATING CONSIDERATIONS

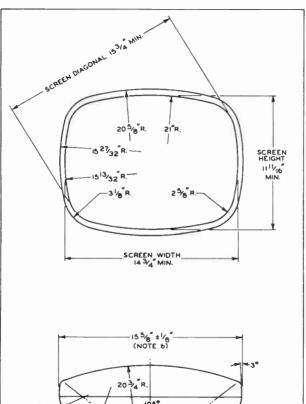
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 17DSP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

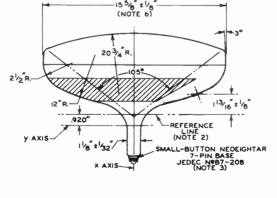
For I-ray shielding considerations, see sheet
I-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

## 170584

#### (RCA) 17DSP4

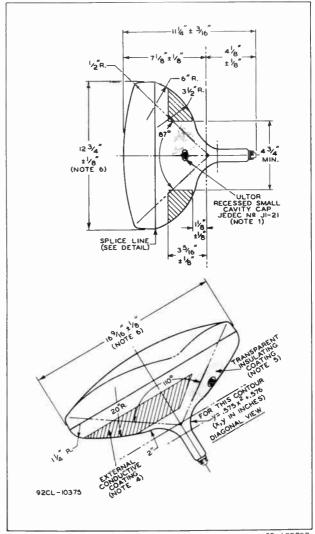
#### PICTURE TUBE





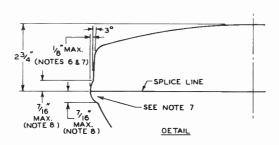


## 10sp PICTURE TUBE









NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm$  30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

MOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC NO.G-126 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BERIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BEALLOWED TO MOVE FREE-LY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

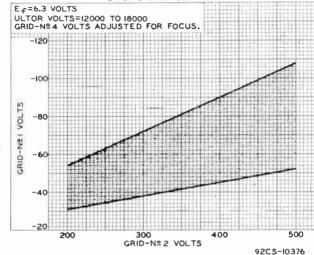
MOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE IN-DICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/4", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/8" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMEN-SIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

NOTE 8: THE TUBE SHOULD BE SUPPORTED ON BOTH SIDES OF THE BULGE. THE MECHANISM USED SHOULD PROVIDE CLEARANCE FOR THE MAXIMUM DIMENSIONS OF THE BULGE. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT—MPREGNATED FELT, OR EQUIVALENT.

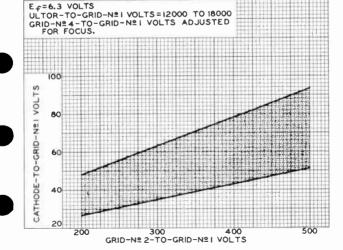


### RASTER-CUTOFF-RANGE CHARTS

GRID-DRIVE SERVICE



#### CATHODE-DRIVE SERVICE



1050





### AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

E = 6.3 VOLTS

ULTOR-TO-GRID-NºI VOLTS= 16000

CATHODE BIASED POSITIVE WITH

RESPECT TO GRID NºI TO GIVE

FOCUSED RASTER CUTOFF,

RASTER FOCUSED

AT AVERAGE BRIGHTNESS.

AT AVERAGE BRIGHTNESS RASTER SIZE = 14"x 10 1/2" GRID-DRIVE SERVICE

E.f. = 6.3 VOLTS

ULTOR VOLTS = 16000

GRID Nº I BIASED NEGATIVE WITH

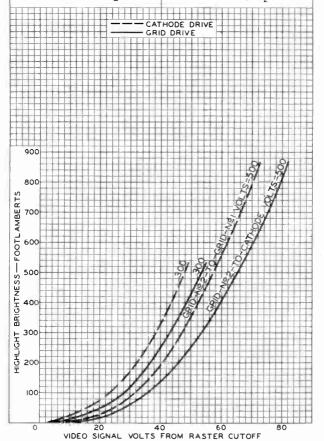
RESPECT TO CATHODE TO GIVE

FOCUSED RASTER CUTOFF,

RASTER FOCUSED

AT AVERAGE BRIGHTNESS.

RASTER SIZE = 14"x 101/2"



11050

# CHARACTERISTIC DRIVE AGE ď A E

CATHODE-DRIVE SFRVICE
Ef=6.3 VOLTS
ULTOR-TO-CRID-NR1
VOLTS=12000 TO 18000
VOLTS=12000 TO 18000
RESPECT TO GRID NR1 TO GIVE
FOCUSED RASTER CUTOFF.

GRID-DRIVE SERVICE

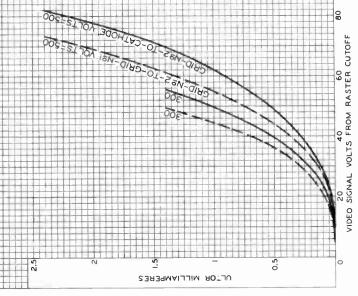
E.f=6.3 VOLTS

ULTOR VOLTS=12000 TO 18000

GRID Nº! BRASED NEGATIVE WITH

RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.

DRIVE DRIVE CATHODE GRID DRIV



ELECTRON TUBE DIVISION
BADIO COPPORATION OF AMERICA, HARRISON, NEW 259

92CM-10382



RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 70° MAGNETIC DEFLECTION

### GENERAL DATA

#### Electrical:

	Heater (urrent at 6.3 volt $\dots \dots	ma
	Direct Interelectrode Carac tances:	
1	Crid No.1 to all other electrodes 6.5	μμf
•	Catheir to all other electrodes 5	µµ f
	External conductive coating to ultor {1500 max. 750 min.	μμ.f μμ.f
	Electron Gun Type Requiring No Ion-Trip Mag	jnet

### Optical:

Faceplate			Fi	Ite	rglass
Light transmission (Approx.)					. 74%
Phosphor (For curves, see front of this Section).	P4 -	Sı	al f	ide	Type,
			- /	ll om	inized

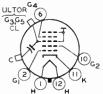
#### Mechanical:

Operating Position.						Any
Weight (Approx.)						18 lbs
Overall Length						19-3/16" ± 3/8"
Neck Length						7-1/z" ± 3/16"
Projected Area of S	creer	n				149 cg. in.
External Conjuctive	Coar	ting:				
Туре						Regular-Band
Contict area for	groui	raing.			. Ne 3	ir Reference Line
For Additional Info	rmat	ion or	Coat	ings	and Di	mensions:
See Picture-Tube D	imens	sional	-Outl	ines	ind Bul	b J133 BiD sheets

Base. . .

Pin 1-Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10 - Grid No. 2 Pin 11 - Cathode Pin 12 - Hester

at the front of this section



(Grid No.3. Grid No.5. Collector C - External Conductive Coating

# 17**DW**P4

Maximum Ratings. Design-Maximum Values:

ULTOR VOLTAGE		22000 max.	volts			
GRID-No.4 (FOCUSING) VOLTAGE: Positive value		800 max. 700 max.				
GRID-No.1 VOLTAGE:	•	700 max.	VUILS			
Negative bias value			volts			
Positive bias value		0 max.				
Positive peak value	•	2 max.	VOLES			
Typical Operating Conditions:						
With ultor voltage of		18000	volts			
and grid-No.2 voltage of		300	volts			
Grid-No.4 Voltage for focus		0 to 400	volts			
Grid-No.1 Voltage for visual						
extinction of focused raster		-28 to -72	volts			

For X-radiation shielding considerations, see sheet 
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES

at front of this section



SHORT RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

General:

ALUMINIZED SCREEN MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

### DATA

deller at.	
Heater, for Unipotential Cathode:	
Voltage (AC or DC)	
Lurrent at 6.3 volts 0.45 amp	)
Warm-up time (Average)	
Direct Interelectrode Capacitances:	
Grid No.1 to all other electrodes 6 μμ	
Cathode to all other electrodes 5	
(1500 may	
External conductive coating to ultor. $\begin{cases} 1300 \text{ max.} & \mu\mu 1\\ 1000 \text{ min.} & \mu\mu 1 \end{cases}$	
Faceplate, Spherical Filterglass	
Light transmission (Approx.)	
Phosphor (For curves, see front of this section). P4—Sulfide Type	
Aluminized	
Fluorescence	
Phosphorescence	
Persistence	
Focusing Method Electrostatio	
Deflection Method	
Deflection Angles (Approx.):	
Diagonal	,
Horizontal	
Vertical	
Electron Gun Type Requiring No Ion-Trap Magnet	
Tube Dimensions:	
Overall length 10-11/16" ± 1/4"	
Greatest width	
Greatest height 12-3/4" ± 1/8"	
Diagonal	
Neck length	
Radius of curvature of faceplate	
(External surface)	
Screen Dimensions (Minimum):	
Greatest width	
Greatest height	
Diagonal	1
Projected area	
Weight (Approx.)	5
Operating Position Any	
Cap Recessed Small Cavity (JEDEC No. J1-21)	
Bulb	
Socket	1
Base Small-Button Neoeightar 7-Pin, Arrangement 1,	
(JEDEC No. B7-208)	
10EDEC 110.57 2007	

# 17DXP4

Basing Designation	for BOTTOM VIEW	8JR
Pin 1 - Heater	<u> </u>	Pin 8 - Heater
Pin 2-Grid No. 1 Pin 3-Grid No. 2	2 C	Cap - Ultor (Grid No.4,
Pin 4 - Grid No.3	3X (5 === 700 A)	Collector)
Pin 6 - Internal	2 7	C - External
Connection- Do Not Use	1) • (8)	Conductive Coating
Pin 7 - Cathode	0 0	

### GRID-DRIVE SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum	and	Minimum	Ratings,	Design-C	enter,	Values:

ULTOR VOLTAGE	max.	volts
12000	min.	volts
GRID-No.3 (FOCUSING) VOLTAGE 650	max.	volts
GRID-No.2 VOLTAGE		volts
300	min.	volts
GRID-No. 1 VOLTAGE:		
Negative—peak value 200	max.	volts
Negative-bias value	max.	volts
Positive-bias value 0	max.	vo¹ts
Positive—peak value 2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds 410	max.	velts
After equipment warm-up period 180	max.	volts
Heater positive with respect to cathode. 180	max.	volts
Faviament Donien Pangost		

#### Equipment Design Ranges:

With any ultor vo	ltage	(Ec. k)	between	12000	and 16000	volts
and grid-No. 2 v	oltage	(Ecok	) betwe	en 400	and 550	volts
Grid-No.3 Voltage	for	-				

Grid-No.3 Voltage for focus§ . . . . . . . . 0 to 400 volts Grid-No.1 Voltage (Ec.k) for visual extinction

Raster Cutoff
(Black level):
White-level value
(Peak positive)......Sa

(Peak positive)..... Same value as determined for E<sub>cik</sub> except video grive is a positive voltage

	Strength of Adjust- e Centering Magnet ∙	0	to 12	qausses
Examp	les of Use of Design Rang	jes:		
and	h ultor voltage of grid-Ko. 2 voltage of	16000 400	160 <i>00</i> 500	volts volts
foc Grid-	No.3 Voltage for ur	0 to 400	0 to 40	00 volts
of Grid- from (Bi)	Gocused raster Mo.1 Video Drive m Raster Cutoff ack level; te-level value			
		)4 (0 0)	, -) (0	10 40113
	um Circuit Values: No.1-Circuit Resistance.		. 1.5 ma	x. megohms
	CATHODE-DR			
	Unless otherwise spe			
	are positive with		_	1 - 1
Maximu	um and Minimum Ratings, <i>L</i>	)esign-Cen		,
ULTOR-	-TO-GRID-No.1 VOLTAGE		. {16000 12000	
GRID-	No.3-TO-GRID-No.1 (FOCUS	ING)	(12000	
	TAGE		. 650 . 690	max. volts
	No.2-TO-GRID-No.1 VOLTAG		6,60	max. volts
	No.2-TO-CATHODE VOLTAGE.		(300	min. volts
	DE-TO-GRID-No.1 VOLTAGE:		200	max. volts
	itive-peak value itive-bias value		. 200	max. volts
	ative-bias value			max. volts
PEAK Hea	ative—peak value HEATER—CATHODE VOLTAGE: ter negative with respec	t to cathod		max. volts
D	uring equipment warm-up not exceeding 15 second		. 410	max. volts
Δ	fter equipment warm-up p			max. volts
Hen	ter positive with respec	t to cathor	ie. 180	max. volts
Equip	ment Design Ranges:			
	With any ultor-to-grid-N	o. 1 voltag	re (Ecugi)	between
	12000 and 16000 volts	and gri	$d = No \cdot 2 - to$	-grid-
	No.1 voltage (Ec28:) b	etween 40	o ana 090	00115
	No.2-to-Grid-No.1 tage for focus§	. 0	to 400	volts



# 17DXP4

Cathode-to-Grid-No.1

Voltage (Ekg ) for visual extinction of focused raster Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black, level):			er-Cutoff-Ran Cathode-Drive		
White-level value (Peak negative)	•	Same va E <sub>kg 1</sub> ex	alue as determ ccept video dr negative	rive is a	
Grid-No.3 Current Grid-No.2 Current Field Strenath of Adjust-			to +25 to +15	µа µа	
able Centering Magnet.			to 12	gausses	
Examples of Use of Design	Ranges	<b>::</b>			
With ultor-to-grid- No.1 voltage of and grid-No.2 to-grid-		16000	16000	volts	
No.1 voltage of Grid-No.3 to-Grid-		400	500	volts	
No.1 Voltage for focus	. (	) to 400	0 to 400	volts	
focused raster Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level):	. 3	34 to 56	41 to 69	volts	
White-level value	3	34 to −5€	6 -41 to -69	volts	

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance. . . . . . 1.5 max. megohms

- Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.
- This value is a working design-center minimum. The equivalent absolute winimum ultor—or ultor—to-grid—No.1 voltage is 11,000 volts, below which the serviceability of the 170xPu will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply—voltage variation and equipment variation the absolute minimum ultor—or ultor—to-grid—No.1 voltage is never less than 11,000 volts.
- The grid-No.3 voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts and is a function of the value of the ultor voltage, ultor current, and grid-No.2 voltage. It changes directly with the ultor voltage at the rate of approximately 46 volts for each 1000-volt change in ultor voltage; inversely with grid-No.2 voltage at the rate of about 60 volts for each 100-volt change in grid-No.2 voltage; and inversely with ultor current at the rate of about 60 volts for each 100-volt change in grid-No.2 voltage; and inversely with ultor current. Because the 17DxP4 has a narrow depth of focus, it is necessary to provide means such as a potentiometer or a 4-tap switch for adjusting the focusing voltage. In general, commercially acceptable focus is obtained if the focusing voltage is within 75 volts of the value required for optimum focus and if the focusing voltage is maintained to within 75 volts of the optimum value during line-voltage fluctuations.



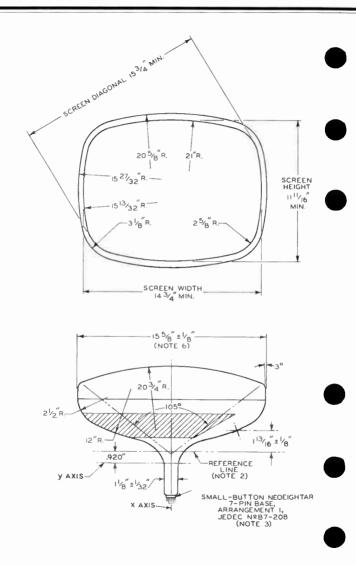


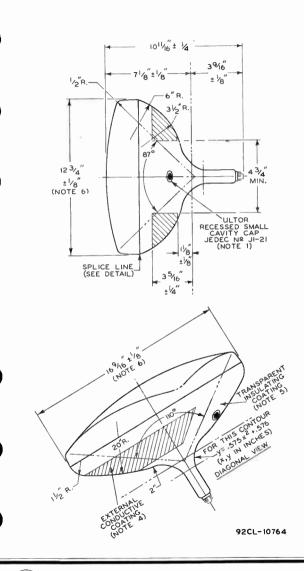
- $\label{eq:posterior}$  pistance from Reference Line for suitable PM centering magnet should not exceed  $2-1/\mu^*$ . Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 5/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.
- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

#### OPERATING CONSIDERATIONS

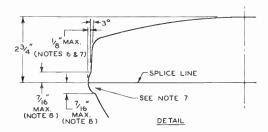
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 170YP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

> For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section





# 17DXP4



NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOT TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm$  30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC NO.6-126 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: MEASURED 2-9/32" ± 1/32" FROM THE PLANE TANGENT TO THE SURFACE OF THE FACEPLATE AT THE TUBE AXIS.

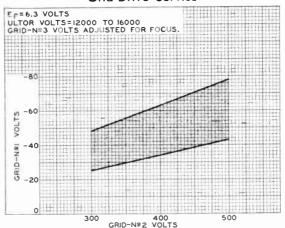
NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE IN-DICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/4", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/8" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMEN-SIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

NOTE 8: THE TUBE SHOULD BE SUPPORTED ON BOTH SIDES OF THE BULGE. THE MECHANISM USED SHOULD PROVIDE CLEARANCE FOR THE MAXIMUM DIMENSIONS OF THE BULGE. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT—IMPREGNATED FELT, OR EQUIVALENT.

NOTE 9: NECK DIAMETER IS MAINTAINED TO AT LEAST 2-7/16" FROM REFERENCE LINE.

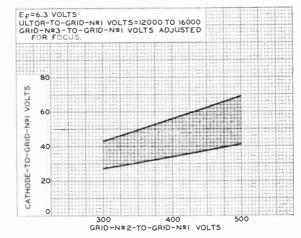


### RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-9930

### Cathode-Drive Service



9205-9931



•

# Color Picture Tube

Perma-Chrome Banded-Type 90° Rectangular Blue-Gun-Down Operation	Implosion Protection Hi-Lite Screen Unity Current Ratios
ELECTRICAL	
Electron Guns, Three with Axes Tilted Toward Tube Axis Heater, of Each Gun Series Connected within Tube with Each of the Other Two Heaters:	Red, Blue, Green
Current at 6.3 V	900 mA
Focusing Method	Electrostatic
Focus Lens	Unipotential
Convergence Method	Magnetic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	90 deg.
Horizontal	79 deg.
Vertical	63 deg.
Direct Interelectrode Capacitances (A	pprox.):
Grid No.1 of any gun to all other electrodes	7.5 pF
Grid No.4 to all other electrodes .	6 pF
All cathodes to all other electrodes	s 15 pF
External conductive coating to anode	{1500 max. pF 1000 min. pF
OPTICAL Faceplate	Filterglass
Light transmission at center (Approx.)	48 %
Surface	Polished
Screen	Aluminized
Matrix	
Phosphor, rare-earth (red), sulfide (blue & green)	•
Persistence	Medium-Short
Array	Dot trios
Spacing between centers of adjacent dot trios (approx.)	0.029 in (0.74 mm)

MECHANICAL		
Minimum Screen Area (Projected) 145 st Bulb Funnel Designation JED Bulb Panel Designation JED Base Designation Small-Butt Basing Designation Pin Position Alignment Pin No.	EDEC No.J 139 EC No.FP 139 on Diheptar 12 JEDEC No.1	9B1 -pin 4BH orox.
Operating Position: For blue gun down Anode Bu For blue gun up Anode Bulb Weight (Approx.)	ilb Contact on Contact on Bo	Top
MAXIMUM AND MINIMUM RATINGS, Design-M	aximum Value	s
Unless otherwise specified, values are for	each gun and	
voltage values are positive with respect to		u 🗭
Anode Voltage	22,500 max. 17,000 min.	V.
Total Anode Current, Long-Term Average	750 max.	μΑ
Voltage: Positive value	1100 max.	v
Negative value	550 max.	v
Peak Grid-No.2 Voltage, Including Video Signal Voltage Grid-No.1 Voltage:	1000 max.	V
Negative bias value	400 max.	V
Negative operating cutoff value	140 max.	V
Positive bias value	0 max.	V
Positive peak value	2 max.	V
Heater voltage (ac or der.	(6.9 max.	V
Under operating conditions	15.7 min.	V
Under standby conditions <sup>d</sup> Peak Heater-Cathode Voltage: Heater negative with respect to cathode;	5.5 max.	v
During equipment warm-up period		
not exceeding 15 seconds	450 max.	V
After equipment warm-up period:		
Combined AC and DC value	200 max.	v v
DC component value Heater positive with respect to cathode:	200 max.	<b>Y</b>
AC component value	200 max.	V
DC component value	0 max.	Ÿ
EQUIPMENT DESIGN RANGES		•
Under the state of		

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

For anode voltages between 17,000 and 22,500 V Grid-No.4 (Focusing Electrode) Voltage . . -75 to 400

Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused Spot SEE CUTOFF DESIGN CHART  Maximum Ratio of Grid-No.2 Voltages, Highest Gun to Lowest Gun in Any Tube (At grid-No.1 spot cutoff voltage of -100 V)
Heater Voltage: <sup>c</sup> Under operating conditions:
When standby operation is not utilized 6.3 V
When 5.0-V standby operation is utilized 6.0 V
Under standby conditions 5.0 V Grid-No.4 Curient (Total)
Grid-No.2 Current
Ratio of cathode currents:   Min. Typ. Max.   Red/blue   0.75   1.10   1.50   Red/green   0.65   1.00   1.50   Blue/green   0.60   0.91   1.30   Displacements, Measured at Center of Screen:
Raster centering displacement:
Horizontal ± 0.45 in (± 11.4 mm).
Vertical
LIMITING CIRCUIT VALUES
Effective grid-No.1-to-cathode-circuit resistance (each gun) 0.75 max. MΩ The low-voltage circuits, including all heater circuits, should be analyzed by assuming the color picture tube heater is connected directly to the receiver chassis ground. Under these conditions the circuits to the elements of all tubes, including the color picture tube, operating from the same heater winding 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 mA total in the assumed picture tube heater ground connection. The leads from all other circuits must be separated from the picture tube leads, by a minimum distance of 0.25 inch (6.4 mm) to prevent energy transfer to the picture tube circuits. Such current limitation will help prevent picture tube damage in case of momentary cascade arcing.

- The mating socket, including its associated, physicallyattached hardware and circuitry, must not weigh more than one pound.
- c For maximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts. The series impedance to any chassis connection in the DC biasing circuit for the heater should be between 100,000 ohms and 1 megohm.
- d For "instant on" applications, a maximum heater voltage d 5.5 volts (design-maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position, All other voltages normally applied to the tube must be removed during standby operation.
- e Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios,

#### X-RADIATION WARNING

Because the 17EZP22 is designed to be operated at anode voltages as high as 22.5 kilovolts (design-maximum value), shielding of the 17EZP22 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

### BASE SPECIFICATION - JEDEC No. 14BH

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.4

Pin11: Cathode of Blue Gun

Pin 12: Grid No. 1 of Blue Gun

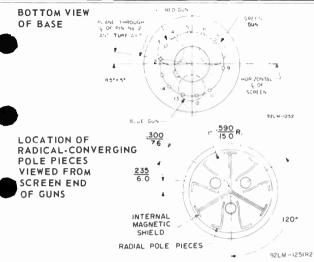
Pin 13: Grid No.2 of Blue Gun

Pin 14: Heater

Cap: Anode (Grid No.3.

Grid No.5, Screen, Collector)

C: External Conductive Coating



### NOTES FOR DIMENSIONAL OUTLINE

Note 1: With tube neck inserted through flared end of reference-line and neck-funnel-contour gauge (JFDEC 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 2-inch (51-mm) circle concentric with bulb axis.

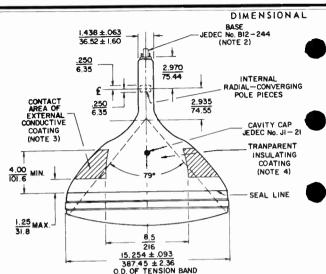
Note 3: The drawing shows the size and location of the contact area of the external conductive coating. The actual area of this coating will be greater than that of the contact area so as to provide the required capacitance. External conductive coating must be grounded with multiple contacts.

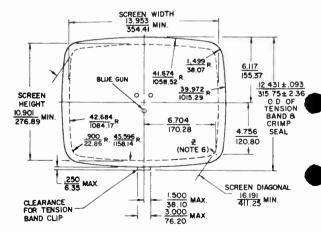
Note 4: To clean this area, wipe only with soft, dry, lintless cloth.

Note 5: All peripheral points of the faceplate lie on a spherical surface having a radius of 25.141 inches (638.58 mm). The center of the faceplate is located .016 inch (.41 mm) above this spherical surface.

Note 6: "Z" is located on the outside surface of the faceplate, on the screen diagonal at a point .125 in (3.18 mm) beyond the minimum screen. This point is used as a reference for the tension band.



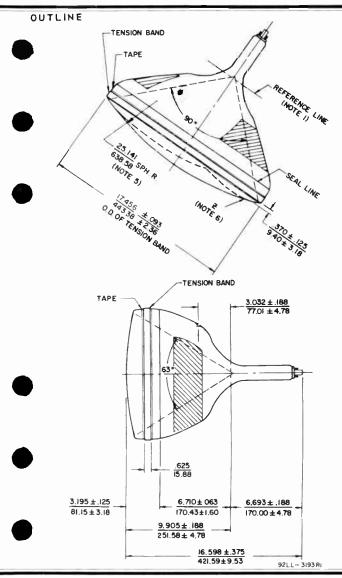




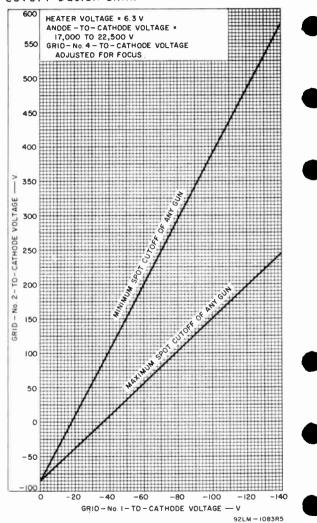
SAGITTAL HEIGHTS AT POINTS  $\frac{125}{318}$  BEYOND EDGE OF MIN. SCREEN

DIAGONAL  $\frac{1.398}{35.51}$  WIDTH  $\frac{1.040}{26.42}$  HEIGHT  $\frac{.642}{16.31}$ 

Dimensions in Inches/mm unless otherwise noted



### CUTOFF DESIGN CHART



RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 700 MAGNETIC DEFLECTION

D4 Culfide Tue

E 1	lect	rio	- 1	•

Direct Interelectrode Capacitances:	
Cathode to all other electrodes 5 pf	
Grid No.1 to all other electrodes 6 pf	
(1500 may, pf	
External conductive coating to anode \ 750 min. pf	
Heater Current at 6.3 volts 600 ± 30 ma	
Electron Gun Type Requiring	
No Ion-Trap Magnet	

### Optical:

Phosphor	(For	Curves.	see	fΓ	ont	. 01	t.h	15	Se	Cti	1 O N	}.	 -4 -	 u	- 1	u	: 1)	Ahe,
															Δ1	un	nini	ized
Faceplate	e. Si	pherica	١.											F	i	te	erq	lass
Light :	tran	smissio	n (/	Apr	oro	x.)												74%

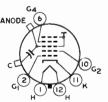
### Mechanical:

Weight (Approx.) .

Overall Length	19-3/16" ± 3/8"
Neck Length	7-1/2" ± 3/16"
Projected Area of Screen	149 sq. in.
External Conductive Coating:	
Type	Regular-Band
Contact area for grounding	. Near Reference Line
For Additional Information on Coatings	
See Picture-Tube Dimensional-Outlines	and Bulb Jigg B/D sheets

at front of this section Cap. . . . . . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-63) Rasing Designation for BOTTOM VIEW . . . . . . . . . . . . 12L

Pin	1 - Heater	
Pin	2 - Grid No.1	
Pin	6-Grid No.4	
Pin	10 - Grid No. 2	
Pin	11 - Cathode	
Pin	12 - Heater	



(Grid No.3. Grid No.5. Screen. Collector) C - External Conductive

Coating

Cap - Anode

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

Unless otherwise specified, voltage values catago with respect to cathode

	are positive with respect to	Carnoac
,	ANODE VOLTAGE	17500 max. volts
	GRID-No.4 (FOCUSING) VOLTAGE:	
	Positive value	1100 max. volts
	Negative value	550 max. volts

# 17HP4C

focused raster . . .

Grid-No.1-Circuit Resistance . . . . .

Maximum Circuit Value:

GRID-No.2 VOLTAGE	volts
Negative peak value	volts
Negative bias value 155 max.	volts
Positive bias value 0 max.	
Positive peak value 2 max.	
HEATER VOLTAGE	
(5.7 1111).	volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater megative with	
respect to cathode:	
During equipment warm-up period	
not exceeding 15 seconds 450 max.	
After equipment warm-up period 200 max.	volts
Heater positive with	
respect to cathode:	
Combined AC and DC voltage 200 max.	
DC compenent 100 max.	volts
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values	
are positive with respect to cathode	
Anode Voltage	volts
Grid-No.4 Voltage56 to +310	volts
Grid-No.2 Voltage 300	volts
Grid-No.1 Voltage for	
visual extinction of	

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



-28 to -72 volts

1.5 max. megohms

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 70° MAGNETIC DEFLECTION

#### Electrical:

Direct Interelectrode Capacitances:	
	рf
	рf
External conductive coating to anode $\begin{cases} 1500 \text{ max.} \\ 750 \text{ min.} \end{cases}$	ρf
	ρf
	mą
Electron Gun Type Requiring	ng
'.o lo-⊸Tris Magne	еt

### Optical:

Phosphor (For Curves, see front	of	this	Section).	P4-Sulfide Type,
				Aluminized
Faceplate, Cylindrical				Filterglass
Light transmission (Approx	ĸ.)			66%

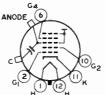
#### Mechanical:

Weight (Approx.)	 	 	19 lbs
Overall Length			
Neck Length			
Projected Area of Screen	 	 	. 149 sq. in.
External Conductive Coating:			
Type	 	 	. Regular-Band
Contact area for grounding	 	 Near	Reference Line

For Additional Information on Coatings and Dimensions: See Picture-Tube Dimensional-Outlines and Bulb Ji33 C/E sheets at front of this section

Cap. . . . . . . . Recessed Small Cavity (JFDEC No.J1-21) Base . . Small-Shell Duodecal 6-Pin (JEDEC Group 4. No. B6-63) Basing Designation for BOTTOM VIEW . . . . . . . . . . . . . . . . . 12L

Pin 1-Heater 2 - Grid No.1 Pin Pin 6-Grid No.4 Pin 10 - Grid No. 2 Pin 11 - Cathode Pin 12 - Heater



(Grid No.3. Grid No.5. Screen, Collector) C - External Conductive Coating

Cap - Anode

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

Unless otherwise specified, voltage values are bositive with respect to cathode

		, -					~ .		•	 ,	V 4-	 	C & C /1 O	u c	
)	ANODE VOLTA	AGF	I NG	i	VC	)i T	AC	F:					17500	max.	volts
	Positive	value											1100	max.	volts
	Negative	value											550	max.	volts

# 17LP4B

GRID-No.2 VOLTAGE	volts
Negative peak value	volts
Negative bias value 155 max.	volts
Positive bias value 0 max.	
Positive peak value 2 max.	
HEATER VOLTAGE	volts
PEAK HEATER-CATHODE VOLTAGE:	¥01103
Heater negative with	4
respect to cathode:	(
During equipment warm-up period	
not exceeding 15 seconds 450 max.	volts
After equipment warm-up period 200 max.	
Heater positive with	***************************************
respect to cathode:	
Combined AC and DC voltage 200 max.	volts d
DC component 100 max.	
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values	
are positive with respect to cathode	
Anode Voltage	volts
Grid-No.4 Voltage	
Grid-No.2 Voltage	volts
Grid-No.1 Voltage for visual	.0.03
and in the second of the secon	1.

Maximum Circuit Value:

extinction of focused raster. . . .

Grid-No.1-Circuit Resistance. . . . . . 1.5 max. megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



-28 to -72 volts

Flectrical:					
		11			; f
regress of entrates of the contract of the con		F1160	4 60	siron	T -
Optical:					
ero in the area of the second strike a			, ,	Stumiriy Stanovi	1
Mechanical:					
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- Picture Tate Firensional - cutline	s and	Bulb	1135	C E Stee	1+ 0
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ANODE  Fright Andrew  Fright Andrew  Grant A	10) G2 K		Co. Fite	it fic.3, Per. Pector) Pral Suctive	

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

Inless otherwise steerined, relarge values are positive with respect to cathode

Ares Ve	:anr.		 			200C ~ · V .	voits
(,r	V 1 * -	a.	 			15( max.	vol+s

# 17QP4B

(6.5	volts
Heater Voltage	volts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period	VOITS
not exceeding 15 seconds 450 max.	volts
After equipment warm-up period 200 max.	
Heater positive with respect to cathode: Combined AC and DC voltage 200 max. DC component	volts
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to cathode	
Anode Voltage	volts
Grid-No.2 Voltage	volts
extinction of focused raster28 to -72	volts
Maximum Circuit Value:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

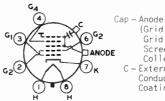


SHORT RECTANGULAR GLASS TYPE ALUMINIZED SCREEN LOW-VOLTAGE ELECTROSTATIC FOCUS 1140 MAGNETIC DEFLECTION INTERNAL MAGNETIC SHIELD

With Heater Having Controlled Warm-Up Time

	GENERAL DATA
	Electrical:
•	Direct Interelectrode Capacitances: Cathode to all other electrodes 3.4 pf Grid No.1 to all other electrodes 3.4 pf External conductive coating to anode.   1400 max. pf
)	Heater Current at 2.68 volts
	Optical:
	Phosphor (For Curves, see front of this Section). P4—Sulfide Type, Aluminized
	Faceplate Filterglass Light transmission (Approx.)
	Weight (Approx.)
	For Additional Information on Coatings and Dimensions:  See Picture-Tube Dimensional-Outlines and Bulb Ji49 A sheets
	at front of this section Cap
	busing besignation for bottom VIEW

р.	4
Pin	1 – Heater
Pin	2-Grid No.2
Pin	3-Grid No.1
Pin	4 - Grid No.4
Pin	6-Grid No.2
	7 - Cathode
Pin	8-Heater



(Grid No.3. Grid No.5, Screen, Collector) C - External

Conductive Coating

# **19ABP4**

Maximum Circuit Value:

Maximum and Minimum Ratings, Design-Maximum Values:	
Unless otherwise specified, voltage values	
are positive with respect to cathode	
ANODE VOLTAGE 20000 max. GRID-No.4 (FOCUSING) VOLTAGE:	volts
Positive value 950 max.	volts
Negative value 700 max.	volts
GRID-No.2 VOLTAGE 550 max. GRID-No.1 VOLTAGE:	volts
Negative peak value 400 max.	volts
Negative bias value 155 max.	volts
Positive bias value 0 max.	volts
Positive peak value 2 max.	volts
HEATER VOLTAGE	volts
\2.4 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:	
Combined AC and DC voltage 200 max.	volts
DC component 100 max.	volts
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values	
are positive with respect to cathode	
Anode Voltage	volts volts volts

For X-radiation shielding considerations, see Sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TÜBES

at front of this Section

Grid-No.1-Circuit Resistance. . . . . 1.5 max. megohms

extinction of focused raster. . . . -35 to -72 volts



BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN
114° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### **GENERAL DATA**

#### Electrical:

	Heater Current at 6.3 volts 600 $\pm$ 5%	m-a
,	Heater Warm-Up Time (Average)	seconds
	Direct Interelectrode Capacitinces:	
	Grid No.1 to all other electrodes 6	uuf
	Cathole to all other electrodes	f بربیر
	External conductive coating to ultor . $\begin{cases} 1500 \text{ max.} \\ 1000 \text{ min.} \end{cases}$	μμ f μμ f
	Electron Gun	Magnet
	711 141 11 9 1 101 11	

### Optical:

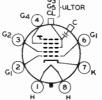
Faceplite and Protective Pinel Light transmission (Approx.)			Filterglass
Phosphor (For curves, see front of	this	Section)	.P4—Sulfide Type,

#### Mechanical:

Operating Position									Anv	
neight (Approx.) .									18-1/2 lbs	
Overall Length									11-5/8" + 5/16"	
Neck Length									. 4-1/8" + 1/8"	
Projected Area of S	ocr	ee	n						. 172 sg. in	
External Conductive	e (	FO.	ti	na:						
Туре									Regular Band	

Contact area for grounding . . . . . . Near Reference Line For Additional Information on Coatings and Dimensions: See Picture-Tube Dimensional-Outlines and Bulb Ji49 C sheets at the front of this section

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 3 - Grid No. 2
Pin 4 - Grid No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater



Cap - Ultor
(Grid No.3,
Grid No.5,
Collector)
C - External
Conductive
Coating

# **19AFP4**

Maximum Ratings, Design-Maximum Values:		
ULTOR VOLTAGE	20000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative beak value	220 max.	volts
Negative bias value	155 max.	volts
Positive bias value	0 max.	
Positive peak value	2 max.	VOITS
PEAK HEATER-CATHODE VOLTAGE:		
Hester negative with		
respect to cathode: During equipment warm-up period		
not exceeding 15 seconds	450 max.	volts
After equipment warm-up period	200 max.	
Hester positive with	200	VO. C3
respect to cathode	200 max.	volts
respect to eathode		
Typical Operating Conditions:		
With ultor voltage of	16000	volts
and grid-No.2 voltage of	300	volts
Grid-No.4 voltage for focus,	0 to 400	volts
Grid-No.1 Voltage for visual extinction		
of focused rister	-35 to -72	volts
Maximum Circuit Values:		
Gris-vo.1- ircait Resistance	1.5 max.	meaohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



SHORT RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW GRID-No.2 VOLTAGE

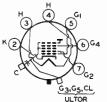
ALUMINIZED SCREEN 1140 MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

### GENERAL DATA

GENERAL DATA	
Electrical:	
Heater Current at 6.3 volts	5
Electron Gun Type Requiring No Ion-Trap Magnet	
Optical:	
Faceplate	6
Operating Position.       Any         Weight (Approx.)       14 lbs         Overall Length.       11–3/8" ± 1/4"         Neck Length       4-1/8" ± 1/8"         Projected Area of Screen.       172 sq. in.         External Conductive Coating:	1
Type	
For Additional Information on Coatings and Dimensions:  See Picture-Tube Dimensional-Outlines and Bulb Ji49 A sheets at the front of this section	
Cap Recessed Small Cavity (JEDEC No.J1-21) Base Special 6-Pin (JEDEC No.B6-214) Basing Designation for BOITOM VIEW	

Pin 2 - Cathode Pin 3 - Heater Pin 4 - Heater Pin 5 - Grid No.1 Pin 6 - Grid No. 4 Pin 7 - Grid No. 2



Cap - Ultor (Grid No.3, Grid No.5. Collector) C-External Conductive Coating

# **19AJP4**

Maximum and Minimum Ratings, Design-Maximum Values:	
ULTOR-TO-GRID-No.1 VOLTAGE	volts
	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:   Positive value	volts volts volts volts
CATHODE-TO-GRID-No.1 VOLTAGE 100 max.	volts
HEATER VOLTAGE 7 max.	volts
( 3.0 mm.	volts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts
Typical Operating Conditions:	
With ultor-to-grid-No.1 voltage of 14500 and grid-No.2-to-grid-No.1 voltage of 50  Grid-No.4-to-Grid-No.1 Voltage for focus . 0 to 500	volts volts
Catnode-to-Grid-No.1 Voltage for visual extinction of focused raster 31 to 49	volts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this section



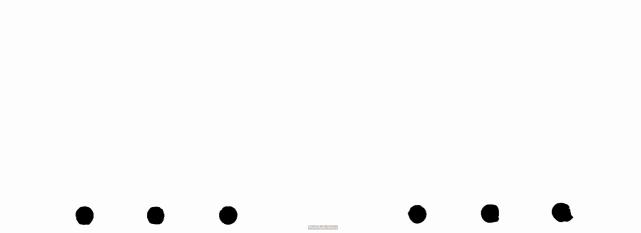


The 19AP4 is like the 19AP4-B except that it has a face plate made of unfrosted, clear glass. As a result, the light output is about 30% greater than shown by the curves under Type 19AP4-B.

# 19AP4-A KINESCOPE

The 19AP4-A is like the 19AP4-B except that it has an unfrosted Filterglass face plate. The light output is essentially the same as that of the Type 19AP4-B.

As soon as feasible, the 19AP4-B will supersede the 19AP4 and 19AP4-A.

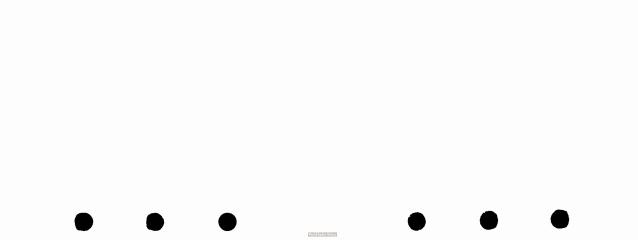


# 194<sub>P</sub>

## KINESCOPE

The 19AP4-D is like the 19AP4-B except that it has a face plate made of frosted, clear glass. As a result, the light output is about 30% greater than shown by the curves under Type 19AP4-B.

As soon as feasible, the 19AP4-B will supersede the 19AP4-D.



RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

Electrical:

ALUMINIZED SCREEN MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

Heater Current at 6.3 volts. 600 ± 30 ma Heater Warm—Up Time (Average). 11 seconds Focusing Method	Electrical;	
Diagonal	Heater Warm-Up Time (Average)	11 seconds Electrostatic
Grid No.1 to all other electrodes	Diagonal	102°
Electron Gun	Grid No.1 to all other electrodes Cathode to all other electrodes	. 5 μμ.f
Faceplate		
Light transmission at center (Approx.)	Optical:	
Phosphorescence.	light transmission at center (Annroy)	. P4—Sulfide Type
Tube Dimensions:  Overall length	Phosphorescence	
Overall length	Mechanical:	
Edge	Overall length	. 16-13/32" ± 1/8" . 13-11/32" ± 1/8" . 18-5/8" ± 1/8" . 4-1/8" ± 1/8"
Screen Dimensions (Minimum):       15-1/8"         Greatest width       12"         Greatest height       12"         Diagonal       17-9/16"         Projected area       172 sq. in.         Weight (Approx.)       14 lbs         Operating Position       Any         Cap.       Recessed Small Cavity (JEDEC No.J1-21)		
	Screen Dimensions (Minimum): Greatest width Greatest height Diagonal Projected area Weight (Approx.) Operating Position Cap	15-1/8" 12" 17-9/16" 14 lbs Any ty (JEDEC No.J1-21)

# **19AVP4**

Base Smal	l-Button Neoeightar	7-Pin, Arrangement 1, (JEDEC No.B7-208)
Basing Designation	for BOTTOM VIEW	8HR
Pin 1 - Heater Pin 2 - Grid No. 1 Pin 3 - Grid No. 2 Pin 4 - Grid No. 4 Pin 6 - Grid No. 1 Pin 7 - Cathode Pin 8 - Heater	3 T T T T T T T T T T T T T T T T T T T	Cap - Ultor (Grid No.3, Grid No.5, Collector) C - External Conductive Coating

### GRID-DRIVE\* SERVICE

ONTO DRIVE GERVICE	SATE SERVICE				
Unless otherwise specified, voltage values					
are positive with respect to cathode					
Maximum and Minimum Ratings, Design-Naximum Values:					
ULTOR VOLTAGE	volts volts				
GRID-No.4 (FOCUSING) VOLTAGE: Positive value	volts				
Negative value	volts				
GRID-No.2 VOLTAGE	volts				
GRID-No.1 VOLTAGE:	volts				
Negative-peak value	volts				
Negative-bias value	volts				
Positive-bias value 0 max. Positive-peak value 2 max.	volts				
	volts volts				
HEATER VOLTAGE	volts				
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts volts volts				
Typical Operating Conditions:					
With ultor voltage (Ecsk) of 20000	volts				
and grid-No.2 voltage (Ec2h) of 400	volts				
Grid-No.4 Voltage for focus 0 to 400 Grid-No.1 Voltage for visual	volts				
extinction of focused raster*36 to -94 Field Strength of Adjustable	volts				
Centering Magnet♦ 0 to 9	gausses				
Maximum Circuit Values:					
Grid-No.1-Circuit Resistance 1.5 max.	megohms				

#### CATHOOF-DRIVE SERVICE

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

Ma	ximum	and	Minimu	m Rat	ings	, De	S 1	7n-	Na	x t t	num Valı	ies:	
UL	TOR-TO	)—GRI	D-No.1	VOLT	AGE.						{23000	max.	volts
	RID-No.	4-TC		No.1							15000	min.	VOITS
_			alue.								1250	max.	volts
	Negat	ive v	alue.									max.	volts
GE	RID-No.	2-T0	-GRID-	No. 1	VOLT	AGE.						max.	volts
											(/	min.	volts
	RID-No. ATHODE	-T0-C	RID-No	.1 VC	LTAG	Ē:		•	•	٠		max.	volts
			eak va					٠	٠	٠		max.	volts
			ias va						٠	٠		max.	volts volts
			oias va beak va							٠		max.	volts
									٠	•		max.	volts
H	EATER	VOLTA	GE					٠	٠	٠		min.	volts
	Dur n Aft	nega ing e ot ex er ed	ative w equipme ceedir quipmer itive w	ith re ent wa ng 15 nt wan	espec arm—u seco rm—up	t to p pe nds. per	eri  rio	od d.			200	max. max.	volts volts volts
Ty	pical	0per	ating	Cond i	tion	s:							
	vol	tage	-to-gr (E <sub>C 5</sub> g 1	) of		1					200	00	volts
0.		tage	(Ec 28)	) of							40	0	volts
	Volta athode	ge fo -to-(	r focu Grid-No	s• 5.1 Vo	oltag	е					0 to	400	volts
,		r <b>♦</b> .	extir					a •			36 to	78	volts
ŗ	Cente	ring	Magnet	Mu j u s		•					0 to	9	gausses
Ma	aximum	Circ	uit Va	lues	:								
G	rid-No	. 1-C	rcuit	Resis	stanc	e.		٠		٠	1.5	max.	megohms
•	Grid d the gr	rive id-No	is the i	operat ntial	ing co with r	ndit espe	lon	in to	ca	hic tho	h the vio	deo sig	nal varies
•	The or	Id-No	u for	arid-N	0.4-10	-ari	d-N	0.1	L)	vo1	tage requ	ired f	or optimum

The grid-No, w (or grid-No.4-to-grid-No.1) voltage required for optimum focus of any individual tube will have a value anywhere between 0 and 400 volts, is independent of ultor current and will remain essentially constant for values of ultor (or ultor-to-grid-No.1) voltage or grid-No.2 (or grid-No.2-to-grid-No.1) voltage within design-maximum ratings shown for these items.

\* See Raster-Cutoff-Range Chart for Grid-Drive Service.

Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/4". The specified centering magnet compensates only for the effect which mechanical tube tolerances may have on the location of the undeflected focused spot with respect to the center of the tube face. Maximum field strength of adjustable centering magnet equals:

# **19AVP4**

$$\sqrt{\frac{\varepsilon_{c_5k \text{ or } \varepsilon_{c_5g_1} \text{ (volts)}}}{16000 \text{ (volts)}}} \times \text{B gausses}$$

The equipment manufacturer must determine and supply additional compensation for the effects of the earth's magnetic field and extraneous fields due to choice of circuitry and components. The additional compensation should preferably be applied as part of the magnetic field of the deflecting yoke.

- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid Mo.1 and the other electrodes.
- ♠ See Raster-Cutoff-Range Chart for Cathode-Drive Service.

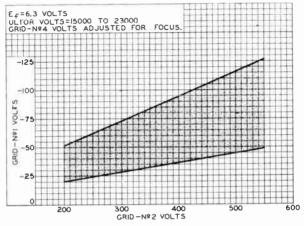
#### OPERATING CONSIDERATIONS

X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation atvoltages as high as 23 kilovolts (Design—maximum value), shielding of this picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

Shatter-Proof Cover Over the Tube Face. Following conventional picture tube practice, it is recommended that the cabinet be provided with\a shatterproof, glass cover over the face of this 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.

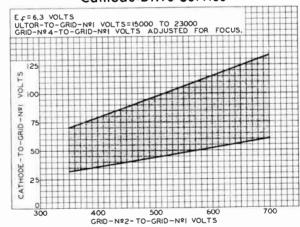


## RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service

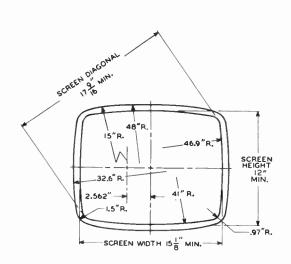


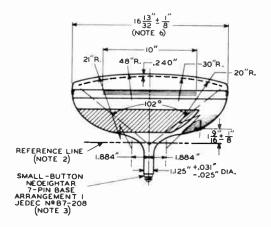
92CS-10790

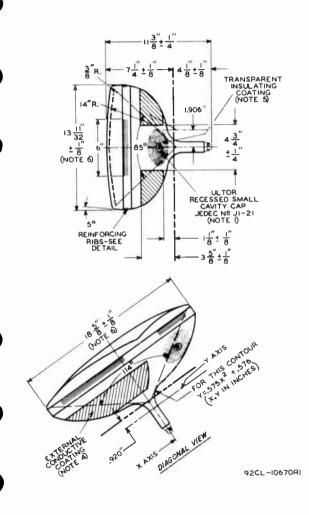
## Cathode-Drive Service

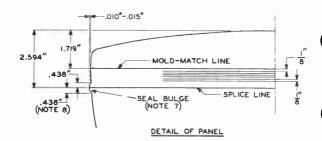


92CS-108I9









NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm~30^{\circ}$ . ULTOR TERMINAL IS ON SAME SIDEAS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPEONLY WITH SOFT DRY LINT-LESS CLOTH.

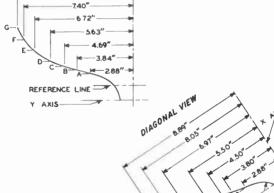
NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD—MATCH LINE.

NOTE 8: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/8" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF THE TUBE SUPPORT BAND. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPECED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

#### BULB-CONTOUR DIMENSIONS

# SHORT-SIDE VIEW Y AXIS -920"



LONG-SIDE VIEW 7.86" -

NOTE: PLANES A THROUGH G ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS FROM THE Y AXIS. THESE COORDINATES DESCRIBE THE BOGIE-BULB EXTERNAL CONTOUR IN PLANES THROUGH THE TUBE AXIS AND THE RESPECTIVE FACEPLATE AXES.

92CL-10669RI



# **19AYP4**

## Picture Tube

SHORT RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 1140 MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 19AYP4 is the same as the 19AVP4 except for the following item:

Electrical:

Heater Current at 6.3 volts. . . . . . 450 ± 20 ma



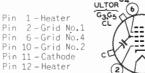
RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW-GRID-No.2 VOLTAGE

ALUMINIZED SCREEN 920 MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

Electrical:  Heater Current at 6.3 volts
Heater Warm-Up Time (Average)
Grid No.1 to all other electrodes
Electron Gun
Electron Gun
Faceplate Filterglass
Faceplate Filterglass
Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized
Mechanical:
Operating Position.       . Any         Weight (Approx.)       . 15 lbs         Overall Length.       . 15-1/4" ± 3/8"         Neck Length       . 5-1/2" ± 3/16"         Projected Area of Screen.       . 172 sg. in.         External Conductive Coating:
Type
See Picture-Tube Dimensional-Outlines and Bulb Ji49 B sheets
at the front of this section Cap
Bases (Alternates): Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.B6-203; Small-Shell Duodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.B6-63) Basing Designation for BOTTOM VIEW
III TOP G4



Cap - Ultor (Grid No.3, Grid No.5, Collector) 10)62 C - External Conductive Coating

# 19BDP4

Maximum and Minimum Ratings, Design-Maximum V.		
ULTOR-TO-GRID-No.1 VOLTAGE		volts volts
Negative value	00 mix. 00 mix. 70 mix.	volts volts volts
	10 min. 00 max. 7 max. 8 min	volts volts volts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	10 max. 30 max.	volts volts
Typical Operating Conditions:		
and grid-No.2-to-grid-No.1 voltage of	14500 50 to 500	
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	5 may	negohme

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 920 MAGNETIC DEFLECTION

#### GENERAL DATA

FI		1.	rica	. 1 .
E	l e c	Lľ	102	11:

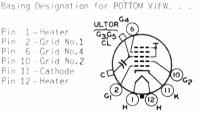
Heater Current at 6.3 volts 600 $\pm$ 5%	ma
Direct Interelectrode Caracitances:	
Grid Mo.1 to all other electrodes 6	$\mu\mu f$
Cathode to all other electrodes 5	μμf
External conductive coating to ultor $\begin{cases} 2000 \text{ max.} \\ 1500 \text{ min.} \end{cases}$	μμ <b>t</b> μμ <b>f</b>
Electron Gun lypė Kėquiring No lon—Irap Ma	gnet

#### Optical:

***************************************
Faceplate Filterglass
Light transmission (Approx.)
Phosphor (For curves, see front of this Section). P4-Sulfide Type,
Aluminized

Mechanical:
Operating Position
Weight (Approx.)
Overall length
Neck Length
Projected Area of Screen
External Conductive Coating:
Type
Contact area for grounding Near Reference Line
For Additional Information on Coatings and Dimensions:
See Picture-Tube Dimensional-Outlines and Bulb Jido B sheets
at the front of this section
Car Recessed Small Cavity (JEDEC No.J1-21)
Bases (Alternates):

Pin 1 - Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10 - Grid No. 2 Pin 11 - Cathode Pin 12 - Heater



Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No. R6-203)

Small-Shell Duodecal 6-Pin, Arrangement 1

(JEDEC Group 4, No. B6 63)

Cap - Ultor (Grid No.3. Grid No.5, Collector) C - External Conductive Coating

# 19**BFP**4

Maximum Ratings, Design-Maximum Values:		
ULTOR VOLTAGE	20000 max.	volts
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE	550 max.	volts
GRID-No.1 VOLTAGE:	454	1.
Negative bias value	154 max.	
Positive bias value	0 max.	
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with		
respect to cathode: During equipment warm-up period		
not exceeding 15 seconds	450 max.	
After equipment warm-up period	200 max.	volts
Heater positive with	ZUU MAX.	VOICS
respect to cathode	200 max.	volts
trojtot to cathode	200	*01(3
Typical Operating Conditions:		
With ultor voltage of	16000	volts
and grid-No.2 voltage of	400	volts
Grid-No.4 Voltage for focus	0 to 400	volts
Grid-No.1 Voltage for visual	0 10 700	***************************************
extinction of focused raster	-36 to -94	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this section



SHORT RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW GRID-Nu. 2 VOLTAGE ALUMINIZED SCREEN 114° MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

#### With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

-			
- 1	lect	PIC	3 l •

Heater Current at ( voits 600 ± 30	ma.
Heater Narm-Un Time (Average)	seconds
Direct Interelectrode Capacitances:	
Grid No.1 to all other electrodec 6	nuf
Catrole to all other electrodes 5	μμf
External conductive coating to ultor \{\begin{align*} \{1500 \text{ max.} \\ 1000 \text{ min.} \end{align*}	μμf
External conductive conting to dirar 11000 min.	J.J.L.F
Electron Gun Type Requiring No Ion-Trai	Mannet

#### ptical

Faceplate Filterglist	
Light transmission (Annrox.)	%
Phosphor (For curves, see front of this section). P: -Sulfide Type	,
Aluminized	d

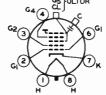
#### Mechanical:

Mechanical:
Operating Position
Weight (Approx.)
Overall Length
Neck Length
Projected Area of Screen 172 sq. in.
External Conductive Coating:
Type
Contact area for grounding Near Reference Line

Contact irea for grounding. . . . Near Reference Line For Auditional Information on Coatings and Dimensions: See Picture-Tube Dimensional-Outlines and Bulb Jidg A Sheets

Arrangement 1 (JEDEČ No.87-208)
Basing Designation for BOTTOM VIEW. . . . . . . . . 8HR

Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode Pin 8 - Heater



(Grid No.3, Grid No.5, Collector) C - External Conductive Coating

Cap - Ultor

# 19CHP4

Maximum and Minimum Ratings, Design-Maximum Values:	
ULTOR-TO-GRID-No.1 VOLTAGE	volts volts
(FOCUSING)       VOLTAGE:         Positive value.       1250 max.         Negative value.       400 max.         GRID-No.2-TO-GRID-No.1 VOLTAGE.       770 max.         40 min.	volts volts volts
CATHODE-TO-GRID-No.1 VOLTAGE: Positive peak value	volts volts volts volts volts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds 450 max. After equipment warm-up period 200 max. Heater positive with respect to cathode	volts
Typical Operating Conditions:	
With ultor-to-grid-No.1 voltage of 16000 and grid-No.2-to-grid-No.1 voltage of 50	volts
Grid-No.4-to-Grid-No.1 Voltage for focus50 to +250 Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster 32 to 50	volts
Maximum Circuit Values:	

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section

Grid-No.1-Circuit Resistance. . . . . . 1.5 max. megohms



# 19CMP4

	Picture Tube
Low-Voltage Electrostatic focus  Low-Grid-No. 2 Voltage — for Cat.	TIT TOTALLITO DETECTION
The 19CMP4 is the same as the 19CHP4 items:	except for the following
ELECTRICAL	
Heater Current at 6.3 volts	450 ± 20 mA
MAXIMUM AND MINIMUM RATINGS, DES Anode Voltage	



#### NO ION-TRAP MAGNET REQUIRED

LOW-VOLTAGE ELECTROSTATIC FOCUS 1140 MAGNETIC DEFLECTION

Lou-Grid-No. 2 Voltage - for Cathode-Drive Operation

#### ELECTRICAL

Direct Interelectrode Capacitances			
Cathode to all other electrodes		 . 5	р
Crid No.1 to all other electrodes.			
Euternal songlist e colding to ancar		 . {1900	max p
Heater Current at 6.3 V Heater Warm-Up Time (Average) Type Requi		 . 11	

#### OPTICAL

Phosphor	.P4—Sulfide Type, Aluminized
for tiring the track of this	· · · · · · · · ·
Faceplate	· · · · · Filterglass
Light transfer of Carres.).	78%

#### MECHANICAL

weight (Approx. /.												
Overall Length										11.625 + 0.250 i	in	
Neck Length										4.375 + 0.125 i	in	
Projected Area of	Sc	cre	er	١.						172 so i	in	
External Conductiv	/e	Co	at	in	а							
					-					0 1 0		

For Addition Information on Coatings and Dimensions

See Picture-Tube Dimensional-Outlines on Bulb 1149A

Pir y = Citron

1: 3 = de .tr

Pin 4 = M. str

Pin 5 = Grid No.1

1: r = unid No.4

Pin 7 = Grid No.4

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Cap = Anode Maria No.3

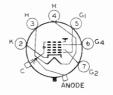
...

...

...

Cap = Citron 1 for Martine

Waight (Approx )



MAXIMUM AND MINIM	UM RAT	TINGS	, DES	I GN -MA	XIMUM VAL	UES
Unless otherw						
are positiv	e with	h res	oec t	to gri	d No.1	
Anode Voltage					{20000	
Grid-No.4 (Focusing) Vo						
Positive value						max V
Negative value					(55	max V
Grid-No.2 Voltage						min V
Cathode Voltage						
Negative peak value .						max V
Negative bias value .						max V
Positive bias value . Positive peak value .						) max V ) max V
					(0.0	max V
Heater Voltage						min V
Peak Heater-Cathode Vol Heater negative with During equipment wa	respe arm—up	peri	00			
not exceeding 15						max V
After equipment war						) max V
Hester positive with Combined AC and DC						max V
DC component						) max V
TYPICAL OPERATING C	ONO IT	IONS	FOR C	ATHOOE	-ORIVE SE	RVICE
Unless otherw						
are positiv	e witi	hres	pect	to gri		
Anode Voltage						000 V
Grid-No.4 Voltage						500 V
Grid-No.2 Voltage Cathode Voltage					35 1	
For visual extinction	n of f	ocus	ed ra	ster		
MA)	( I MUM	CIRCI	JIT V	ALUE		
Grid-No.1 Circuit Resis	stance	e			1.5	max MΩ

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at from of this section



PAN-O-PLY-INTEGRAL IMPLOSION PROTECTION
(Provided by Formed Rim and Welded Tension Bands Around Periphery of Tube Panel—No Separate Safety-Glassor Integral Protective Window Required)
LOW-VOLTAGE ELECTROSTATIC FOCUS 1140 MAGNETIC DEFLECTION
ELECTRICAL
Disable Lateral advanta Constitution
Direct Interelectrode Capacitances Catrone to all other electrones
rid No. 1 to all other electroles 6 pt
External on as "vecostra to snow . 1250 min-1750 max pl
Heater Current at 6.3 volts 450 ± 20 m/s
Heater Warm-Up Time (Average)
Electron Gun Type Requiring No Ion-Trap Magne
OPTICAL
Phosphor
For tree, see frunt of this ection
Faceplate
Light Transmi sion (Approx.) 48
MECHANICAL
Woight (Amount)
Weight (Approx.)
Overall Length
Neck Length 4.125 ± .125 ir
Projected Area of Screen 172 sq in
External Conductive Coating <sup>a</sup>
vr
Contitures for grounding Near Reference Line

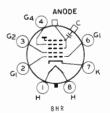
# Arrangement I. (JEDEC No.B7-208) TERMINAL DIAGRAM (Bottom View)

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

For Additional Information on Coatings and Dimensions
See Picture-Tube Dimensional-Outlines and Bulb J149F on its

Pin 1 - Hoster
Pin - Gris No.1
Pin y - Gris No.2
Pin 1 - Gris No.1
Pin 7 - Cris No.1
Pin 7 - Cathour
Pin 8 - Hoster
Cap - Anote (Gris No.1
Collector)
(-External Conductive

at from of this action



. Small-Button Neoeightar 7-Pin,

→ Indicates a change.



### MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Unless otherwise specified, voltage values are positive with respect to cathode Anode Voltage. . . 11000 min-23000 max Grid-No.4 (Focusing) Voltage Positive value . . 1100 max 'vegstive value . . 550 max ٧ Grid-No.2 Voltage. . 200 min-550 max ٧ Grid-No. | Voltage Negative peak value. . 220 max Negative bis value. . 155 max ٧ Positive bias value. . . 0 max ٧ Positiv- perk value. . . . 2 max ٧ Heater Voltage . . . . . 5.7 min-6.9 max ٧ Peak Heater-Cathode Voltage Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds. . . 450 max After equipment warm-up period 300 max Heater positive with respect to cathour: Combined At and DC voltage . . 200 max DC component . . . . . . . . . 100 max TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE Unless otherwise specified, voltage values

are positive with respect to grid No. 1

Anode Voltage		v
Grid-No.4 Voltageb	200	ů
Grid-No.2 Voltage		٧.
Cathoda Valtage		¥
Cathode Fortage	28 to 62	٧
For visual extinction of	focused raiter	
Field Strength of required	adjustable	
centering magnet <sup>c</sup>	0 to 8	G

#### MAXIMUM CIRCUIT VALUE

#### Grid-No. | Circuit Resistance . . . . . . . 1.5 max

External conductive coating and implosion protection hardware must be grounded.

For A ridiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



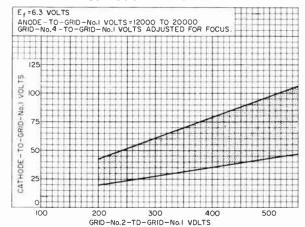
The grid-No. 3 voltage required for optimum focus of any individual tube will have a value anywhere between 0 and +400 volts with the combined grid-No.1 voltage and videu-signal voltage adjusted to give an anode current of 100 microamperes on a 10-1 2-inch by 14-inch pattern from an BCA-2F21 monoscope, or equivalent.

Di tance from Reference Line for suitable PM centering magnet should not exceed all aims, The specified entering magnet should not exceed all aims, The specified entering magnet compensates only for the effect which mechanical tube tolerances may have on the loading after the indifferent focused sput with respect to the center of the last face. Maximum field they in or adjustable unitering manet equal.

The epripment manufacturer must determine and supply idditional compensition for the iffect of the markets mignetic field and extraneous field due to concer of circultry and components. The additional compensation should preferably be applied is part of the magnetic field fit deflecting you.

For X-radiation shimiding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES

## RASTER-CUTOFF-RANGE CHART Cathode-Drive Service



9205-12008



#### PAN-O-PLY - INTEGRAL IMPLOSION PROTECTION

(Provided b, Formed Rim and Welded Tension Bands Around Periphery of Tube
Panel — No Separate Safety-Glass or Integral Protective Window Required)
RECTANGULAR GLASS TYPE

NO ION-TRAP MAGNET REQUIRED
LOW-VOLTAGE ELECTROSTATIC FOCUS
HEATER CONTROLLED WARM-UP TIME

ALUMINIZED SCREEN

The 19DRP4 is the same as the 19DQP4 except for the following item:
Flectrical:

Heater current at 6.3 volts . . . . . . 600 ± 30 ma



#### PAN-O-PLY -- INTEGRAL IMPLOSION PROTECTION

(Provided by Formed Rim and Welded Tension Bands Around Periphery of Tube Panel - No Separate Safety-Glass or Integral Protective Window Required) 114º MAGNETIC DEFLECTION LOW-VOLTAGE ELECTROSTATIC FOCUS

NO ION-TRAP MAGNET REQUIRED

Low-Grid-No. 2-Voltage - for Cathode-Drive Operation

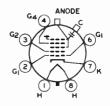
#### ELECTRICAL

	ρΓ pF
tate in a conductive to a ling to alloge.	pF -
Heater Current at 6.3 volts 600 ± 30	nA s
OPTICAL	
Phosphor	55
MECHANICAL	
Weight (Approx.)	in in
Type	ne
at front of this section Cap Recessed Small Cavity (JEDEC No.JI-21 Base	ı,

Pin 1 - Heater Pin 2-Grid No.1 Pin 3 - Grid No. 2 Pin 4 - Grid No. 4 Pin 6 - Grid No. 1 Pin 7 - Cathode Pin 8-Heater

Basing Designation for BOTTOM VIEW. . . .

Cap - Anode (Grid No.3. Grid No.5, Screen. Collectori C-External Conductive Coating



- Indicates a change.



#### MAXIMUM AND MINIMUM RATINGS. DESIGN-MAXIMUM VALUES

Intess otherwise specified, intage values are positive with respect to grid No. 1

Anode Volta															J	20000		¥
Anoue voite	ige .		•	٠	•	•	٠	•	•	•	•	•	٠	•	. [	10000	min	٧
Grid-No.4	(Focus	ing)	Vo	lta	age	,												
T + T+ T+ T																1250	max	٧
· Parlice	valu															400		٧
Grid-No.2	/oltan	p															max	٧
di 10-110.2	, or tag		•	•	•	•	•	•	•	•						140	min	٧
Cathode Vo	ltage																	
Veritive	D+ 1K	ما اد،														2	max	٧
tea this	£ 1 15															0	max	٧
Poritive	bi-s	, d.,-														100	max	٧
Fo itiv	Dt 14	v 3° Ler															max	٧
Heater Vol	tage.																тах	٧
nearer voi	cago.			-												15.7	min	٧
Peak Heater																		
the steem to												3.	:					
ering.	3.11	····		• • •		. :	,-		7									
	/c e :																max	V
Artir -																300	max	٧
1 1121 0																		
																	max	٧
ii (cn	1 750-5				-					-		٠			٠	100	max	٧
TYPICAL	ADED	LTING	00	WL	н	10	N S		OE.	, ,	٠,٨٦	ГНГ	30.5		RΙ	VE SER	VICE	
																	17 1 UL	
	, ,	. 1							- 1			7 .			!			

Inless otherwise specified, inlage values
are positive with respect to grid No. 1

are postrice and respect to grave	110 - 1
Anode Voltage	. 16000 V
Grid-No.4 Voltageb	
Grid-No.2 Voltage	. 50 V
Cathode Voltage for visual extinction	
of focused raster	. 32 to 50 V
Field Strength of required adjustable	04-0
centering magnet	. 0 to 8 G

#### MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance. . . . . . . . . . 1.5 max M?

1 External conductive coating and implosion protection hardware must be grounded.

The gradeNo.1 voltage required for optimum focus of any individual tube will have a value anywhere between -100 and +300 volts with the combined grid-No.1 voltage and video-siznal voltage adjusted to give an amode current of 100 microamperes on a 10-1 2-inch by 14-inch pattern from an RV-2121 monoscope, or equivalent.

A-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES of



	riciore Tube
FILLED-RIM TYPE	1140 MAGNETIC DEFLECTION
Direct Interelectrode Capacitances Catho in to all other electrodes. Grid No.1 to all other electrodes. External conductive conting to model Heater Current at 6.3 V	6 pF a. 1250 min—1750 max pF . 600 ± 30 mA
OPTICAL	
For curves, see front of this secti	Filterglass
MECHANICAL	
Weight (Approx.)	11.625 ± .250 in
Type ( c. at outlives 1 at front of this Contact area for grounding . Cap	Near Reference Line   Cavity (JEDEC No.JI-21)
TERMINAL DIAGRAM (Bot	tom View)
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.4 Pin 7 - Grid No.1 Pin 7 - Grid No.1 Pin 7 - Grid No.3, Grid No.5, Schenn, Collector) C - External Conductive Costing	G4 4 ANODE  G2 3 T 6 G G G G G G G G G G G G G G G G G G
MAXIMUM AND MINIMUM RATINGS, DE	
Voltages are positive with re Anode Voltage. Grid-No.4 Voltage Positive value. Legative value Grid-No.2 Voltage. Grid-No.1 Voltage	1100 min - 23000 max
Negative bias value.  Positive bias value.  Positive bias value.  Positive bias value.  Heater Voltage	220 max

Peak Heater-Cathode Voltage					
Heater negative with respect to cathore:					
During · suipmert warm-up perio: ≤ 15		450	max	٧	
After equipment warm-up perion		300	max	٧	
Heater positive with respect to athoge:					
Combined AC & DC voltage		200	max	٧	
DC component				V	

#### TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

Voltages are positive with respect to grid No. 1

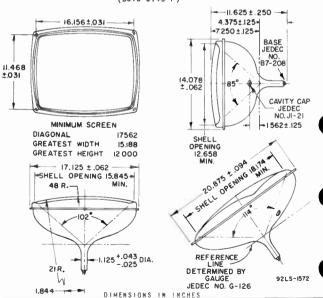
Anode Voltage Grid-No.4 Voltage Grid-No.2 Voltage Cathode Voltage	 	 0 to 400 V 300 V
Field Strength		 0 to 8 G

MAXIMUM CIRCUIT VALUE

Grid-No. | Circuit Resistance . 1.5 max M.

Of required adjustible centering higher

#### DIMENSIONAL OUTLINE (Bulb J149 F)



a Includes implosion protection hardware.

## Picture Tube

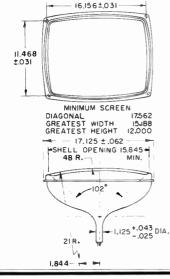
	riciore Tube
FILLED-RIM TYPE	
114° MAGNETIC DEFLECTION	IOW GRID-No.2 VOLTAGE
Direct Interelectrode Capacitances	
Cathore to all other electroses	5 pF
[xt.rn:] confictive continues non-a	6 pF
Heater Current at 6.3 V	450 + 20 max pr
Heater Warm-Up Time (Average)	11 s
Electron Gun Type Requir	
OPTICAL	, ,,,,
	lfide Tune Aluminiant
For curves, retront of the section	lfide Type, Aluminized
	Filterglass
Light ** remi for at corter (increx.	
MECHANICAL	
	16 lb
Overall Length	
eck Length	
rojected Area of Screen	
ternal Conductive Coating	•
pr (Sec CFT OUTLINES 1 at front of tris sec	
Cortact in-: for arounding	
Cap	avity (JEDEC No.JI-21) tton Neoeightar 7-Pin,
	t I. (JEDEC No.B7-208)
TERMINAL DIAGRAM (Bottom	
,	1 11011)
Pin 1 - He iter G4 (4) D	C p - Anod-
Pin - 111 10.1	(Grid No.1,
Pin 3 = Grid No. 2 623 T X 66	Grisho
Pin 4 = Grijs to.4	ocr. cn.
Mir - Jrip No.1	oll.ctor)
Pin /-C.thod	C-1-ternil
F'r 8 - 1	Conduct's Costina
	COSTING
8 H R	
MAXIMUM AND MINIMUM RATINGS, DESIGN	N-MAXIMUM VALUES
· · · · · · · · · · · · · · · · · · ·	
Voltages are positive with respec	
Anode Voltage	12000 min—21000 max V
Po '' v val	1250 max V
Service value	400 max V
Grid-No.2 Voltage	25 min—60 max V
Cathode Voltage	
Neartive perk value	2 max V
Scartic dia volue	O max V
Politive bie vele	100 max V
Politice resk value	I50 max V

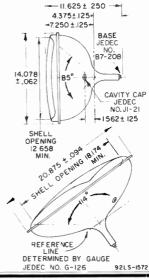
Heater Voltage 5.7 min—6.9 max Peak Heater-Cathode Voltage	٧
Heater negative with respect to cathode:	
During equipment #:rm-up period < 15 s 450 max	٧
After equipment warm-up period 300 max	٧
Heater positive with respect to cathode:	
(ombined AC & DC voltage 200 max	٧
DC component	٧
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	
Voltages are positive with respect to grid No.1	
Anode Voltage	٧
Grid-No.4 Voltage 0 to 400	٧
Grid-No.2 Voltage 50	٧
Cathode Voltage	٧
For visual extinction of focused raster	
Field Strength 0 to 8	G
Of required adjustable centering magnet	
MAXIMUM CIRCUIT VALUE	
Grid-No.1 Circuit Resistance 1.5 max l	<b>M</b> ()

a Includes implosion protection hardware.

## DIMENSIONAL OUTLINE (Bulb J149 F)

OIMENSIONS IN INCHES



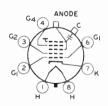


## Picture Tube

PAN-O-PLY—INTEGRAL IMPLOSION PROTECTION LOW-VOLTAGE FLECTROSTATIC FOCUS 1140 MAGNETIC DEFLECTION LOW-GRID-No. 2 VOLTAGE CATHODE-DRIVE TYPE
ELECTRICAL
Direct Interelectrode Capacitances  Cathode to all other electrode
Heater Current at 6.3 V
OPTICAL
Phosphor
MECHAN I CAL
Weight (Approx.)
Contact area for grounding Near Reference Line For Additional Information on Coatings and Dimensions  See Picture-Tube Dimensional-Outlines and Bulb J149 F Page 15
at front of this section

## TERMINAL DIAGRAM (Bottom View)

Pin 1 - Heater
Pin 2 - Gris No.1
Pin 3 - Gris No.2
Pin 4 - Gris No.4
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater
Csp - Anode (Gris No.3,
Grid No.5, Screen,
Collector)
C - Ext-rnsl Conductive
Coating



. . Recessed Small Cavity (JEDEC No.JI-21)
. . . . . . Small-Button Neoeightar 7-Pin,
Arrangement I, (JEDEC No.B7-208)

8 H R

### MAXIMUM AND MINIMUM RATINGS. DESIGN-MAXIMUM VALUES

Unless otherwise specified, voltage values

are positive with respect to Grid No. 1	
Anode Voltage	V
Grid-No.4 (Focusing) Voltage Positive value	٧
'legitive valur 400 max	V
Grid-No.2 Voltage	٧
Cathode Voltage	٧
regative perk value 2 max	٧
Negative bias value 0 max	¥
Positive bias value 100 max	¥
Positive peak value,	٧
Heater Voltage	V
Peak Heater-Cathode Voltage	٧
Heater negative with respect to distrode:	
During equipment warm—up portiod not exceeding	
15 econus	٧
After equipment warm-up period 300 max	٧
Heater positive with respect to cuthop:	· ·
Combined AC and PC voltage 200 max DC component	V
	*
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	
Unless otherwise specified, voltage values	
are positive with respect to grid No.1	
Anode Voltage	
Grid-No.4 Voltage	٧
Grid-No. 2 Voltage	V
Cathode Voltage	٧
MAXIMUM CIRCUIT VALUE	
Grid-No.1-Circuit Resistance 1.5 max	$M\Omega$

a External conductive coating and implosion protection bardware must be grounded. The grid-Vo.4 voltage required for optimum forus of any individual tube will have a value anywhere between 0 to + 400 volts with the combined grid-Vo.1 voltage and videos-signal voltage adjusted to give an annote current of 100 microamperes on a 10-1-2 inch by 14\*inch pattern from an HCA-2F21

For x-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES



monoscope, or equivalent.

## Picture Tube

PAN-O-PLY TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW-GRID-No.2 VOLTAGE

### ELECTRICAL

Direct Interelectrode C	apacitances
-------------------------	-------------

Cathore to all other electron 5	pF
Grisholito allotrarale troses 6	pF
Esternal constitue coating to mode1250 min-1750 max	pF
Heater Current at 6.3 volts 450 ± 20	mΑ
meater warm-up rime (Average):	3
Electron Gun Type Requiring No Ion-Trap Magn	net
Focus Lens Unipotent	ial

## OPTICAL

Phosphor	Type, Aluminized
Faceplate	Filtoralace
Light than mi sion of which (22 row).	48%

#### MECHANICAL

Weight (Approx.)		 		15	11
Overall Length					
Neck Length		 	4.375	± .125	ir
Projected Area of Screen		 		172 sq	ir
External Conductive Coatinga					

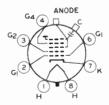
at front of this section

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

Cap. . . . . Recessed Small Cavity (JEDEC No.JI-21)
Base . . . . . . . . Small-Button Neocightar 7-Pin,
Arrangement I, (JEDEC No.B7-208)

## TERMINAL DIAGRAM (Bottom View)

Pin 1 - Heater
Pin 2 - Grid No.1
Pin 2 - Grid No.4
Pin 3 - Grid No.4
Pin 6 - wrid No.4
Pin 7 - Cathole
Pin 8 - Heater
Cap - Anone (Grid No.2,
Grid No.5, Schapen,
Collector)
Casting (Onto tive



8 H R

b n n

## MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

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

Anode Voltage	٧
Political Column	٧
Granting adaptation and the second se	V
Grid-No.2 Voltage 20 min—60 max	v
Cathode Voltage	
Seriative peak velom 2 max	v
	v
Real and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second sec	
Politive pins value 100 max	٧
Politicand kalue 150 max	٧
Heater Voltage 5.7 min—6.9 max	V
Peak Heater-Cathode Voltage	
neutro regaria, with respect to carmoget	
(ring Agripment Warm-up paring rot	
exceding 15 econds 450 max	v
300 max	v
	¥
ho temposition with respect to harrow:	
ombined A and DC voltage 200 max	V
omponent 100 max	٧
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	

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

Anode Voltage		٧
Grid-No.4 Voltage <sup>b</sup>	100	٧
Grid-No.2 Voltage	30	٧
Cathode Voltage	22 to 45	٧
Fervior 1 Thir rior of		
Field Strength of required	adiustable	
centering magnet	0 to 8	G

#### MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit	Doointoon					I F man M	
Urid-No.  -Lircuit	Kesistance					1.5 max M	12

a Includes inclosion protection hardware.

A-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES



b the grid-No.1 voltage required for optimum focus of any individual tube will have a value anywhere between 1100 and 300 volts with the combined grid-No.1 voltage and video-signal voltage adjusted to give an anode current of 100 eicroseperes on a 10.1-inch by 11-inch pattern from an IRA-2721 memors open conjugatent.

## Picture Tube

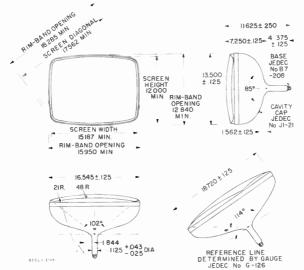
PAN-O-PLY—INTEGRAL IMPLOSION PROTECTION LOW-VOLTAGE ELECTROSTATIC FOCUS 114° MAGNETIC DEFLEC	TION
ELECTRICAL	IION
Direct Interelectrode Capacitances	
Catholic to all other electrons 5	рF
uria lo il otto relettore.	p.F
titernal conductive coating to upon a. 1250 min 1750 may	pF
Heater Current at 6.3 V	mA
Heater Warm-up Time (Average)	s
Electron Gun Type Requiring No Ion-Trap Ma	gnet
OPTICAL	•
Phosphor	izod
for unve , see from of this section	1260
Faceplate	lass
Light true mis ion at center (approx.)	48%
MECHANICAL	,.
Weight (Approx.)	5 lb
Overall Length	
Neck Length	
Projected Area of Screen	
External Conductive Coating	
Type 'see cat outline latter than action Regular-	Band
Ont: 11:3 Or ground rg Near Reference	line
Cap Recessed Small Cavity (JEDEC No.JI Base	-21)
	Pin,
Arrangement I, (JEDEC No. B7-	208 ]
TERMINAL DIAGRAM (Bottom View)	
Pin and or G4 ANODE	
Pin 2-Gris No.:	
Pin 3 - Grid No. 2 920 // - \X\ \Gi	
Pin 4 - Gri : 1.0.4	
Pin b - Grid No. 1	r.)
Pin 7 - Cathode Pin 8 - Hester  Gi	
0111 ()	
(Oa* 'r ;	
8HR	
MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES	
Voltages are positive with respect to cathode	
Anode Voltage	V
Grid-No.4 (Focusing) Voltage	
Positive value	٧
Negative value	٧
Grid-No.! Voltage 200 min—550 max	٧
to a man to the second of the	
Negative bias value.	¥
	V
Positive tias value	
Positive tias value 0 max Positive peak value 2 max	V

Heater Voltage 5.7 min—6.9 max Peak Heater-Cathode Voltage	٧
Heater negative with respect to carroom:  Luring au pment whom apperions in the recommendation of the recommen	٧
Compire: A to colline	٧
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE Noltages are positive with respect to grid No. 1	
Anode Voltage	V V
Cathode Voltage	٧
Grid-No.1 Circuit Resistance 1.5 max	MΩ

External conductive couting and implosion protection hardware must be grounded.

The grid-No.: voltage required for optimum focus of any individual tube will have a value anywhere between 0 and +400 volts with the combined grid-No.! voltage and video-signal voltage adjusted to give an anode current of 100 microamperes on a 10.5-inch by 14-inch pattern from an RCA-2F21 monoscope, or equivalent.

## DIMENSIONAL OUTLINE (BULB J149 FA)



DIMENSIONS IN INCHES

## Picture Tube

PAN-O-PLY TYPE WITH MOUNTING	
PAN-U-FEI TIFE WITH MOUNTING	LUGS 1140 MAGNETIC DEFLECTION
£	LECTRICAL
Direct Interelectrode Capac	citances
the collister leader to the collister leader to the collister leader to the collister leader to the collister leader to the collister leader to the collister leader  5 pl 1 100 6 pl 1 10 800 2 . 1250 min—1750 max pl 450 my	
	OPTICAL
	P4—Sulfide Type, Aluminized
Faceplate	Filterglas
м	ECHANICAL
feight (Approx.)	
erall Length ck Length ojected Area of Screen. ternal Conductive Coating	4.375 ± .125 in
Contact area for grounding	ont of this section)Regular-Band 
TERMINAL DI	AGRAM (Bottom View)
Pin 1 - Heater Pin 2 - Uris No.1 Pin 3 - Grid No.2 Pin 1 - Uris No.4 Pin 6 - Grid No.1 Pin 7 - Urishode	AGRAM (Bottom View)  GA ANODE  G2 3 C GG
Pin 1 - Heater Pin 2 - Gris No.1 Pin 3 - Grid No.2 Pin 1 - Grid No.1 Pin 6 - Grid No.1	G2 3 G G G G G G G G G G G G G G G G G G
Pin 1 - Heater Pin 2 - uris No.: Pin 3 - Grid No.2 Pin 1 - uris No.4 Pin 6 - Grid No.: Pin 7 - urhode Pin 8 - Heater Cap - Aron (Grid No.) Carid No.5, (creen oll-ctor) C - External Conductive Coating	GA ANODE  GA GI  GA GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA GI  GA
Pin 1 - Heater Pin 2 - Gris No.: Pin 3 - Grid No.: Pin 3 - Grid No.: Pin 6 - Grid No.: Pin 7 - Grid No.: Pin 7 - Grid No.: Pin 8 - Heater Cap - Aroa (Grid No.) Grid No.5. (Green oll-ctor) Cating MAXIMUM AND MINIMUM R.	G2 3 C G G G G G G G G G G G G G G G G G G
Pin 1 - Heater Pin 2 - uris No.: Pin 3 - Grid No.2 Pin 1 - ris No.4 Pin 6 - Grid No. Pin 7 - Usthode Pin 8 - Heater Cap - Arose (Gris No.) Grid No.5. 'creen oll-ctor) C - External Conductive Coating  MAXIMUM AND MINIMUM R.	ANODE  GA 4  ANODE  GA 4  B H  B HR  ATINGS, DESIGN-MAXIMUM VALUES

Grid-No.   Voltage	
Negative peak value	y •
Peak Heater-Cathode Voltage	9 max V
Heater negative with re pect to c:tho:::  During equipment warm-up period ≤ 15 °	max V max V max V max V
	•
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE S	
Voltages are positive with respect to grid No	. 1
0-14 N= 0 0-14	0000 V
	o 400 V
CoAbode V-14	100 V
For visual extinction of focuses raster	10 02 ¥
Field CAAb	to8 G
MAXIMUM CIRCUIT VALUE	
Grid-No.1 Circuit Resistance	5 max M.)
a Includes implosion protection hardware.	· · · · · · · · · · · · · · · · · · ·
See X-RADIATION PRECAUTIONS at front of this sec	tion
OIMENSIONAL OUTLINE (JEDEC BULB J149F2A)	
7.250 4	375
16.156 ±.188 — -	.125 7
OLA COMAL 17500	562
OIAGONAL 17.562 GREATEST WIDTH 15.188 GREATEST HEIGHT 12.000	125
TRANSPARENT INSULATING COATING	ee e jugete
JEDEC No. B7-208 92cL-14674	

# 19GJP4A

## Picture Tube

PAN-O-PLY TYPE 114° MAGNETIC DEFLECTION



## Color Picture Tube

"PERMA-CHROME" ASSEMBLY FOR OPTIMUM FIELD PURITY AND UNIFORMITY DURING WARM-UP

RECTANGULAR TUBE MAGNETIC CONVERGENCE 90° MAGNETIC DEFLECTION
3 ELECTROSTATIC-FOCUS GUNS

ALUMINIZED TRICOLOR PHOSPHOR-DOT "Hi-Lite" SCREEN (Utilizing a New. Improved Rare-Earth Red-Emitting Phosphor)

For the in Color-Ti Receivers

The 19GVP22 is the same as the 19GWP22 except for the following items:

#### OPTICAL

#### MECHANICAL

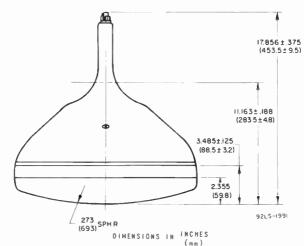
#### Tube Dimensions

Overall length . . . .  $17.856 \pm .375$  in  $(453.5 \pm 9.5$  mm)  $4.54 \pm (453.5 \pm 9.5$  mm)  $4.54 \pm (453.5 \pm 9.5$  kg) . . . . . . . . . . . . 21 lb (9.5 kg)

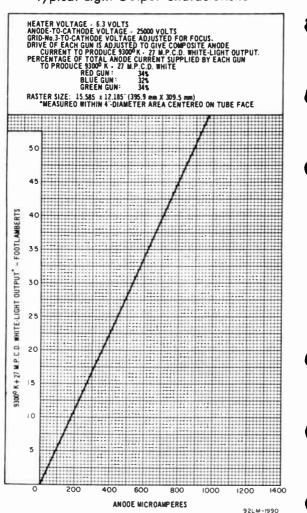
a It is recommended that the cabinet be provided with a shatter-proof glass cover over the face of the 19GPP2 to protect it from being struck accidentally and to protect against possible damage resulting from the implies on under some abnormal condition. This safety cover can also provide visualization protection when required.

#### DIMENSIONAL OUTLINE

Dimensions shown are only those which are different from the corresponding dimensions for the 19GWP22



## Typical Light-Output Characteristic





## Color Picture Tube

<b>N</b>	ULTRA-RECTANGULAR HI-LITE SCREEN
	4 X 3 Aspect Ratio Blue-Gun-Down Operation
	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 V
	Focusing Method Electrostatic
	Focus Lens ,
	Deflection Method Magnetic
	Deflection Angles (Approx.):
	Diagonal 90 deg Horizontal 78 deg
	Vertical
	Direct Interelectrode Capacitance (Approx.):
	Grid No.1 of any gun to all other electrodes 7.5 pF Grid No.4 to all other electrodes 6 pF
	All cathodes to all other electrodes
	Capacitance Between Anode and External ( 2300 max. pF
	Conductive Coating
	Resistance Between Metal Hardware and External Conductive Coating 50 M $\Omega$
	Optical
	Faceplate Filterglass Light transmission at center (Approx.) 53% Surface Polished
	Screen
	Persistence Medium-Short Array 382,000 Dot trios
	Spacing between centers of adjacent dot trios (Approx.) 0.024 in (0.61 mm)
	dot trios (Approx.) 0.024 in (0.61 mm)
	Mechanical
	Minimum Screen Area (Projected) 185 sq in (1194 sq cm)
	Bulb Funnel Designation JEDEC No.J160-3/4 B1/C1
	Bulb Panel Designation JEDEC No.FP161-3/4 V1
	Base Designation <sup>a</sup> Small-Button Diheptar 12-Pin (JEDEC No.B12-244)
	Basing Designation JEDEC No.14BH
	Pin Position Alignment Pin No.5 Aligns Approx. with Anode Bulb Contact



Operating Position, preferred Anode Bu		
Gun Configuration		
Weight (Approx.)	25 lb (11.4 kg)	
Implosion Protection		
Type	Banded	
Maximum and Minimum Ratings, Design-Maximu	ım Values	
Unless otherwise specified, values are for eac values are positive with respect to cathode.	h gun and voltage	
Anode Voltage	22.5 max. kV	
	17 min. kV	
Anode Current, Long-Term Averageb	1000 max. μA	
Grid-No.4 (Focusing Electrode) Voltage:		
Positive value	1100 max. V	
Negative value	550 max. V	J
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	140 max. V	
Positive peak value	0 max. V	
Positive peak value	2 max. V	
Heater Voltage (ac or dc): <sup>C</sup> Under operating conditions	∫ 6.9 max. V	
Under standby conditions <sup>d</sup>	5.7 min. V	
	` 5.5 max. V	
Heater-Cathode Voltage: Heater negative with respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconds	450 max. V	
DC component value	200 max. V	
Peak value	200 max. V	
DC component value	0 max. V	
Peak value	200 max. V	
Equipment Design Ranges	_	
Unless otherwise specified, values are for each values are positive with respect to cathode.	n gun and voltage	
For anode voltages between 17 and 22.5 kV		
Grid-No.4 (Focusing Electrode) Voltage	~75 to 400 V	
Grid-No.2 Voltage for Visual Extinction		
of Undeflected Focused Spot See CUTOFF	DESIGN CHART	
A. C. 1141 A	in Figure 3	
At Grid No.1 voltage of -75 V	. 90 to 270 V	
		_



	At Grid No.1 voltage of -125 V At Grid No.1 voltage of -140 V			
	Maximum Ratio of Grid-No.2 Voltag Lowest Gun in Any Tube (At grid-N voltage of -100 V)	o.1 spot cuto	off	1.86
	Heater Voltage:C			
	Under operating conditions:			
	When standby operation is no	t utilized .	6.	3 V
	When 5.0-V standby operation			
	Under standby conditions <sup>d</sup>		5.	0 V
	Grid-No.4 Current (Total)			
	Grid-No.2 Current		±	5 µA
	Grid-No.1 Current		±	5 µA
_				
		Illum. D	Color	
	To Produce White Light of	6550° K +	9300° K +	
	CIE Coordinates:	7 M.P.C.D.	27 M.P.C.D	٠.
	×	0.313	0.281	
	Y	0.329	0.311	
	Percentage of total anode curren	t		
	supplied by each gun (average):			
	Red	41	30	%
	Blue	24	31	%
	Green	35	39	%
	Ratio of cathode currents:			
	Red/blue:			
	Minimum	1.35	0.75	
	Typical	1.70	0.95	
	Maximum	2.20	1.25	
	Minimum	0.95	0.60	
	Typical	1.15	0.75	
	Maximum	1.70	1.10	
	Blue/green:	1.70	1.10	
	Minimum	0.50	0.60	
	Typical	0.70	0.80	
	Maximum	0.95	1,10	
	Displacements, Measured at Center of	Screen		
	Raster centering displacement:	OCICEII.		
	Horizontal	± 0.45	in (± 11.4	mm)
	Vertical			
	Lateral distance between the blue			
	the converged red and green beam		in (± 6.4	mm)
_	Radial convergence displacement e			
	effects of dynamic convergence			
	(each beam)	± 0.37	in (± 9.4	mm)



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

curve in Figure 2. X-radiation at a constant anode voltage varies

- b The short-term average anode current should be limited by circuitry to 1500 microamperes.
- c For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis con-



linearly with anode current.

DATA 2

nection 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.

- d The use of a 5-volt standby condition in conjunction with 6-volt operating conditions is recommended to improve the reliability of the color picture tube by extending the emission wear-out life and reducing other gun-related defects. A maximum heater voltage of 5.5 volts (Design-Maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. 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.

IMPORTANT: Refer to sheet Safety Precautions For Color Picture Tubes at front of this section.

#### Notes For Dimensional Outline

- Note 1 With tube neck inserted through flared end of referenceline 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 2-inch (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 grounded with multiple contacts.
- Note 4 To clean this area, wipe only with soft, dry, lintless cloth.

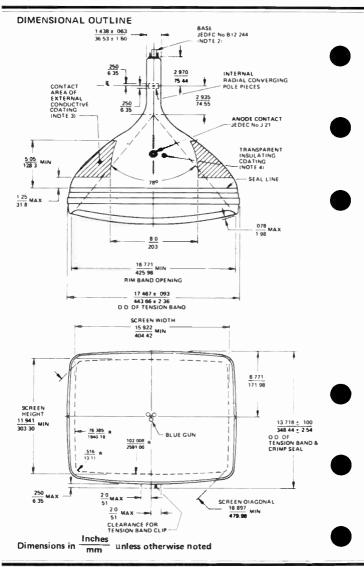
SAGITTAL HEIGHTS AT POINTS 125 BEYOND EDGE OF MIN SCREEN

DIAGONAL 1 965

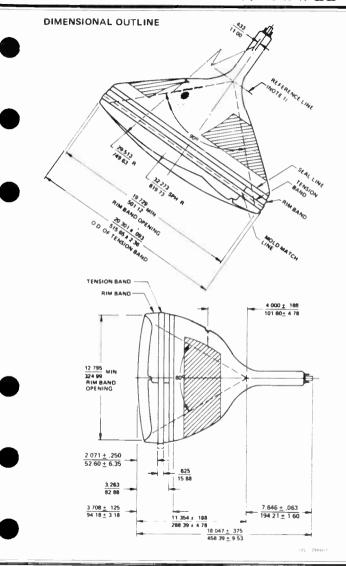
WIDTH 26.52

582 14.78

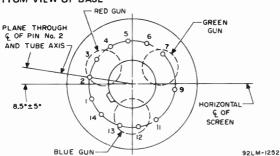








#### BOTTOM VIEW OF BASE



### Base Specification - JEDEC No.14BH

Pin 1: Heater Cap: Anode (Grid No.3, Grid No.5,

Pin 2: Cathode of Red Gun Screen, Collector)

Pin 3: Grid No.1 of Red Gun C: External Conductive Coating Pin 4: Grid No.2 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.4

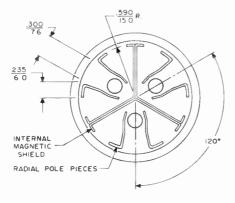
Pin 11: Cathode of Blue Gun

Pin 12: Grid No.1 of Blue Gun

Pin 13: Grid No.2 of Blue Gun

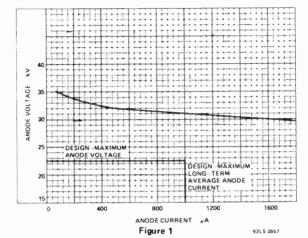
Pin 14: Heater

# LOCATION OF RADIAL-COVERGING POLE PIECES VIEWED FROM SCREEN END OF GUNS

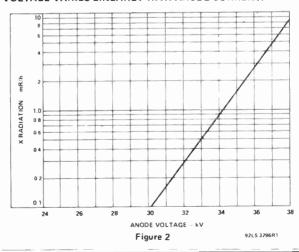


92LM-1251R1

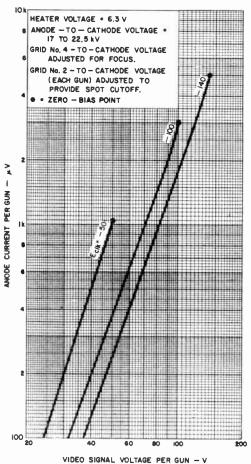
## 0.5 mR/h ISODOSE - RATE LIMIT CURVE



## X-RADIATION LIMIT CURVE AT A CONSTANT ANODE CUR-RENT OF 300 $\mu$ A (X-RADIATION AT A CONSTANT ANODE VOLTAGE VARIES LINEARLY WITH ANODE CURRENT)

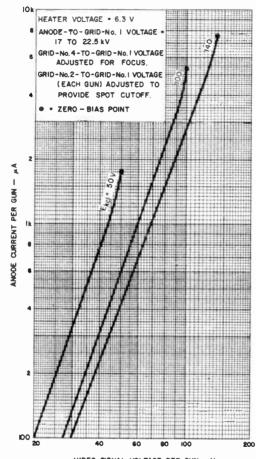


### TYPICAL DRIVE CHARACTERISTICS, GRID-DRIVE SERVICE



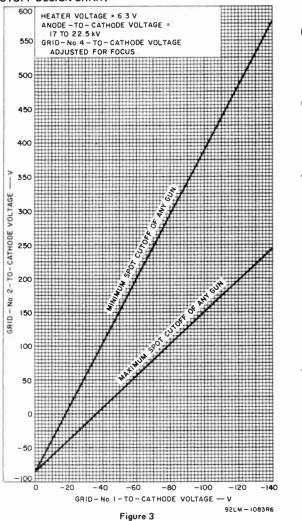


# TYPICAL DRIVE CHARACTERISTICS, CATHODE-DRIVE SERVICE



VIDEO SIGNAL VOLTAGE PER GUN -- V 92LM-3542

## **CUTOFF DESIGN CHART**



# 19VBRP22

# Color Picture Tube

Jitra-Rectangular	Hi-Lite Matrix Screen
x 3 Aspect Ratio	Light Neutral Screen Appearance
Electrical:	
Heater:	Axes
	900 mA
Focusing Method	Electrostatic
Focus Lens	Bipotential
Convergence Method	Magnetic
Deflection Method	Magnetic
Horizontal	
Grid No.1 of any gun to Grid No.3 to all other of All cathodes to all other	o all other electrodes 6 pF electrodes 6.5 pF er electrodes 15 pF le and External 2300 max. pF 1800 min. pF
Decirence Retugen Metal I	Hardware and $\Omega$
Optical:	
Light transmission at ce	
Matrix Phosphor, rare earth (re Persistence Array Spacing between center	Aluminized Black opaque material b) sulfide (blue & green) P22 Medium-Short 382,000 Dot trios s of ødjøcent 0.024 in (0.61 mm)
Mechanical:	
	rojected) 185 sq in (1194 sq cm) JEDEC No.J510A06
	JEDEC No.FP161-3/4 W1
Base Designation <sup>®</sup>	Small-Button Diheptar 12-Pin (JEDEC No.B12-244)
Basing Designation	JEDEC No.14BE
	Pin No.12 Aligns Approx. with



Anode Bulb Contact

# 19VBRP22

Operating Position, preferred Anode Bul Gun Configuration		Delta
Implosion Protection:  Type	s and Tension	Band
Maximum and Minimum Ratings, Design-Maximu	m Values:	
Unless otherwise specified, values are for each values are positive with respect to cathode.	gun and vo	ltage
Appella Malayar	27.5 max.	kV
Anode Voltage	20 min.	kV
Anode Current, Long-Term Averageb		μА
Grid-No.3 (Focusing Electrode) Voltage		V
Peak-Grid-No.2 Voltage	0000 11184.	•
Including Video Signal Voltage	1000 max.	V
Grid-No.1 Voltage:		
Negative bias value	400 max. 200 max	V
Positive bias value	0 max.	v
Positive peak value	2 max.	v
Heater Voltage (ac or dc):C		
Under operating conditions	6.9 max.	V
Onder operating conditions	5.7 min.	V
Under standby conditionsd	5.5 max.	V
Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period	450	
not exceeding 15 seconds After equipment warm-up period:	450 max.	V
DC component value	200 max. 200 max.	V
Heater positive with respect to cathode:	200 IIIax.	V
DC component value	0 max.	V
Peak value	200 max.	V
Equipment Design Ranges:		
Unless otherwise specified, values are for each values are positive with respect to cathode	gun and vol	tage
For anode voltages between 20 and 27.5 kV		
Grid-No.3 (Focusing Electrode) Voltage	16.8% to 20% Anode volt	



	Grid-No 2 Voltage for Visual Extinct of Undeflected Focused Spot So		DESIGN CH	HART
	At Grid No.1 voltage of -75 V At Grid No.1 voltage of -125 V At Grid No.1 voltage of -175 V		80 to	280 ∨ 550 ∨
	Maximum Ratio of Grid-No.2 Voltag Lowest Gun in Any Tube (At grid-N voltage of -100 V)	o.1 spot cuto	ff	1.86
	Heater Voltage <sup>c</sup> Under operating conditions When standby operation in no When 5.0-V standby operation Under standby conditions <sup>d</sup>	et utilized	6 6	.3 V .0 V
	Grid-No.3 Current (Total)		<u>+</u> '	15 μA
	Grid-No.2 Current			5 µA
	Grid-No.1 Current			5 μΑ
	To Produce White Light of	Illum. <b>D</b> 6550 <sup>O</sup> K + 7 M.P.C.D.	Color 9300 <sup>0</sup> K 27 M.P.C.	
	CIE Coordinates. X	0.313	0.281	
		0.329	0.201	
	Percentage of total anode curren			
	supplied by each gun (average):			
	Red	41	30	%
	Blue	24	31	%
	Green	35	39	%
	Ratio of cathode currents:			
	Red/blue:	1.35	0.75	
	Minimum	1.35	0.75 0. <b>95</b>	
	Typical	2.20	1.25	
_	Red/green	2.20	1.25	
	Minimum	0.95	0.60	
	Typical	1.15	0.75	
	Maximum	1.70	1.10	
	Blue/green:			
	Minimum	0.50	0.60	
	Typical	0.70	0.80	
	Maximum	0.95	1.10	
	Displacements, Measured at Center Raster centering displacement: Horizontal Vertical Lateral distance between the bluthe converged red and green bea	± 0.4 ± 0.4 ± 0.4	45 in (± 11 45 in (± 11 25 in (± 6.	.4 mm)



## 19VRRP22

TO VOICE
Radial convergence displacement excluding effects of dynamic convergence (each beam)
Maximum Required Correction for Register® (Including Effect of Earth's Magnetic Field when Using Recommended Components) as Measured at the Center of the Screen in any Direction 0.005 in (0.13 mm) max.
Light-Output Characteristic:
Typical White-Light Output
Measured within a 4 in (102 mm) diameter area centered on the tube face with the following operating conditions:  Anode Voltage
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-circuit resistance (each gun) 0.75 max. M $\Omega$
X-Radiation Characteristic:

Maximum Anode Voltage at which the X-radiation emitted will not exceed 0.5 mR/h at an anode current of

The X-radiation emitted from this picture tube, as measured in accordance with the procedure of JEDEC Publication No.64A will not exceed 0.5 mR/h throughout the useful life of the tube when operated within the Design-Maximum ratings: 27.5 kV anode voltage and 1000 µA anode current. The tube should not be operated beyond its Design-Maximum ratings stated above (such operation may shorten tube life or have other permanent adverse affects on its performance), but its X-radiation will not exceed 0.5 mR/h for anode voltage and current combinations given by the isodose-rate limit characteristics as shown in Figure 1. Operation above the values shown by the curve may result in failure of the television receiver to comply with the Federal Performance Standard for Television Receivers, Sub-Part C of Part 78 of Title 42, Code of Federal Regulations (PL90-602) as published in the Federal Register Vol.34, No. 247, Thursday, December 25, 1969. Maximum X-radiation as a function of anode voltage at 300 µA anode current is shown by the curve in Figure 2. X-radiation at a constant anode voltage varies linearly with anode current,

- The meting socket, including its essociated, physically-attached hardware and circuitry, must not weigh more than one pound (one-half kilogrem).
- The short-term average anode current should be limited by circuitry to 1500 microamperes.
- For meximum 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.
- d. The use of a 5-volt standby condition in conjunction with 6-volt operating conditions is recommended to improve the reliability of the color picture tube by extending the emission wear-out life and reducing other gun-related defects. A maximum heater voltage of 5.5 volts (Design-Maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. All other voltages normally applied to the tube must be removed during standby operation.
- e Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios.

Notes for Dimensional Outline

- Note 1 With tube neck inserted through flared end of referenceline and neck-funnel-contour gauge (JEDEC No.G162) and with tube seeted in gauge, the reference line is determined by the intersection of the plane C-C of the gauge with the gless 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 2-inch (51-mm) circle concentric with bulb exis.
- Note 3 The drawing shows the size and location of the contact area of the external conductive coating. The ectuel erea of this coating will be greater then thet of the contact area so as to provide the required capacitence. External conductive coating must be grounded with multiple con-
  - Note 4 To cleen this erea, wipe only with soft, dry, lintless cloth.

SAGITTAL HEIGHTS AT POINTS 125 BEYOND EDGE OF MIN SCREEN

1 485 37 72 DIAGONAL

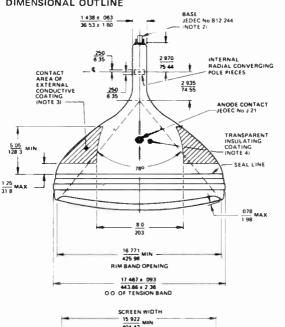
1.044 HEIGHT

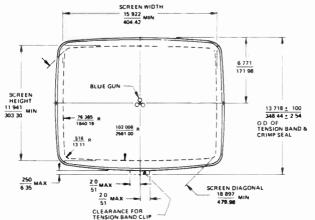
582 14 78



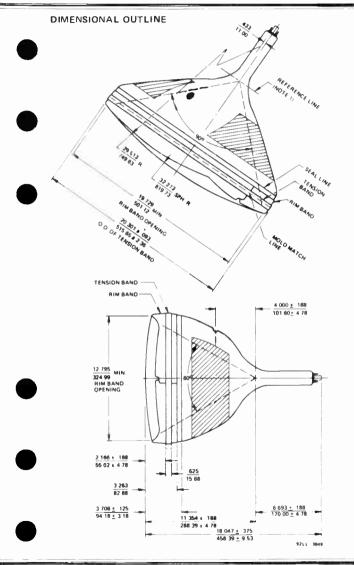
## 19VBRP22

#### DIMENSIONAL OUTLINE

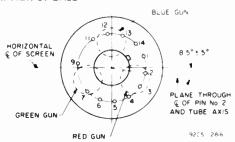




Dimensions in Inches/mm unless otherwise noted



#### BOTTOM VIEW OF BASE



## Base Specification - JEDEC No.14BE

Pin 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 Grid No.1 of Green Gun

Pin 9-Grid No.3

Pin 11-Cathode of Blue Gun Pin 12-

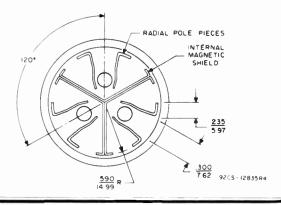
Grid No.1 of Blue Gun Pin 13--Grid No.2 of Blue Gun

Pin 14-Heater

Bulb Contact - Anode (Grid No.4, Screen, Collector)

C- External Conductive Coating

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



0.5 mR/h ISODOSE -- RATE LIMIT CURVE (JEDEC CURVE No.XC-2)

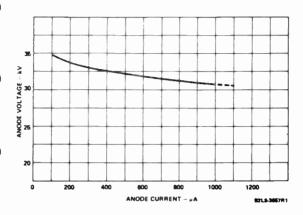


Figure 1

X-RADIATION LIMIT CURVE AT A CONSTANT ANODE CURRENT OF 300  $\mu$ A (X-RADIATION AT A CONSTANT ANODE VOLTAGE VARIES LINEARLY WITH ANODE CURRENT) (JEDEC CURVE No. XC-1)

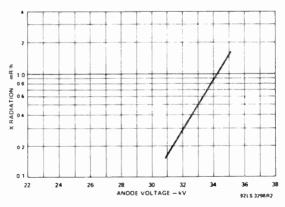
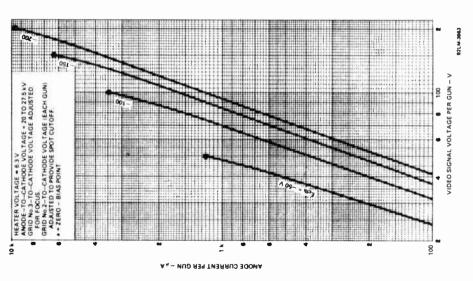


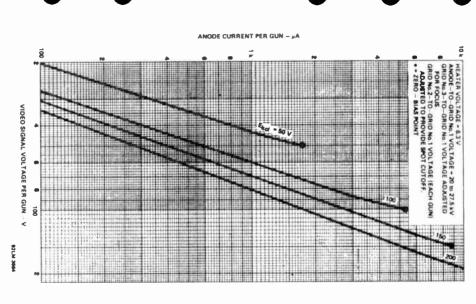
Figure 2

# 19VBRP22

# GRID-DRIVE SERVICE DRIVE CHARACTERISTICS, TYPICAL



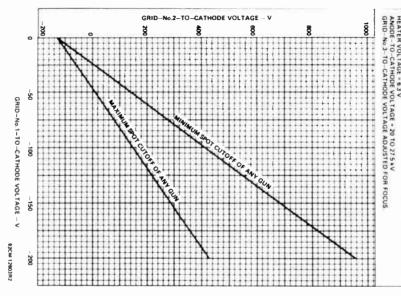
### CATHOD YPICA Ē E-DRIV О RIV m m 0 SE AH; D D VICE D Ô 4 m RIS $\dashv$ rics,





# 19VBRP22

# CUTOFF DESIGN CHART



Picture IMPORTANT Tubes at front of this section. Refer to sheet Safety **Precautions For Color** 

FIGURE 3

# Picture Tube

SHORT RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

Electrical:

ALUMINIZED SCREEN MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

# GENERAL DATA

Little Little	
Heater Current at 6.3 volts	
Diagonal	
Grid No.1 to all other electrodes 6 $\mu\mu$ f Cathode to all other electrodes 5 $\mu\mu$ f External conductive conting to ultor . { 1500 max. $\mu\mu$ f $\mu\mu$ f $\mu$ f	
Electron Gun Type Requiring No Ion-Trap Magnet	
Optical:  Faceplate	
Fluorescence	
Mechanical:	
Tube Dimensions:  Overall length	
Center	
Screen Dimensions (Minimum):         15-1/8"           Greatest width         12"           Greatest height         12"           Diagonal         17-9/16"           Projected area         172 sq. in.           Weight (Approx.)         14 lbs           Operating Position         .Any	
Cap Recessed Small Cavity (JEDEC NO.31-21)	
Cap Recessed Small Cavity (JEDEC No.J1-21) Bulb	

# 19YP4

Connection-

Do Not Use Pin 7 - Cathode	<b>₩</b>	6				Coat	ting	
GR I D-D	BIVE	٠	nu i	0.5				
Unless otherwise								
ues are positive								_
Maximum and Minimum Ratings	, Des	ı gn	-Ma:	x ı m	um Valı	ies:		
ULTOR VOLTAGE					20000		volts	•
GRID-No.3 (FOCUSING) VOLTAG			•	•	11000	min.	volts	
Positive value					700	max.	volts	
Negative value			•			max.	volts	
			•	•		max.	volts	
GRID-No.2 VOLTAGE						min.	volts	
GRID-No.1 VOLTAGE:					()			
Negative-peak value					220	max.	volts	
Negative-bias value					154	max.	volts	
Positive-bias value						max.	volts	
Positive-peak value						max.	volts	
HEATER VOLTAGE						max. min.	volts	
PEAK HEATER-CATHODE VOLTAGE Heater negative with respect to cathode: During equipment warm-u not exceeding 15 seco After equipment warm-up Heater cositive with respect to cathode.	p per nds. peri			•	<b>4</b> 50 200	max. max.	volts volts volts	•
			•		200	····CIA •	VU1 (3	
Typical Operating Condition								
With ultor voltage $(E_{C+k})$					160	00	volts	
and grid-No.2 voltage (Ec	2 k) 0	f			50	0	volts	_
Grid-No.3 Voltage for focus Grid-No.1 Voltage for visua	1				0 to		volts	
extinction of focused ras Field Strength of Adjustable Centering Magnet	e				-43 to		volts	
		٠.			0 10	10	gausses	
Maximum Circuit Values:								
Grid-No.1-Circuit Resistance	ė				1.5	max.	megohms	



Conductive

# CATHODE-DRIVE SERVICE

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

Maximum and Minimum Ratings, Design-Yaximum Values:			
ULTOR-TO-GRID-No.1 VOLTAGE	{20000 max. 11000 min.	volts	
GRID-No.3-TO-GRID-No.1 (FOCUSING) VOLTAGE:	(22000		
Positive value	850 max. 200 max.	volts volts	
Negative value	750 max.	volts	
GRID-No.2-TO-GRID-No.1 VOLTAGE	1450 min.	volts	
GRID-No.2-10-LAIHUŪE VÕLTAGE CATHODE-TO-GRID-No.1 VOLTAGE:	600 max.	volts	
Positive-peak value	220 max.	volts	
Positive-bias value	154 max.	volts	
Negative-bias value	0 max. 2 max.	volts	
Negative-peak value	6.9 max.	volts	
HEATER VOLTAGE	15.7 min.	volts	
Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds After equipment warm-up period Heater positive with respect to cathode	450 max. 200 max. 200 max.	volts volts	
Typical Operating Conditions:			
With ultor-to-grid-No.1 voltage $(E_{C,q}g_1)$ of and grid-No.2-to-grid-No.1	16000	volts	
voltage (Ec281) of	500	volts	
Grid-No.3-to-Grid-No.1 Voltage for focus <sup>6</sup>	. 0 to 400	volts	
extinction of focused raster	. 41 to 69	volts	
Centering Magnet	. 0 to 10	gausses	
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance	. 1.5 max.	megohms	

Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

The grid-No.3 voltage required for optimum focus of any individual The grid-No.3 voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts and is a function of the value of the ultor voltage. Ultor current, and grid-No.2 voltage. It changes directly with the ultor voltage at the rate of approximately 46 volts for each 1000-volt change in ultor voltage; inversely with grid-No.2 voltage at the rate of about 60 volts for each 100-volt change in grid No.2 voltage; and inversely with ultor current at the rate of about 60 volts for each 100-microampere change in ultor current. Because this tube has anarrow depth of focus, it is necessary to provide means such as a potentiometer or a 4-tap switch for adjusting the focusing voltage. In general, commercially acceptable focus is obtained if the focusing voltage is within 75 volts of the value

# 19YP4

required for optimum focus and if the focusing voltage is maintained to within 75 volts of the stimum value during line-voltage fluctuations.

See Raster-Cutoff-Range Chart for Grid-Drive Service.

Listance from Reference Linv for suitable PM centering magnet should not exceed 2-1/4". The specified centering ranget compensates only for the effect which mechanical tube tolerances may have on the location of the undeflected focused sout with respect to the center of the tube face. Maximum field strength of adjustable centering magnet equals:

$$\sqrt{\frac{\varepsilon_{\text{cuk}} \text{ or } \varepsilon_{\text{cuq}_1} \text{ (volts)}}{16000 \text{ (volts)}}} \cdot 10 \text{ gausses}$$

The equipment manufacturer must determine and supply additional compensation for the effects of the earth's magnetic field and extraceous fields due to children for circuitry and components. The additional compensation hould preferably be applied as part of the magnetic field of the diffecting yoke.

Cathode trive is the (prating consistion in which the video signal varies the athode potential with respect to grid No.1 and the other electroles.

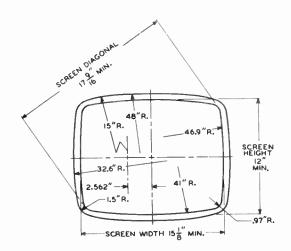
• Tee Raster-Cutoff-Range Chart for Cathode-Drive Service.

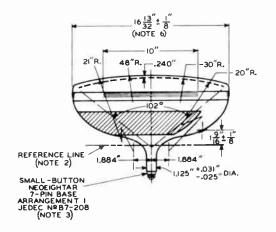
### OPERATING CONSIDERATIONS

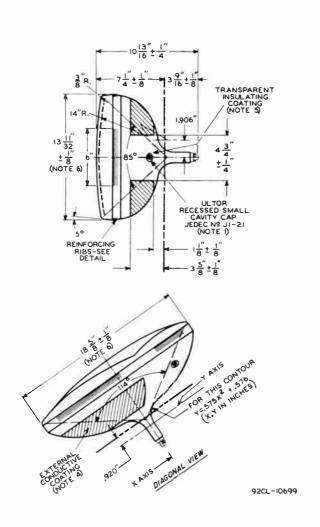
Y-Ran Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube foes not produce any harmful X-ray radiation. However, because the rating of this type permits operation atvoltages as high as 20 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

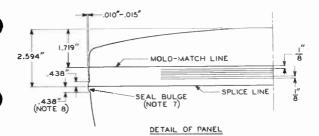
Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from tube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











NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TDLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END DF REFERENCE-LINE GAUGE JEDEC No. G-126 ISHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETFRMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

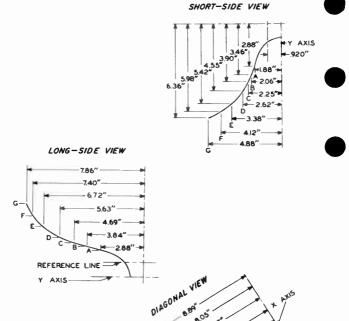
NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRYLINT-LESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

NOTE 8: UNDISTURBED AREA BETWEEN MOLD-MATCH LINF AND SPLICE LINE IS 3/8" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF THE TUBE SUPPORT BAND. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

### BULB-CONTOUR DIMENSIONS

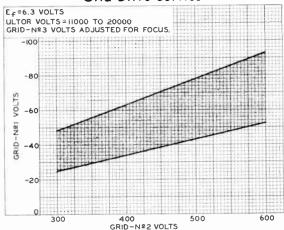


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NOTE: PLANES A THROUGH G ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS FROM THE YAXIS. THESE COORDINATES DE-SCRIBE THE BOGIE-BULB EXTERNAL CONTOUR IN PLANES THROUGH THE TUBE AXIS AND THE RESPECTIVE FACEPLATE AXES.

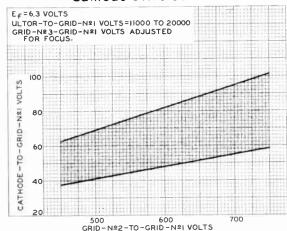
92CL-10669RI

# RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-10789

# Cathode-Drive Service



92C S-10818







# KINESCULE

RECTANGULAR GLASS TYPE
MAGNETIC FOCUS MAGNETIC CEFLECTION

MAGNETIC FOCUS	MAGNETTO DEFLECTION
DATA	
General:	
Heater, for Unipotential Cathode:	
Voltage 6.3 .	ac or dc volts
Current 0.6 .	amp
Oirect Interelectrode Capacitances:	_
Grid No.1 to All Other Electrodes.	6 µµt
Grid No.1 to All Other Electrodes. Cathode to All Other Electrodes. Face Platerwith about 66% light transmiss	σ μμτ
Phosphor (For Curves, see front of this Se	ction) No.4-Sulfide Type
Fluorescence and Phosphorescence .	White
Persistence of Phosphorescence	Short
Focusing Method	Magnetic
Deflection Method	Magnetic
Deflection Angles (Approx.):	70°
Oiagonal	
Vertical	rnal, Single-Field Magnet
Overall Length	21-7/16" ± 3/8"
Greatest Diagonal of Tube at Face	20–3/32" ± 3/16"
Greatest Width of Tube at Face Greatest Height of Tube at Face Screen Size	18-11/16" ± 3/16"
Screen Size	17_1/4" > 13_1/4"
IMOUNTING POSITION.	Anv
Cap Recessed Small	Cavity (JETEC No.J1-21)
Base Small-Shell Duodeca	al 5-Pin (JETEC No.85-57)
BOTTOM VIEW	
Pin 1-Heater	Pin 11 - Cathode
Pin 2-Grid No.1	Pin 12-Heater
Pin 10 - Grid No. 2	Cap - Anode
X \ X \ X \ X \ X \ X \ X \ X \ X \ X \	, , , , , , , , , , , , , , , , , , , ,
€ (1 m = 10 m)	
Maximum Ratings, Design-Center Values	s:
ANODE VOLTAGE	410 max. volts
GRID-No.1 VOLTAGE:	
Negative bias value	
Positive bias value	
PEAK HEATER-CATHOOE VOLTAGE:	2 max. voits
Heater negative with respect to cat	thode:
Ouring equipment warm-up period r	
exceeding 15 seconds	
After equipment warm-up period.	
Heater positive with respect to cat	thode. 150 max. volts





# KINESCOPE

	Typical Operation:				
	Anode Voltage*	14000	16000	volts	
	Grid-No.2 Voltage	300	300	volts	
1	Grid-No.1 Voltage for Visual				
	Extinction of Undeflected Focused Spot	-33 to -77	-33 to -77	volts	
		104 ± 10%		ma	(
	Field Strength of Single-	20 1 2 20 2			
	Field, Ion-Trap Magnet				
1	(Approx.)†	50	55	gausses	

### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . . 1.5 max. megohms

- Brilliance and definition decrease with decreasing anode voltage. In general, the anode voltage should not be less than 14000 volts.
- O For specimen focusing coil similiar to JETEC Focusing Coil No.109, positioned with air gap toward kinescope screen, and center line of air gap about 3 inches from Reference Line (see Outline Drawing). The indicated currents are for the condition with the combined grid-No.1 bias voltage and video-signal voltage adjusted to produce a highlight brightness of 30 foot-lamberts on a 17° x 12-3/4° picture area sharply focused at center of screen.
- † Measured at center of field with General Electric Gauss Meter, Cat. No. 409X51.





### OPERATING NOTES

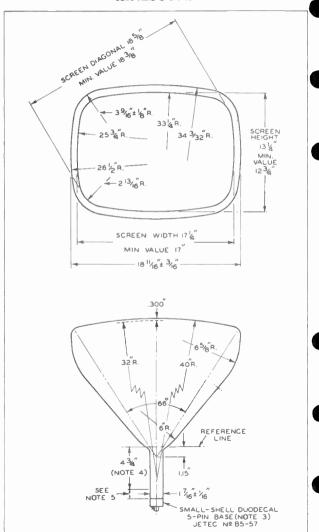
X-Ray Warning. When operated at or below 16000 volts, the 20CP4 does not produce any harmful x-ray radiation. In general, picture tubes may be operated at voltages (if ratings permit) up to 16000 volts without personal injury on prolonged exposure at close range. Above 16000 volts, special shielding precautions for x-ray radiation may be necessary.

Direction of the field of the ion-trap magnet should be such that thenorth pole is adjacent to vacant pin position No.8 and the south pole to pin No.2.

20084



# KINESCOPE

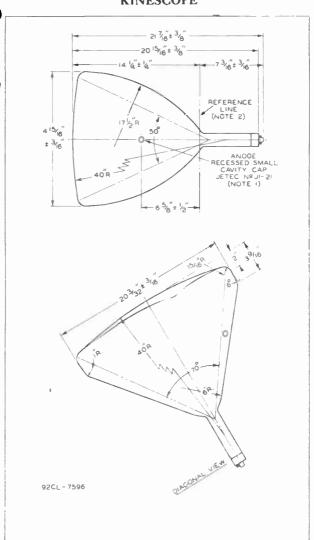


MAY 1, 1951

TUBE DEPARTMENT









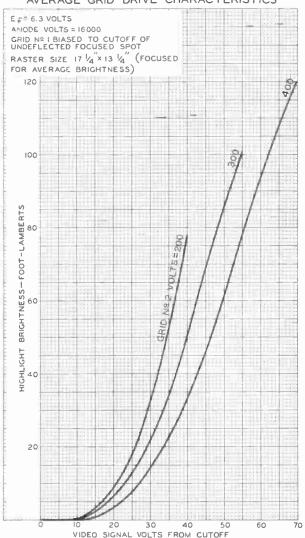


- NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND VACANT PIN POSITION NO.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ANODE TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ANODE TERMINAL IS ON SAME SIDE AS VACANT PIN POSITION NO. 6
- NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC NO. 110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE. THE REFER-ENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC! OF THE GAUGE WITH THE GLASS FUNNEL.
- SOCKET FOR THIS BASE SHOULD NOT BERIGIDLY 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 4: LOCATION OF DEFLECTING YOKE AND FOCUSING DEVICE MUST BE WITHIN THIS SPACE.
- NOTE 5: KEEP THIS SPACE CLEAR FOR SINGLE-FIELD. FON-TRAP MAGNET.





# AVERAGE GRID-DRIVE CHARACTERISTICS

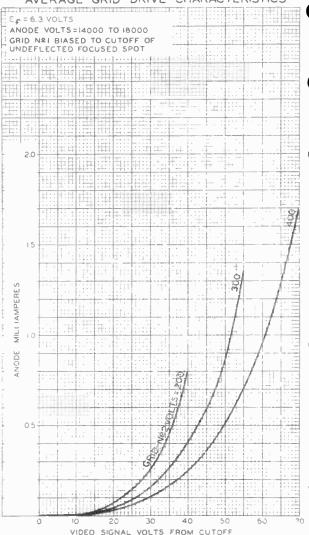


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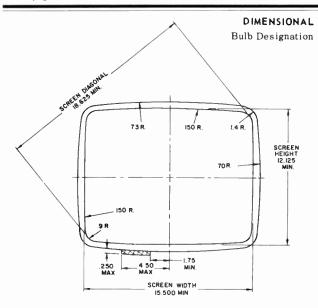
# 20CP4

# AVERAGE GRID-DRIVE CHARACTERISTICS

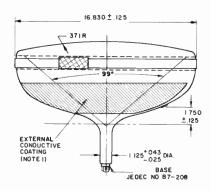


# Picture Tube

Pan-o-Ply Type Low-Volta	ge Electrosta	itic Focus
114 <sup>0</sup> Magnetic Deflection	Low Grid-No.	2 Voltage
Direct Interelectrode Capacitances:		
Cathode to all other electrodes .	5	pF
Grid No.1 to all other electrodes	6	pF
External conductive coating		_
to anode a	\$2000 max.	pF
Heater Current at 6.3 volts	4	pF mA
Heater Warm-Up Time (Average)	450 ± 20 11	seconds
Electron Gun Type Requi		
Focus Lens		
Phosphor		
Faceplate		
Light Transmission at Center (Ap		
Weight (Approx.)	=	
Overall length		
Neck length		
Projected Area of Screen		
Cap Designation		
		No.J1-21)
Base Designation Small-	Button Neoeigl	htar 7-Pin,
Arrangemer	it 1, (JEDEC N	No.B7-208)
TERMINAL DIAGRAM (	Bottom View)	
Pin 1: Heater	_ AN	ODE
Pin 2: Grid No.1	G4(4)	C
Pin 3: Grid No.2	. /	× 6.
Pin 4: Grid No.4	' <sup>2</sup> ③/(T	X 1001
Pin 6: Grid No.1	7	· /
Pin 7: Cathode		$\stackrel{\sim}{}$
Pin 8: Heater	c(2)\ \	(7) <sub>K</sub>
Cap: Anode (Grid No.3,	5 -	
Grid No.5, Screen,		(8)
Collector) C: External Conductive	H 8HR	н
C: External Conductive  Coating		
MAXIMUM AND MINIMUM RATINGS, DE	ECICN MAYIMIN	. WALLIES
Unless otherwise specified,		
are positive with respect to		8
are positive with respect to	23,000 max	v
Anode Voltage	11,000 min	
Grid-No.4 Voltage:		
Positive value	1250 max	
Negative value	400 max	. V

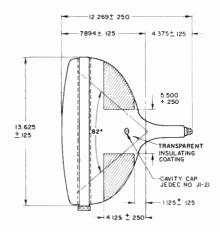


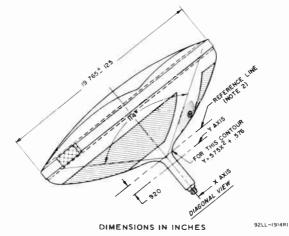
### EM KEEP THIS SPACE CLEAR OF ANY MEHANICAL OBSTRUCTION



# OUTLINE

JEDEC NO.J157-1/2 A1





Note 1: External conductive coating and implosion protection hardware must be grounded.

Note 2: Determined by Gauge JEDEC No.G-126.



MANIMUM AND MINIMUM KAI	11403 (CONT D)	
a	\60 max.	V
Grid-No.2 Voltage	20 min.	V
Cathode Voltage:		
Negative peak value	2 max.	V
Negative bias value	0 max.	V
Positive bias value	100 max.	V
Positive peak value	150 max.	V
Heater Voltage	{6.9 max.	V
Meater voltage	15.7 min.	V
Peak 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	300 max.	V
Heater positive with		
respect to cathode;		
Combined AC & DC voltage.	200 max.	V
DC Component	100 max.	V
TYPICAL OPERATING CON CATHODE-DRIVE SE		
Unless otherwise specified,	voltage values	
are positive with respect to		
Anode Voltage		V
Grid-No.4 Voltage b	100	V
Grid-No.2 Voltage	30	V
Cathode Voltage for visual		
extinction of focused		
raster	22 to 40	V
Field Strength of required		
adjustable Centering Magnet	0 to 8	G
MAXIMUM CIRCUIT V	ALUE	
		мΩ
Grid-No.1 Circuit Resistance	1.5 max.	MZ5
Includes implosion protection hardwa	re.	
bThe grid-No.4 voltage required for individual tube will have a value a and +300 volts with the combined	nywhere between	-100

MAXIMUM AND MINIMUM RATINGS (CONT'D)

See X-RADIATION PRECAUTIONS at front of this section

video-signal voltage adjusted to give an anode current of 100 microamperes on a 11.25-inch by 15-inch pattern from

an RCA-2F21 monoscope, or equivalent.

# Picture Tube

# Pan-o-Ply Type Low-Voltage Electrostatic Focus 114<sup>o</sup> Magnetic Deflection

	Magnette betteetion	
I	Direct Interelectrode Capacitances:	
	Cathode to all other electrodes 5	pF
	Grid No.1 to all other electrodes . 6	pF
	External conductive coating   2000 max.	рF
	to anode 1400 min.	pF
I	Heater Current at 6.3 volts $450 \pm 20$	mA
I	Heater Warm-Up Time (Average) 11	seconds
Ī	Electron Gun Type Requiring No Ion-Trap	p Magnet
1	Focus Lens Uni	potential
]	Phosphor P4-Sulfide Type, Ale	uminized
1	Faceplate Fi Light Transmission at Center (Approx.)	
١	Weight (Approx.)	. 16.5 lb
!	Overall length     12.269 in       Neck length     4.375 in       Projected Area of Screen     18	± .125 in
(	Cap Designation Recessed Smal (JEDEC N	•
f	Base Designation Small-Button Neoeighta Arrangement 1, (JEDEC No	

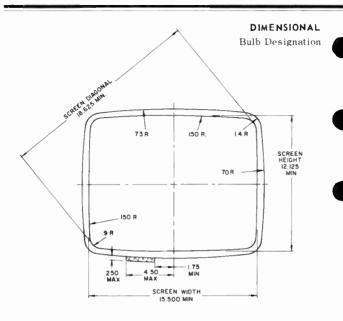
# TERMINAL DIAGRAM (Bottom View)

Pin 1 - Heater	GA ANODE
Pin 2 - Grid No.1	G4(4) [] C
Pin 3 - Grid No.2	62 - 1
Pin 4 - Grid No.4	(3) (T===Y \ \(6\))
Pin 6 - Grid No.1	
Pin 7 - Cathode	( /===-/ )
Pin 8 - Heater	2X 1
Cap - Anode (Grid No.3, Grid	GIO K
No.5, Screen, Collector)	
C - External Conductive Coati	ing U
	" H 8HR H

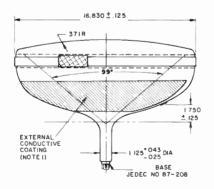
# MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Unless otherwise specified, voltage values are positive with respect to cathode

Anode Voltage	23,000 max.	V V
Positive value	1100 max.	V
Negative value	550 max.	V

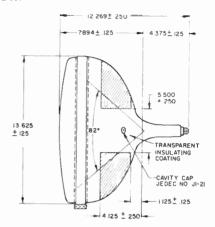


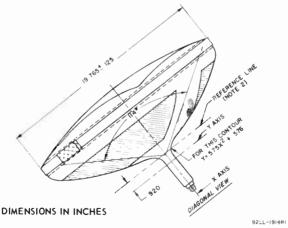
KEEP THIS SPACE CLEAR OF ANY MEHANICAL OBSTRUCTION



### OUTLINE

JEDEC No.J157-1/2 A1





Note 1: External conductive coating and implosion protection hardware must be grounded.

Note 2: Reference line is determined by gauge JEDEC No.C-126.

MAXIMUM AND MINIMUM RATINGS (CONT'D)		
Grid-No.2 Voltage	∫550 max.	V
Grid-No.1 Voltage:	200 min.	V
Negative peak value	220 max.	V
Negative bias value	155 max.	V
Positive bias value	0 max.	V
Positive peak value	2 max.	V
Heater Voltage	j 6.9 max.	V
Peak Heater-Cathode Voltage:	5.7 min.	V
Heater negative with		
respect to cathode:		
During equipment warm-up		
period not exceeding		
15 seconds	450 max.	V
After equipment warm-up		
period	300 max.	V
Heater positive with		
respect to cathode:		
Combined AC & DC Voltage	200 max.	V
DC Component	100 max.	V
TYPICAL OPERATING CONDITIONS		
FOR CATHODE-DRIVE SERVICE:		
Unless otherwise specified, voltage va	lues are posi-	-
tive with respect to grid No.	. 1	
Anode Voltage	. 16,000	V
Grid-No.4 Voltage b		V
Grid-No.2 Voltage	. 300	V
Cathode Voltage for visual		
extinction of focused		
raster	. 28 to 62	V
Field Strength of required	0 . 0	_
adjustable Centering Magnet	. 0 to 8	G
MAXIMUM CIRCUIT VALUE		
Grid-No.1 Circuit Resistance	1.5 max.	мΩ
GIRI-10.1 Cheun Resistance 1.1.1.1.1	110 maxi	
<sup>a</sup> Include implosion protection hardware.		
bThe grid-No.4 voltage required for opti	imum focus o	of an
The gini-1014 vottage required for opti		

The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between 0 and +400 volts with the combined grid-No.1 voltage and videosignal voltage adjusted to give an anode current of 100

microamperes on a 11.25-inch by 15-inch pattern from an RCA-2F21 monoscope, or equivalent.

See X-RADIATION PRECAUTIONS at front of this section.



# Picture Tube

	Ticiore Tobe
RECTANGULAR GLASS TYPE MAGNETIC FOCUS	ALUMINIZED SCREEN 90° MAGNETIC DEFLECTION
Electrical:	
Heater Current at 6.3 volts Direct Interelectrode Chpacitances: Grid No.1 to all other electrodes Chthode to all other electrodes	6 pf
fxternal conductive coating to anode	{2500 max, pf 2000 min, pt
Flectron Gun	
Optical:	
Faceplite, Spherical	Filterglass 74% tion) . P4-Sulfide Type, Aluminized
Mechanical:	
Operating Position	24 lbs 20" ± 3/8" 7-1/2" ± 3/16"
Type	Near Reference Line
Deflection Angles: See Picture-Tube Dimensional-Outlines at the front of this section	
Cap Recessed Small Base Small-Shell Duodecal 5-Pin (J Basing Designation for BOTTOM VIEW .	JEDEC Group 4. No.B5-57)
ANODE	
Pin 1-Heater Pin 2-Grid No.1	Cap-Anode (Grid No.3,

Pin	1	- Heate	er
Pin	2	-Grid	No.1
Pin	10	-Grid	No.2
Pin	11	- Catho	ode
Pin	12	- Heate	er



Collector) C-External Conductive Coating

Maximum Ratings, Design-Maximum Values:

Anode Voltage							20000	max.	volts
Grid-No.2 Voltage							550	max.	volts

# **21AMP4B**

Grid-No.1 Voltage:  Neg:tive peak value	volts volts volts volts
During equipment warm-up period not exceeding 15 seconds	volts volts
Typical Operating Conditions:	
With anode voltage of 16000	volts
and grid-No.2 voltage of 300	volts
Grid-No.1 Voltage for visual extinction of focused raster28 to -72	volts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

for x-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



# 21AVP4C

# Picture Tube

Electrical:								
	ent at 6.3 y					60	0	m
Grid No.1 Cathode t	relectrode ( to all other o all other conductive (	er elect electro	rodes. des			∫250	6 5 00 max.	
	n					guiri	O min. ng No rap Ma	Ion
Optical:								
light tra	Spherical . nsmission (/ r curves, see	Approx. )						749 Type
Mechanical:								
Weight (App Overall Len Neck Length Projected A	osition rox.) gth	en				23-1 7-1	24 /32" ± /2" ± 3	1 lb 3/8 3/16
Type Contact a For Addition	rea for ground Informa	unding.		s and	Near d Dir	– Refo mensio	erence ons;	Lin
at the fr	ont of this	section						
Base		 Arrang	Sma ement 1	11-SI ,(JEL	hell DEC G	Duode roup 4	ecal 6- , No.B	-Pin 6-63
Basing De	signation f	or BOTTO <b>G4</b>	M VIEW.	• •				12
Pin 1-H Pin 2-0 Pin 6-0 Pin 10-0	eater rid No.1 rid No.4	ANODE		)	C	(	node Grid No Grid No	5,



Pin 11 - Cathode Pin 12 - Heater

C - External Conductive Coating

# **21AVP4C**

Maximum Ratings, Design-Maximum Values:		
Anode veltage	22000 max.	volts
Positive value Neartive value Grid-No.2 Voltage Grid-No.1 Voltage:	1100 max. 550 max. 550 max.	volts volts volts
healtive peak value. Vegative his value. Positive his value. Positive peak value. Peak Heater-Cathole Voltage:	220 max. 155 max. 0 max. 2 max.	volts volts volts
Heater negitive with re prot to cathode: During equipment warm-up period not exceeding 15 seconds	450 max. 200 max.	volts volts
Typical Operating Conditions:  With anode voltage of and grid-No.2 voltage of  Grid-No.4 Voltage for focus  Grid-No.1 Voltage for visual extinction of focused raster	18000 300 -72 to +396 -28 to -72	
Maximum Circuit Values: Grid-No.1-Circuit Resistance	1.5 max. m	egohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



# Picture Tube

NO ION-TRAP MAGNET REQUIRED RECTANGULAR GLASS TYPE ALUMINIZED SCREEN MAGNETIC FOCUS 72° MAGNETIC DEFLECTION
Electrical:
Direct Interelectrode Capacitances: Cathode to all other electrodes
Heater Current at 6.3 volts 600 ± 30 ma Heater Warm-un time (Average)
Optical:
Phosphor (For curves, see front of this Section) P4—Sulfide Type,
Faceplate, Spherical
Mechanical:
Weight (Approx.)
Iype
Cap
Pin 1 - Heater Pin 2 - Grid-No.1 Pin 10 - Grid No.2 Pin 11 - Cathode Pin 12 - Heater Cap - Anode (Grid No.3,
Screen, Collector) C-External Conductive Coating
Maximum and Minimum Ratings, Design-Maximum Values:
Unless otherwise specified, voltage values
are positive with respect to cathode  Anode Voltage 20000 max. volts  Grid-No.2 Voltage

NO ION-TRAP MAGNET REQUIRED

# **21AWP4A**

Grid—No.1 Voltage:         220 max           Negative peak value.         155 max           Negative bias value.         0 max           Positive bias value.         2 max           Positive peak value.         2 max           Heater Voltage.         5.7 min.	volts volts volts volts volts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts volts
Combined AC and DC voltage 200 max. DC component	volts volts
Typical Operating Conditions for Cathode-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to grid No.1	
Anode Voltage	volts volts
Maximum Circuit Values:	V0113
The state of the s	

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms





# 21A+052

# COLOR KINESCOPE

THREE-GUN SHADOW-MASK TYPE MAGNETIC CONVERGENCE

ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

DATA
General:
Electron Guns, Three with Axes Tilted  Toward Tube Axis
Voltage 6.3 ac or dc volts Current 1.8 amp Unrect Interelectrode Capacitances (Approx.): Grid No.1 of any gun to all other
electrodes except the No.1 grids of the other two guns
other electrodes 16 μμf Grid No.3 (Of each gun tied within tube to No.3 arias of other two
guns) to all other electrodes
Type Metal-Backed, 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
Deflection Method
Tube Dimensions: Maximum overall length
At lip
e: See next page.





Socket
Basing Designation for BOTTOM VIEW
Pin 1 - Heater Pin 9 - Grids No.3
Pin 2 - Grid No.1 Pin 11 - Grid No.2
of Red Gun _ of Blue Gun
Pin 3 - Grig No. 2 Pin 12 - Grid No. 1
of Red Gun of Blue Gun
Pin 4 - Cathode Pin 13 - Cathode
of Red Gun of Blue Gun
Pin 5 - Cathode 3 Pin 14 - Heater
of Green Gur @ METAL-SHELL LIP:
Pin 6-Grid No.1 Ultor
of Green Gun (Grid No.4,
Pin 7 - Grid No.2 Grid No.5.
of Green Gun Collector)
Maximum Ratings, Design-Center Values:
JLTOR -TO-CATHODE (Of each gun) VOLTAGE 25000 max. volts
ULTOR CURRENT, (Average, each gun) 500 max. μamp
GRID-No.3-TO-CATHODE (Of each our) VOLTAGE 6000 max. volts
GRID-No.2-TO-CATHODE VOLTAGE (Each oun) 800 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 dun):
Hester megative with respect to cathode: During equipment warm—up period
not exceeding 15 seconds 410 max. volts
After equipment warm-up period
Heater positive with respect to cathode. 180 max. volts
quipment Design Ranges:
For ultor voltage (Ecqkeach gun) of 25000 volts
Grid—No.3 (Focusina electro.e)-to-Cathode
(Of each gun) Voltage. 15.2% to 21.2% of Eq. ( volts
4 each gun
Grid-No.2-to-Cathode
Voltaam (Each dun)
when circuit design utilizes grid-No.1-
to-cathode voltage
$(E_{c_1k})$ at fixed
value for raster
cutoff See Cutoff Design Chart
A value of average ultor current per gun higher than 500 microamperes will increase picture brightness but may impair resolution and shorter
nathode life.

•: See next page.

TENTATIVE DATA 1



#### 21AXP22 COLOR KINESCOPE

21story

Grid-No.1-to-Cathode Volt-		
age (Each gun) for Visual		
Extinction of Focused		
Raster when circuit de-		
sign utilizes arid-No.2- to-cathode voltage		
	See Cutoff Desi	gn Chart
Variation in Raster		
Cutoff Between Guns		
	rerade of highe	
	t cutoff value	15
Grid-No.3 Current for ultor current of 800 μamp45	to +75	μamp
Grid-No.2 Current (Each aun)5		иато
	10 10	LLamb
Percentage of Total Ultor Current Supplied by Each Gun:		
To produce Illuminant—C White		
(1.C.1. Coordinates x = 0.310, y = 0.316):		
	7 to 67	per cent
Blue gun	1 to 24	per cent
Green gun 20	) to 33	ner cent
To produce White of 8500°K +		
27W.P.C.D. (I.C.I. Coordin-		
ates x = 0.287, y = 0.316): Red qun	2 to 60	per cent
	2 to 27	per cent
Green gun 23	3 to 38	ner cent
Maximum Raster Shift in Any Direction from Scr∍en Center <sup>□</sup>	1	inch
Maximum Compensation to be Pro- vided by the Following Components:		
	er shift of 1" i	
rect	ion from scree	n center
Converging component (Each gun):		
For static convergence-		
After adjustment has been		
made for optimum color		
purity and dynamic convergence	Shift of snot	by ± 5/8"
convergence	3.111 0. 3000	09 1 370
The "ultor" in a cathode—ray tube is the elethe highest dc voltage for accelerating the ctp its deflection. In the 21AKP22, the ultigrid No.4. Since grid No.4. grid No.5, and gether within the 21AKP22, they are collect ultor for convenience in presenting data as	ectrode to which electrons in the pr function is pe collector are con ively referred to	beam prior rformed by nected to- simply as
unitors for convenience in presenting data at centering of the raster on the screen is acco	omplished by pass	ing direct
Ocentering of the raster on the screen is accourrent of the required value through each compensate for raster shift resulting from a vergence and color purity.	pair of deflectin d'ustmen's for op	a coils to timum con-

TENTATIVE DATA 2



Ex

## 21AXP22 COLOR KINESCOPE

For dynamic convergence!—  Effected by mmf of approxi— mately parabolic waveshape synchronized with scanning
Horizontal:
Red spot and green spot Shift of 1/4" Blue spot Shift of 1/2"
Vertical:
Red spot and green spot Shift of 3/8" Blue spot Shift of 1/8"
Blue-positioning magnet (Blue gun):
After adjustment has been made for color purity and dynamic convercence Shift of blue spot by ± 1/2"
xamples of Use of Design Ranges:
For ultor voltage of 25000 volts
id-No.3 (Focusing electrode)- to-Cathode (Of each gun) Voltage
rid-No.2-to-Cathode Voltage (Each gun) when circuit design utilizes orid-No.1-to-cathode voltage of -70 volts for raster cutoff
rid-No.1-to-Cathode Voltage (Each gun) for Visual Extinction of Focused Raster when circuit

#### Limiting Circuit Values:

design utilizes grid-No.2-tocathode voltage of 200 volts. . . .

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 ultor power supply and the grid-No.3 power supply be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 50 milliamperes. addition, to prevent cathode damage with resultant decrease in tube life, the effective resistance between the ultor power supply output capacitor and the ultor, and the effective resistance between grid-No.3 power supply output capacitor and the grid-No.3 electrode should not be less than 50000 ohms. These resistances should be capable of withstanding the maximum instantaneous currents and voltages in their

Indicated values apply when RCA test yoke is used with the 21AXP22.

-45 to -100

volts.

# RIA+DED

#### COLOR KINESCOPE

respective circuits. It is to be noted that the effectiveness of the resistance between the ultor power supply output capacitor and the ultor may be impaired if capacitance in excess of 750  $\mu\mu f$  is introduced between the kinescope and ground by the mounting arrangement of the kinescope.

In equipment utilizing a well-regulated ultor power supply, the grid-No.3-circuit resistance should be limited to 7.5 megulums.

Low-Voltage Circuits:

Grid-No.1-Circuit Resistance (Each gun). . 1.5 max. megohms

When the cathode of each gun is not connected directly to its associated 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 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.

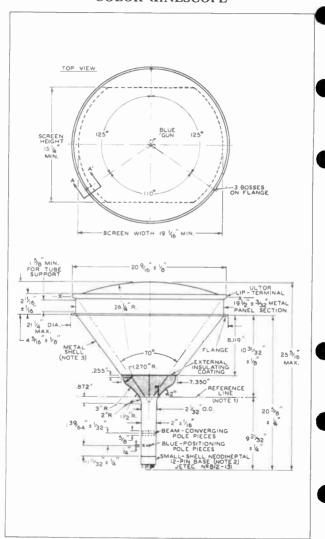
#### X-RAY WARNING

X-ray radiation is produced by the 21AXP22 when it is operated at its normal ultor voltage. The radiation is through the faceplate, and is sufficient to require the adoption of safety measures in TV receivers. Shielding such as that provided by a 1/4-inch thickness of safety glass (lime) in front of the faceplate, should prove adequate to provide protection against personal injury from prolonged exposure at close range when the tube is operated at its maximum ultor voltage rating.

when this tube is being serviced outside of the TV receiver cabinet, it should never be operated without providing adequate X-ray shielding in front of faceplate. Because the ultor voltage may rise above its maximum rated value for short periods during adjustment with increase in the amount of X-ray radiation, provision should be made for placing a 3/8-inch thickness of safety glass in front of the faceplate to avoid the hazard of X-ray radiation.

# 2144655

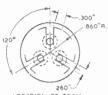
## RCA) 21AXP22 COLOR KINESCOPE



MAR. 1, 1955







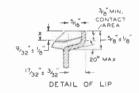
69° - 1 19-.520″ .860″ R.

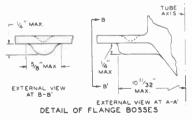
LOCATION OF BEAM-CONVERGING POLE PIECES

LOCATION OF BLUE-POSITIONING POLE PIECES



#### BASE BOTTOM VIEW





92CL-8399R3

2144922



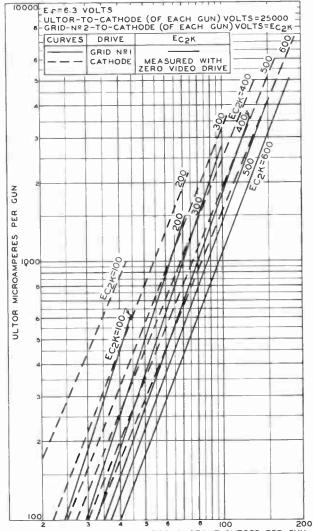
NOTE 1: REFERENCE LINE IS DETERMINED BY POSITION WHERE A CYLINDRICAL GAUGE 2.465" ± 0.001" I.D. CONCENTRIC WITH NECK AXIS, WILL REST ON ENVELOPE FUNNEL.

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 METAL—SHELL AXIS AND HAVING A DIAMETER OF 3".

NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.



#### TYPICAL DRIVE CHARACTERISTICS



VIDEO SIGNAL VOLTS FROM ULTOR-CURRENT CUTOFF PER GUN

SIA+PER



#### TYPICAL LIGHT-OUTPUT CHARACTERISTIC

E<sub>F</sub>=6.3 VOLTS

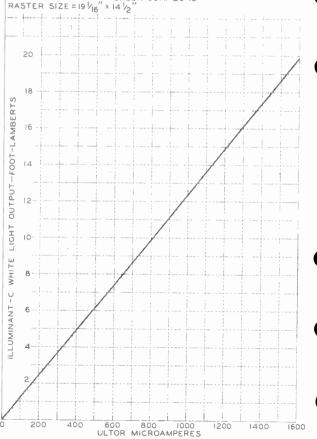
ULTOR-TO-CATHODE (OF EACH GUN) VOLTS=25000
GRID-N23-TO-CATHODE (OF EACH GUN) VOLTS=ADJUSTED FOR FOCUS

DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ULTORIC CURRENT TO PRODUCE ILLUMINANT-C WHITE LIGHT OUTPUT PERCENTAGE OF TOTAL ULTOR CURRENT SUPPLIED BY EACH GUN TO PRODUCE ILLUMINANT-C WHITE:

RED GUN: 57 % BLUE GUN: 17 % GREEN GUN: 36 %



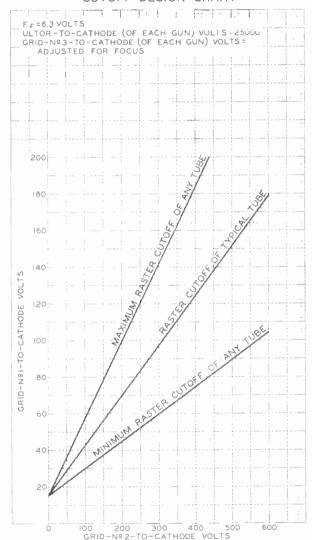
2144924







#### CUTOFF DESIGN CHART







C/4+022.4

THREE-GUN SHADOW-MASK TYPE MAGNETIC CONVERGENCE

ELECTROSTATIC FUCUS MAGNETIC DEFLECTION

ALUMINIZED TRICOLOR PHOSPHOR-DOT SCREEN
Supersedes Type 21AXP22

1	DATA						
Į,	General:						
Ш	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 6.3 ac or dc volts  Current 1.8 ± 10% 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						
	gun + cathode of red gun to all other electrodes 16 μμτ Grid No.3 (Of each gun tied within tube to No.3 grids of other two						
	guns) to all other electrodes 9						
	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						
	Height						
	Focusing Method						
	Deflection Angles (Approx.):       70°         Horizontal						
	Tube Dimensions:  Maximum overall length						
)	At lip						

# 2144022.4

## 2IAXP22-A

#### COLOR KINESCOPE

Ultor Terminal	os.214NMINSC (Radial leads)
Basing Designation for BOTTOM VIE	(Axial leads), or equivalent
Pin 1-Heater	Pin 9-Grids No.3
Pin 2-Grid No.1	Pin 11 - Grid No. 2
of Red Gun	of Blue Gun
Pin 3-Grid No.2	Pin 12 - Grid No.1
of Red Gun	of Blue Gun
Pin 4 – Cathode	Pin 13 - Cathode
of Red Gun ④ \\	of Blue Gun
Pin 5 - Cathode	Pin 14 - Heater
of Green Gun	METAL SHELL:
of Green Gun	(Grid No.4,
Pin 7-Grid No.2	Gria No.5.
of Green Gun	Collector)
Maximum Ratings, Design-Center Va	
ULTOR-TO-CATHODE (Of each gun) VO	LTAGE 25000 max. volts
ULTOR CURRENT, (Average, each gun	) 500°max. μamp
GRID-No.3-TO-CATHODE (Of each gun)	VOLTAGE . 6000 max. volts
GRID-No.2-TO-CATHODE VOLTAGE (Eac GRIO-No.1-TO-CATHODE VOLTAGE (Eac	h gun) 800 max. volts
Negative bias value	
Positive bias value	
Positive peak value	
PEAK HEATER-CATHODE VOLTAGE (Each	
Heater negative with respect to	
During equipment warm-up perio	
not exceeding 15 seconds	
After equipment warm-up period	
Heater positive with respect to	cathode. 180 max. volts
Equipment Design Ranges:	
With any ultor voltage (Ec4keach	dun) between 20000# and
	25000 volts
Grid-No.3 (Focusing	
electrode)-to-Cathode	
(Of each gun) Voltage . 15.2% to	21.2% of Ecakasch aug volts
Grid-No.2-to-Cathode	4 each gun
Voltage (Each gun)	
when circuit design	
utilizes grid-No.1-	
to-cathode voltage	
(E <sub>C1k</sub> ) at fixed	
value for raster	See Cutoff Design Chart
Cutoffi	See Catoff Design Chart
', <sup>#</sup> : See next page.	

8-56

TENTATIVE DATA 1



## 2IAXP22-A COLOR KINESCOPE

214+022.4

	Grid-No.1-to-Cathode Volt- age (Each gun) for Visual Extinction of Focused Raster when circuit de-
)	sign utilizes grid-No.2- to-cathode voltage (E <sub>C2</sub> k) at fixed value See Cutoff Design Chart
	Variation in Raster Cutoff Between Guns in Any Tube
	Grid-No.3 Current for ultor current of 800 μαπρ45 to +75 μαπρ
,	Grid-No.2 Current (Each gun)5 to +5 $\mu$ amp
	Percentage of Total Ultor Current Supplied by Each Gun:
	To produce Illuminant-C White (I.C.I. Coordinates x = 0.310, y = 0.316): Red gun. 47 to 67 per cent
	Red gun
	Green gun 20 to 33 per cent
	To produce White of 8500°K + 27 M.P.C.D. (I.C.I. Coordin-ates x = 0.287, y = 0.316):
	Red gun 42 to 60 per cent
	Blue gun
	Maximum Raster Shift in Any Direction from Screen Center 1 inch
١	Adjustment to be Provided by
	the Following Components:  Purifying magnet Raster shift of 1" max. in
	any direction from screen center
)	Magnetic-field equalizer Beam displacement with respect to phosphor dot at position of max. displacement (i.e., edge of screen)
	Tangential
	<ul> <li>A value of average ultor current per gun higher than 500 microamperes will increase picture brightness but may impair resolution and shorten cathode life.</li> </ul>
	D Centering of the raster on the screen is 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 con- vergence and color purity.
	# prilliance and definition decrease with decreasing ultor voltage. In

# Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 20000 volts.

# 2144022.4

lateral-Converging Magnet:



Lateral - Converging Magnet:		
made for color purity and		
dynamic convergence—  Max. shift of blue beam	±1/4"	
Max. shift of red and green beams		١.
Average of max. shift of red	11/0 (0 1/0	
and green beams	±7/32" to ±9/32"	•
Radial-Converging Magnet		
Assembly:®		
For static convergence		
After adjustment has been made		
for optimum color purity		
and dynamic convergence (Each beam)	Shift of ±5/8"	
For dynamic convergence!—		'
Effected by magnetomotive force		
of parabolic and/or saw-		1
tooth waveshape synchron-		1
ized with scanning.		1
Horizontal:		
Blue pattern—		ĺ
Parabola amplitude to provide	Shift of 1/4" to 9/16"	
Sawtooth amplitude to	31111 01 174 10 3710	
provide <sup>00</sup>	Shift of ±50% of the	ĺ
	shift caused by pa-	
	rabola amplitude	
Red pattern & green pattern		
Parabola: Amplitude to provide*	Ch: 44 -4 1/0" 4- 2/0"	
Ratio of red-pattern	311111 01 176 10 376	
shift to green-pattern		_
shift	1/2 to 2	
Sawtooth:		
Amplitude for red pattern		
to provide <sup>00</sup>	Shift of -35% to +85%	
	of the shift caused by parabola amplitude	
Amplitude for green pattern	parabora ampritude	
Amplitude for green pattern to provide <sup>00</sup>	Shift of -85% to +35%	4
	of the shift caused by	
	parabola amplitude	
Difference between red-		
pattern shift and green-		
pattern shift	0 to +100%	
(Shift <sub>R</sub> - Shift <sub>G</sub> )	0 (0 +100%	
Blue pattern—		
Parabola amplitude to		•
provide♣	Shift of 0 to 1/8"	
• + † • m		
•, •, †, •, ∞: See next page.		

8-56

TENTATIVE DATA 2



## 2IAXP22-A COLOR KINESCOPE

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	For dynamic convergence <sup>†</sup> (Cont'd):  **Vertical: Sawtooth amplitude to provide <sup>00</sup> Shift of 0 to 1/ Red pattern & green pattern—	4"
	Parabola: Amplitude to provide Shift of 1/8" to 3/ Ratio of red-pattern shift to green-	8*
	pattern shift	
)	pattern shift and green-pattern shift (Shift <sub>R</sub> - Shift <sub>G</sub> ) 0 to +10 Examples of Use of Design Ranges:	Ю%
	For ultor voltage of 20000 25000 vol	ts
	Grid-No.3 (Focusing Electrode)- to-Cathode (Of Each Gun) Voltage 3040 to 4240 3800 to 5300 vol	ts
	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 vol	ts
	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 vol	ts
	la cara de la SA Malanda	

#### 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 ultor power supply and the grid-No.3 power supply be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 50 milliamperes. In addition, to prevent cathode damage with resultant decrease intube life, the effective resistance between grid-No.3 power supply output capacitor and the grid-No.3 electrode should be not less than 50000 ohms. This resistance should be capable of withstanding the maximum instantaneous current and voltage in the grid-No.3 circuit.

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

● d t A OO: See next page.

TENTATIVE DATA 3

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### 21A XP22-A COLOR KINESCOPE

Low-Voltage Circuits:

Grid-No.1-Circuit Resistance

(Each Gun) . . . . 1.5 max.

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 milliamoeres total. Such current limitation will prevent heater burnout in case of a momentary internal arc within the tube.

Shift is the movement of the regions of bar-or-dot-generator pattern indicated in notes  $(\triangleq)$  and  $\{\circ\circ\}$ .

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 the 21AXP22-A.

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.

#### X-RAY WARNING

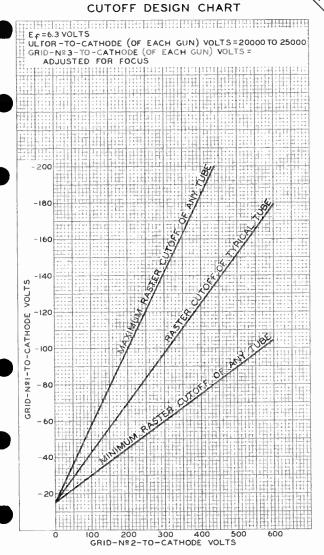
X-ray radiation is produced by the 21AXP22-A when it is operated at its normal ultor voltage. The radiation is through the faceplate, and is sufficient to require the adoption of safety measures in TV receivers. Shielding such as that provided by a 1/4-inch thickness of safety glass (lime) in front of the faceplate, should prove adequate to provide protection against personal injury from prolonged exposure at close range when the tube is operated at its maximum ultor voltage rating.

When this tube is being serviced outside of the TV receiver cabinet, it should never be operated without providing adequate X-ray shielding in front of faceplate. Because the ultor voltage may rise above its maximum rated value for short periods during adjustment with increase in the amount of X-ray radiation, provision should be made for placing a 3/8-inch thickness of safety glass in front of the faceplate to avoid the hazard of X-ray radiation.



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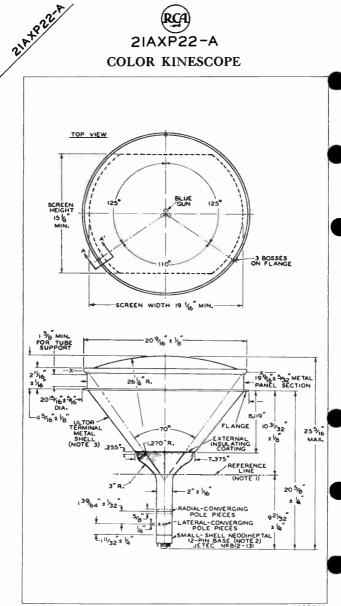
CIA TOCK



TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8565RI

## 2IAXP22-A COLOR KINESCOPE

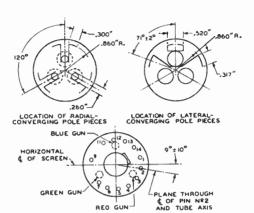


8-56

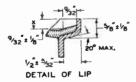
CE-8399R4A

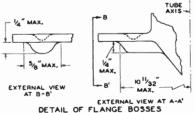
## RCA

## 2IAXP22-A COLOR KINESCOPE



BASE BOTTOM VIEW





92CL-8399R4

2144222-4

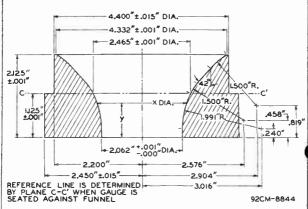
## (RC4) 2IAXP22-A COLOR KINESCOPE

NOTE 1: WITH TUBE NECK INSERIED THROUGH FLARED END OF REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE (SHOWN BELOW) 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. BOTIOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH METAL—SHELL AXIS AND HAVING A DIAMETER OF 3".

NOTE 3: METAL SHELL AND GLASS FACE OPERATE AT HIGH VOLTAGE. ANY MATERIAL IN CONTACT WITH THE SHELL OR THE FACE MUST BE INSULATED TO WITHSTAND THE MAXIMUM APPLIED ULTOR VOLTAGE.

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



I	у		x	у	х	
	0.000"	2.062"	+ 0.001"	0.385"	2.062" + 0.001" - 0.000"	Ì
	0.125"	2.062"	+ 0.001"	0.500"	2.084" ± 0.001"	
	0.250"	2.062"	+ 0.001"	0.625"	2.122" ± 0.001"	
	0.375"	2.062"	+ 0.001"	0.750"	2.1B2" ± 0.001"	

8-56



## 2IAXP22-A COLOR KINESCOPE

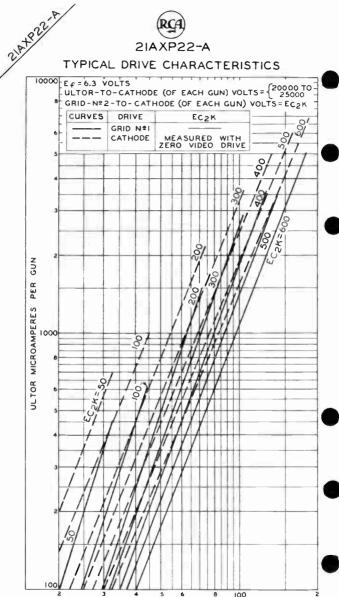
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1	у	х
	0.875"	2.258" ± 0.001"
	1.000"	2.352" ± 0.001"
١	1.125"	2.465" ± 0.001"
ĺ	1.250"	2.604" ± 0.001"
	1.375"	2.778" ± 0.001"
	1.500"	2.990" ± 0.00 "

у	*
1.625"	3.216" ± 0.001"
1.750"	3.440" ± 0.001"
1.875"	3.678" ± 0.001"
2.000"	3.958" ± 0.001"
2.125"	4.332" 1 0.001"

#### 2IAXP22-A

#### TYPICAL DRIVE CHARACTERISTICS



VIDEO SIGNAL VOLTS FROM ULTOR-CURRENT CUTOFF PER GUN



21440224

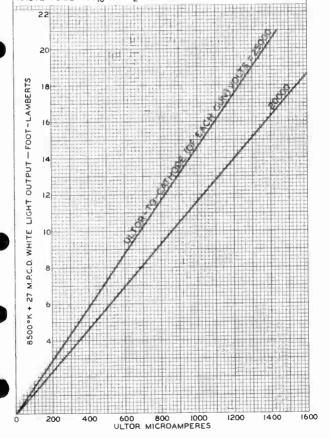
#### TYPICAL LIGHT-OUTPUT CHARACTERISTICS

Er= 6.3 VOLTS GRID-Nº3-TO-CATHODE (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS

DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ULTOR CUR-RENT 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: 51% BLUE GUN: 19 % GREEN GUN: 30%

RASTER SIZE: 19 1/16" x 14 1/2"





#### Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 90° MAGNETIC DEFLECTION

#### GENERAL DATA

lec		

. . 600 ± 10% ma Heater Current at 6.3 volts . . . . . . . Direct Interelectrode Capacitances: Grid No.1 to all other electrodes . 6 uu f 5 Muf Cathode to all other electrodes . (2500 max. External conductive coating to ultor. 12000 min. . . Type Requiring No Ion-Trap Magnet Electron Gun. .

#### Optical:

Faceplate, Spherical...... Filterglass Light transmission (Approx.)..... Phosphor (For Curves, see front of this Section) . P4—Sulfide Type, Aluminized

#### Mechanical:

One sating Position

Operating Fusition	•			•	•	
Weight (Approx.)						24 lbs
Overall Length			,			18" ± 3/8"
Neck Length					٠	5-1/2" ± 3/16"
Projected Area of Screen			•	•		262 sq. in.
External Conductive Coating:						
Type						Special
Contact area for grounding.						Near Reference Line

For Additional Information on Coatings and Dimensions: See Picture-Tube Dimensional-Outlines and Bulb Ji71 D/E sheets at the front of this section

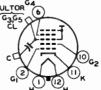
Cap . . . . . . . . . . . . . . . Recessed Small Cavity (JEDEC No., J1-21) Bases (Alternates):

Short Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.86-203)

Small-Shell Duodecal 6-Pin, Arrangement 1

(JEDEC Group 4, No.86-63) Basing Designation for BOTTOM VIEW.

Pin 1 - Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10 - Grid No. 2 Pin 11 - Cathode Pin 12 - Heater



Cap - Ultor (Grid No.3. Grid No.5. Collector C - External Conductive Coating

#### **21CBP4A**

Maximum and Minimum Ratings, Design-Maximum Values:	
ULTOR VOLTAGE	volts
GRID-No.4 (FOCUSING) VOLTAGE:	
Positive value 1000 max.	volts `
Negative value 500 max.	volts
GRID-No.2 VOLTAGE	volts
Negative peak value	volts
Negative bias value	volts
Positive bias value 0 max.	volts
Positive peak value 2 max.	
(6.0	
HEATER VOLTAGE	volts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts
Heater positive with	741.03
respect to cathode 200 max.	volts
Typical Operating Conditions:	
With ultor voltage of 16000	volts
and grid-No.2 voltage of 300	volts
Grid-No.4 Voltage for focus 0 to 450 Grid-No.1 Voltage for visual extinction of focused raster28 to -72	volts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section





PICQA P

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

With heater having controlled warm-up time

	DATA		
General:			
Current Warm-up time (Aver Capacitance between Coating and Ultor	tial Cathode:	. 0.6 ± 5% a . 11 s . {2500 max. } . {2000 min. }	ani sec uu uu ass ype
Horizontal Vertical Electron Gun		10 8	05° 37°
Greatest width Greatest height . Diagonal Neck length Radius of curvatur		20-1/4" ± 1/ 16-3/8" ± 1/ 21-3/8" ± 1/ 5-3/16" ± 3/1	/8" /8" /8" /8"
Screen Dimensions (M Greatest width. Greatest height Diagonal. Projected area. Operating Position. Cap.		19-1/1 15-1/1 15-1/1 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2 10-1/2	16" 16" /4" in. Any 21)
Pin 2 - Cathode Pin 3 - Heater Pin 4 - Heater Pin 5 - Grid No.1 Pin 6 - Grid No.4 Pin 7 - Grid No.2		Cap - Ultor (Grid No.3, Grid No.5, Collector) C - External Conductive Coating	)
Maximum Ratings, Des ULTOR VOLTAGE GRID-No.4 (FOCUSING) Positive value Negative value	VOLTAGE:	18000 max. vol	





#### PICTURE TUBE

GRID-No.1 VOLTAGE:  Negative-peak value	volts volts volts volts
During equipment warm-up period not exceeding 15 seconds 410 max. After equipment warm-up period 180 max. Heater positive with respect to cathode	volts volts
Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max. r	negohms

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

#### Color Picture Tube

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

ALL-GLASS ENVELOPE MAGNETIC CONVERGENCE

General:

ELECTROSTATIC FOCUS

Supersedes Type 21CYP22

#### DATA

_	40	
	Electron Guns, Three with Axes Tilted Toward Tube Axis	d
	Fach Gun, Paralleled with Each of the Other Two Heaters within Tube:  Voltage (AC or DC)*  Current at 6.3 volts 1.6 am	
	Direct Interelectrode Capacitances (Approx.): Grid No.1 of any qun to all other electrodes except the No.1 grids	
	of the other two guns 7 μμ Cathode of blue gun + cathode of green	f
	qun + cathode of red qun to all other electrodes	f
	guns) to all other electrodes 9	f
	guns) to all other citetroats.	
	External conductive coating to grid No.6 2000 min.	
	Faceplate, Spherical Filterglas	
	Light transmission (Approx.)	76
	Type Aluminized, Tricolor, Phosphor-Do Phosphor (Three separate phosphors, collectively) P2 Fluorescence and phosphorescence of	2
	separate phosphors, respectively Blue, Green, Re	d
	Persistence of group phosphorescence Mediu	ıın. √€
	Dot arrangement Triangular group consisting of blue dot, green dot, and red do	) t
	Spacing between centers of adjacent dot trios (Approx.) 0.029	)"
	Size (Minimum):	
	Greatest width 19-1/4	
_	Height	
	Projected area	1.
	Focusing Method	
	Convergence Method	
	Deflection Method Magnet	C
	Deflection Angles (Approx.):	20
	nor izontal	50
_		)
	Tube Dimensions:	211
	Overall length	ŽΗ
	Diameter	, ,
	Weight (Approx.)	, 0

(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),	4
214NMINC (Axial leads), or equivalent	•
Base Small-Shell Neodiheptal 12-Pin (JEDEC No. B12-131)	
Basing Designation for BOTTOM VIFW 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	
Die 6 Celebra 1	_
of Green Gun	
Pin 7 - Grid No.2	
of Green Gun	
Pin 9-Grid No.3 (2)	_
Pin 11 - Grid No. 2	
of Blue Gun	•
Pin 12 - Grid No.1 Can* Over of Blue Gun Pin 2 - Grid No.6.	
of Blue Gun Pin 2-Grid No.6, Pin 13-Cathode of Blue Gun Collector, High-	
Pin 14 - Heater Voltage-Supply	
Cap Terminal	
Over C - External	
Pin 1 - Ultor (Grid No.4, Conductive	
Grid No.5) Coating	
Maximum Ratings, Design-Center Values:	
ULTOR-TO-CATHODE (Of each oun) 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 connec-	
ted to the High-Voltage-Supply Terminal—never directly to the Ultor Terminal.	_
GRID-No.3-TC-CATHODE (Of each gun; VOLTAGE 6000 max. volts	-
GRID—No.2—TO—CATHODE VOLTAGE (Each gun). 6000 max. volts	
GRID—No.1—TO—CATHODE VOLTAGE (Each gun):	
The state of the s	

Negative-bias value. . . . . . . . . . . . .

Positive-bias value. . . . . . . . . . . . . . . .

Positive-peak value. . . . . . . . . . . . .

After equipment warm-up period . . . .

Heater positive with respect to cathode.

PEAK HEATER-CATHODE VOLTAGE (Each gun):
Heater negative with respect to cathode:
During equipment warm-up period
not exceeding 15 seconds . . . .

Operating Position . . . . . . . . Tube Axis Horizontal



volts

volts

volts

volts

400 max.

410 max.

180 max.

180 max. volts

O max.

2 max.

Equipment Desi	an Ranges:
----------------	------------

Equipment Design Kanges:				
With ultor volt	age (Ec.	keach gun	)	
between 20000	and 25	000 volt	S	
Grid-No.3 (Focusing				
Electrode)-to-Cathode	0.001.1.0	07 5		volts
(Of each gun) Voltage 1	6.8% to 2	U% OT LC4ke	ach gun	VOILS
Grid-No.2-to-Cathode				
Voltage (Each gun)				
when circuit design				
utilizes grid-No.1- to-cathode voltage				
(E <sub>c.i.k</sub> ) at fixed value				
for raster cutoff		.See Cutof	f Design	Chart
Grid-Nc.1-to-Cathode				
Voltage (Each gun)				
for Visual Extinction				
of Focused Raster				
when circuit design				
utilizes grid-No.2-				
to-cathode voltage				
(E <sub>c2k</sub> ) at fixed				
valūe		.See Cutoj	f Design	Chart
Variation in Raster				
Cutoff Between Guns	210 -5	average of	highert	
in Any Tube		est cutoff		
Crid No 3 Current		-45 to +45	values	μа
Grid-No.3 Current Grid-No.2 Current		45 (0 145		μ
(Each gun)		-5 to +5		μа
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:		40		Of.
Red gun		49		%
Blue gun		18		% %
Green gun		33		76
Ratios of Cathode Currents:				
To Produce White of				
8500° K + 27 M.P.C.D.				
(CIE Coordinates	Min.	Typical	Max.	
x = 0.287, y = 0.316): Red cathode to	/3 + /4 +	. ,,	.,	
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

inch

7/8

Maximum Required Displacements	
of Beam Trios with Respect to	
Associated Phosphor-Dot Trios:	
Uniform in any direction over	
entire screen area	
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	
Average of maximum lateral shift	
of red beam and green beam ±7/32" to ±9/32" Radial-Converging Magnet Assembly:  For static convergence including	
Radial-Converging Magnet Assembly:	
For static convergence including	
compensation for dc component	
of dynamic convergence	
(Each beam)	
For dynamic convergence*—	
Effected by magnetomotive force	_
of parabolic and/or sawtooth	
waveshape synchronized with	
scanning.	
ý .	
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 provideShift 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%	J
of the shift caused by	
parabola amplitude	
Difference between red-	
pattern shift and green-	
pattern shift (Shift <sub>R</sub> -	
Shift <sub>G</sub> )	
Vertical:	
Blue pattern—	_
Parabola amplitude to	
provide Shift of -1/8" to +1/16"	
Sawtooth amplitude to	
provide <sup>⊕</sup>	
4	



	Sawtooth:  Amplitude to prov Difference betwee rattern shift	vide*Shi tern shift rn shift vide*Shift en red- and areen-	2/3 t of -1/8" to	to 3/2 +3/16"
	Examples of Use of Design F			volts
	For ultor voltage of	annan	25000	00113
)	Grid-No.3 (Focusing Electrode)-to-Cathode (Of each qun) Voltage. • Grid-No.2-to-Cathode Voltage (Fach qun) when	3360 to 4000	4200 to 5000	volts
	circuit design utilizes arid-No.1-to-cathode voltage of -70 volts for raster cutoff Grid-No.1-to-Cathode Voltage (Fach gun) for Visual Extinction of	130 to 370	130 to 370	volts
	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  $1100~\mu a$  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; the red beam toward the lower left 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.

Lack of correspondence in position of the centers of the Nisregister. 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.

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

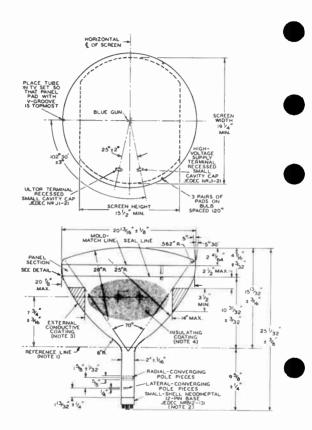
#### GENERAL CONSIDERATIONS

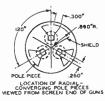
X-Ray-Warning. Because this color picture tube is designed to be operated at ultor voltages as high as 25 kilovolts (Design-center maximum value), shielding of this color picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range.

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.

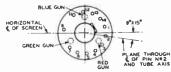
> REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE for Type 21CYP22-A is the same as that shown for Type 21AXP22-A



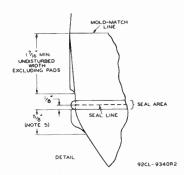




LOCATION OF LATERAL-CONVERGING POLE PIECES WITH RESPECT TO GUINS



BASE BOTTOM VIEW



### 21CYP22-A

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 RREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 3".

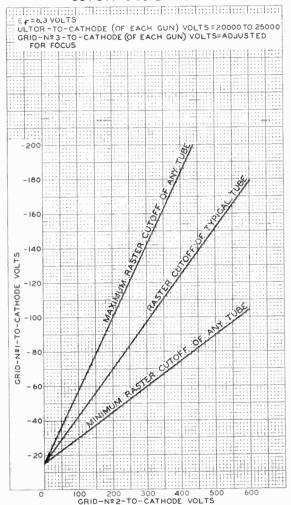
NOTE 3: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT BAND OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THAT OF THE CONTACT BAND SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

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".



#### CUTOFF DESIGN CHART



92CM-8565RI

## 21CYP22-A

#### TYPICAL DRIVE CHARACTERISTICS

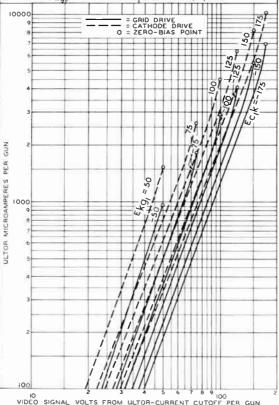
CATHODE-DRIVE SERVICE Er = 6.3 VOLTS ULTOR - TO - GRID - NºI (OF EACH GUN) ULTOR - TO - CATHODE (OF EACH GUN) VOLTS = 20000 TO 25000 GRID - Nº3-TO-GRID - Nº1 (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS

GRID-Nº2-TO-GRID-NºI VOLTS (EACH GUN) = ADJUSTED TO PROVIDE ULTOR - CURRENT CUT-OFF FOR DESIRED FIXED CATH-ODE -TO - GRID - NºI (EACH GUN) VOLTAGE (Ekg)

GRID - DRIVE SERVICE

E f = 6.3 VOLTS GRID-Nº3-TO-CATHODE (OF EACH GUN) VOLTS = ADJUSTED FOR FOCUS

GRID - Nº2-TO- CATHODE VOLTS (EACH GUN) = ADJUSTED TO PROVIDE ULTOR-CURRENT CUI
OFF FOR DESIRED FIXED GRIDNSI-TO-CATHODE (EACH GUN) VOLTAGE (Ecik)



92CL - 942I

PER GUN

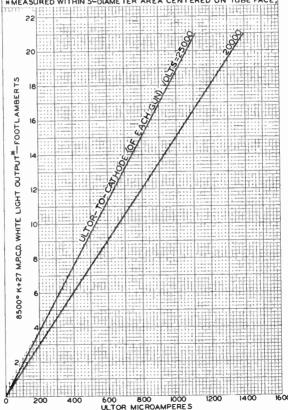


#### TYPICAL LIGHT-OUTPUT CHARACTERISTICS

E, = 6,3 VOLTS
GRID-N23-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 %

BLUE GUN: 19 %
BLUE GUN: 19 %
GREEN GUN: 31 %
RASTER SIZE: 19 ¼ X 14 ½ CENTERED ON TUBE FACE,
MMEASURED WITHIN 5 DIAMETER AREA CENTERED ON TUBE FACE



92CM-94I7



• • • •

#### Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 1100 MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

- 1- 1	OCT.	rical	

ı	Heater Current at 6.3 volts 450 ± 5%	ma
	Heater Warm-Up Time (Average)	seconds
	Direct Interelectrode Capacitances:	
	Grid No.1 to all other electrodes 6	μμf
	Cathode to all other electrodes 5	μμf
	External conductive coating to ultor . $\begin{cases} 2500 \text{ max.} \\ 1700 \text{ min.} \end{cases}$	μμf
		μμf
	Electron Gun	Magnet

#### Optical:

Faceplate			Filterglass
Light transmissio	n (Approx.)		76%
Phosphor (For curves,	see front of	this Section)	
			Aluminized

#### Mechanical:

Operating Position .

Weight (Approx.)
Overall Length
Neck Length 5-7/16" + 1/8" - 7/16"
Projected Area of Screen
External Conductive Coating:
Type Regular Band
Contact area for grounding Near Reference Line
For Additional Information on Coatings and Dimensions:
See Picture-Tube Dimensional-Outlines and Bulb Ji7: G/K sheets
at the front of this section
Cap Recessed Small Cavity (JEDEC No.J1-21)
Bases (Alternates):
Small-Button Eightar 7-Pin, Arrangement 2,
(JEDEC No. B7-183)
Small-Button Neoeightar 7-Pin, Arrangement 1,

Pin 1 - Heater Pin 2-Grid No.1 Pin 3-Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode Pin 8 - Heater

(JEDEC No. B7-208)

Basing Designation for BOTTOM VIEW . .



Cap - Ultor (Grid No.3, Grid No.5. Collector) C - External Conductive

Coating

## 21DHP4

Maximum Ratings, Design-Maximum Values:		
ULTOR VOLTAGE	19800 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE:	1120	- 1
Positive value	1100 mix.	volts
Negative value	550 max.	volts
GRID-No.2 VOLTAGE:	550 mix.	volts
Negative peak value	220 max.	volts
Negatile pius value	154 mar.	vo'ts
Positive bias value	O max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with		
respect to cathode:		
During equipment warm-up period		
not exceeding 15 seconts	450 mix.	volts
After equipment warm-up periol	200 max.	volts
Heater positive with		
respect to cathode	.×£ " 00°.	volts
Typical Operating Conditions:		
With ultor voltage of	16000	volts
and grid-No.2 voltage of	300	volts
Grid-No.4 Voltage for focus	J to :00	volts
Grid-No.1 Voltage for visual extinction	0 (0 +00	VOI (5
of focused rister	to -72 عر-	volts
Maximum Circuit Values:		
Gris-No.1-Gircuit Resistance	1.5 max.	megohins

For (-rigidation shielding considerations, sie shiet

X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES

if front of this section





PIDIA

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN MAGNETIC DEFLECTION

	DATA	
General:		
Heater, for Unipotential (Voltage	6.3 0.6 ± 10% acitances: electrodes	
Faceplate, Spherical Light transmission (App Phosphor (For curves, see fr		Filtergia
FluorescencePhosphorescence Persistence Focusing Method Deflection Method Deflection Angles (Approx Diagonal Focusion	.):	
Tube Dimensions: Overall length. Greatest width. Greatest height Diagonal Neck length Screen Dimensions (Minimum		17" ± 3/ 20-1/4" ± 1/ 16-3/8" ± 1/ 21-3/8" ± 1/
Greatest width	cessed Small Ca Shell Duodecal -203), or Small	15-1/1
Basing Designation for E	JET) WELV MOTTOB	EC Group 4, No.B6-6
Pin 1-Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10-Grid No.2 Pin 11-Cathode		Cap - Ultor (Grid No.3, Grid No.5, Collector)

Pin 11 - Cathode

Pin 12 - Heater

C - External





#### PICTURE TUBE

#### GRID-DRIVE\* SERVICE

Unless otherwise specified, voltage values are fositive with respect to cathode

Maximum and Minimum Ratings, Des	sign-Center Values:	
ULTOR VOLTAGE	(20000	max. volts
	\12000 <sup>6</sup>	min. volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value		max. volts
Negative value		max. volts
GRID-No.2 VOLTAGE.	500	mix. volts
GRID-No.1 VOLTAGE:	200	max. volts
Negative-peak value		max. volts
Positive-bias value		max. volts
Positive-peak value		max. volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to	cathode:	
During equipment warm-up per	riod	
not exceeding 15 seconds		max. volts
After equipment warm-up per		max. volts
Heater positive with respect to	cathode. 180	max. volts
Equipment Design Ranges:		
1	4	
With any ultor voltage $(E_{C_5k})$ and grid-No.2 voltage $(F_{C_2k})$		
Grid-No.4 Voltage for		
focus§	-50 to $+400$	volts
Grid-No.1 Voltage (E <sub>Cik</sub> )		
for visual extinction		
of focused raster	See Raster-Cutoff-	
Grid-No.1 Video Drive	for Grid-Dr	ive service
from Raster Cutoff		
(Black Level):		
White-level value		
(Peak positive)	Same value as det	ermined for
	Ecik except video	drive is a
		ive voltage
Grid-No.4 Current	-25 to +25	ıμλ
Grid-No.2 Current	-15 to +15	$\mu a$
Field Strength of Adjust-	0.4.0	
able Centering Magnet*	0 to 8	gausses
Examples of Use of Design Range	5:	
With ultor voltage of	16000	volts
and grid-No.2 voltage of	300	volts
Grid-No.4 Voltage for		
focus	0 to 400	volts





#### PICTURE TUBE

orid No.1 Video Drive from Raster Cutoff (Black Level):	to -72		volt
Maximum Circuit Values:			
Grid N. 1 Circuit Resistance	1.5 m	ar, m	egohn
CATHODE-DRIVE® SERVICE			
Unless otherwise specified, voltage value with respect to grid No.		posit	ive
Maximum and Minimum Ratings, Design-Center	Values	:	
JLTOR-TU-GRID-No.1 VOLTAGE	∫20000	тзх.	volt
	12000*	min.	velt
GRID-No.4-TO-GRID-No.1 VOLTAGE:			
Positive value	1000	max.	volt
Negative value	500	max.	volt
GRID-No.2-TO-GRID-No.1 VOLTAGE	640	max.	volt
GRID-No. 2-TO-CATHODE VOLTAGE	500	max.	volt
CATHODE-TO-GRID-No.1 VOLTAGE: Positive-peak value	200	Max.	volt
Positive-bias value	140	max.	vol
Negative-bias value	0	max.	vol
Negative-peak value	2	max.	vol
PEAK HEATER-CATHODE VOLTAGE:	4		
Heater negative with respect to cathode:			
During equipment warm-up period			
not exceeding 15 seconds	410	max.	vol
After equipment warm—up period	180	max.	vol
Heater positive with respect to cathode.	180	max.	vol
Equipment Design Ranges:			
Equipment besign kanges.			
W 41			2000
With any ultor-to-grid-No. 1 voltage (Ec.	ga) bet	ween i	- 1
and 20000 volts and grid-No. 2-to-grid-No.	1 volta	ween i ge (Ec	28 1
and 20000 volts and grid-No.2-to-grid-No. between 225 and 640 vol	1 volta	ween i ge (Ec	28 1
and 20000 volts and grid-No.2-to-grid-No. between 225 and 640 vol Grid-No.4-to-Grid-No.1	i voltu	ween i ge (Ec	2g 1)
and 20000 volts and grid-No.2-to-grid-No. between 225 and 640 vol. Grid-No.4-to-Grid-No.1 Voltage for focus§0	1 volta	ween i ge (Ec	vol:
and 20000 volts and grid-No.2-to-grid-No.between 225 and 640 vol.  Grid-No.4-to-Grid-No.1  Voltage for focus§0  Cathode-to-Grid-No.1	i voltu	ween i ge (Ec	2g 1)
and 20000 volts and grid-No.2-to-grid-No.  between 225 and 640 volt  Grid-No.4-to-Grid-No.1  Voltage for focus§0  C.sthode-to-Grid-No.1  voltage (Ekg.) for	i voltu	ween i ge (Ec	2g 1)
and 20000 volts and grid-No.2-to-grid-No.  between 225 and 640 volt  Grid-No.4-to-Grid-No.1  Voltage for focus§0  Cathode-to-Grid-No.1  voltage (E <sub>kg1</sub> ) for  visual extinction	Toolta ts to 450	ge (Ec	vol:
and 20000 volts and grid-No.2-to-grid-No. between 225 and 640 volt  Grid-No.4-to-Grid-No.1  Voltage for focus§ 0  Cathode-to-Grid-No.1  voltage (Ekg₁) for  visual extinction  of focused raster See Raster	Toolta ts to 450	ge (Ec -Range	28 1 vol

, 6, • . ■: See next page.



Cathode-to-Grid-No.1



#### PICTURE TUBE

Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative)		Same value as deter Ekg_ except video o	
Grid-No.4 Current Grid-No.2 Current Field Strength of Adjust-		negativ -25 to +25 -15 to +15	ve voltage µa µa
able Centering Magnet.		0 to 8	gausses
Examples of Use of Design	Ranges	:	
With ultor-to-grid- No.1 voltage of and grid-No.2-to-grid-		16000	volts
No. 1 voltage of		300	volts
Grid-No.4-to-Grid-No.1 Voltage for focus Cathode-to-Grid-No.1 Voltage for visual		0 to 400	volts
extinction of focused raster		28 to 60	volts
Raster Cutoff (Black Level): White-level value		-28 to -60	volts
Maximum Circuit Values:			

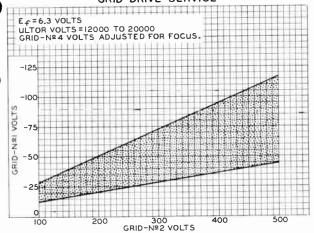
Grid-No.1-Circuit Resistance. . . . megohms 1.5 max.

- Grid drive is the operating condition in which the video signal varies the  $\operatorname{grid-No.1}$  potential with respect to cathode.
- This value is a working design-center minimum. The equivalent absolute minimum ultor- or ultor-to-grid-No.1 voltage is 11,000 volts, below which the serviceability of the 21DLPa will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the hand of the work of the variation than ultor- or ultor-to-grid-No.1 voltage is never less than it follows: than 11.000 volts.
- The grid-No.4 voltage or grid-No.4-to-grid-No.1 voltage required for focus of any individual tube is independent of ultor current and will remain essentially constant for values of ultor voltage (or ultor-grid-No.1 voltage) or grid-No.2 voltage (or grid-No.2-to-grid-No.1 voltage) within design ranges shown for these items.
- Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 7/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.
- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

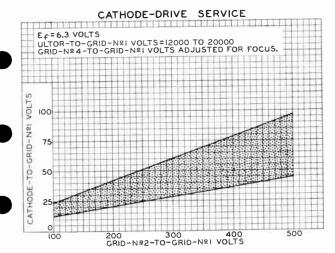
RCA) 21DLP4

RASTER-CUTOFF-RANGE CHARTS
GRID-DRIVE SERVICE



92CS-9349V

PIDIPA

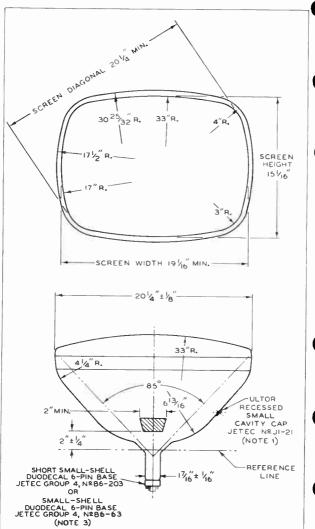


ELECTRON TUBE DIVISION

92CS-9350V

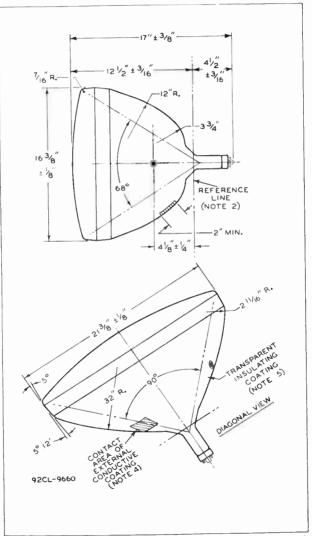
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## (RCA) 2IDLP4 PICTURE TUBE



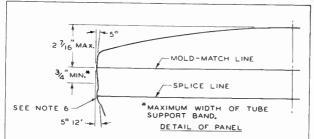












NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE IHROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm~30^{\circ}$ . ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC NO.G-116 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BERIGIDLY 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 2-3/4".

**HOTE 4:** THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

MOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.



## 210104 21DLP4

DRIVE CHARACTERISTICS AVERAGE

 $E_f = 6.3 \text{ VOLIS}$ ULTOR-TO-GRID-NO.1 VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID NO.1 TO GIVE FOCUSED

CATHODE-DRIVE SERVICE

RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS.

RASTER SIZE = 18"x13-1/2"

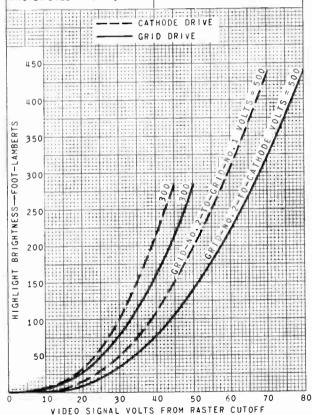
GRID-DRIVE SERVICE

 $E_f = 6.3 \text{ VOLTS}$ ULTOR VOLTS = 16000

GRID NO. 1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.

RASTER FOCUSED AT AVERAGE BRIGHTNESS.

PASTER SIZE =  $18^{\circ} \times 13 - 1/2^{\circ}$ 

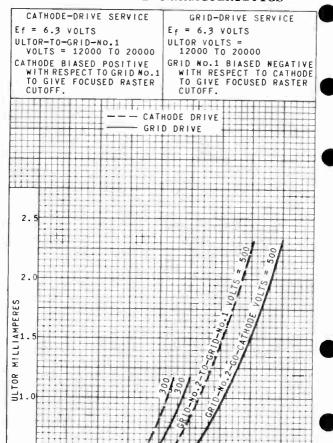


ELECTRON TUBE DIVISION BADIO CORPORATION OF AMERICA, HARRISON, NEW JEESEY

92CS-9143R1



#### AVERAGE DRIVE CHARACTERISTICS



20 40 60 BO VIDEO SIGNAL VOLTS FROM RASTER CUTOFF



## 2IDSP4 PICTURE TUBE

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW GRID-No.2 VOLTAGE ALUMINIZED SCREEN MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

PIDSON





Basing Designation	for BOTTOM VIEW	12L
Pin 1 - Heater	. (6)	Cap - Ultor
Pin 2-Grid No.1	87	(Grid No.3,
Pin 6-Grid No.4	/ Z===7 /	Grid No.5,
Pin 10 - Grid No.2	<b>★</b> / <b>==</b>	Collector)
Pin 11 - Cathode	°4/ // 20	C - External
Pin 12 - Heater	(2) (1) (1)	Conductive
	(1)_(15)	Coating

#### CATHODE-DRIVE SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No. 1  Maximum and Minimum Ratings, Design-Center Values:				
	x. volts			
ULTOR-TO-GRID-No.1 VOLTAGE	n. volts			
GRID-No.4-TO-GRID-No.1 VOLTAGE:				
	ix. volts			
	x. volts			
	x. volts			
	x. volts			
CATHODE-TO-GRID-No.1 VOLTAGE:				
Tooler to pour ture to the total to the	x. volts			
	ix. volts			
	x. volts			
I meaning the control of the control	x. volts			
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with	1			
respect to cathode:				
During equipment warm-up period				
not exceeding 15 seconds 410 ma				
The state of the s	x. volts			
Heater positive with				
respect to cathode 180 ma	x. volts			
Equipment Design Penness				

#### Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage ( $E_{C581}$ ) between 12000 and 20000 volts and grid-No.2-to-grid-No.1 voltage ( $E_{C281}$ ) between 40 and 64 volts

Grid-No.4-to-Grid-No.  Voltage for focus§ 0 to 400	volts	4
Cathode-to-Grid-No.1 Voltage	70.15	,
(Ekg <sub>1</sub> ) for visual extinction of focused raster See Raster-Cutoff-Range	Chart	

Cathode-to-Grid-No.1 Video

Drive from Raster Cutoff (Black level):

White-level value



## 21050

## PICTURE TUBE

Grid-No.4 Current	-25 to +25 -15 to +15 0 to 8	µа µа qausses
Examples of Use of Design Ranges:		
No.1 voltage of and grid-No.2-to-grid-	18000	volts
No. 1 voltage of Grid-No.4-to-Grid-No.1 Voltage	50	volts
for focus	0 to 350	volts
of focused raster	32 to 47	volts
AND A S S S	-32 to -47	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms
Cathode drive is the operating condition in varies the cathode potential with respect to electrodes.	which the vid grid No.1 and	eo signal the other

Operation below this value is not recommended.

The grid-No.4 voltage or grid-No.4-to-grid-No.1 voltage required for focus of any individual tube is independent of ultor current and will remain essentially constant for values of ultor-to-grid-No.1 voltage or grid-No.2-to-grid-No.1 voltage within design ranges shown for

Distance from Reference Line for suitable PM centering magnet should not exceed  $2-1/4^{\circ}$ . Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 7/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

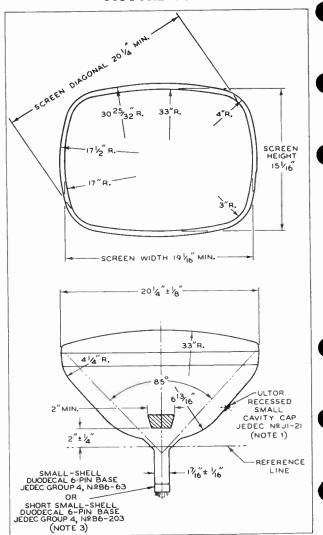
The cathode-to-grid-Mo.1 voltage ( $E_{kg1}$ ) for visual extinction of focused raster will increase by approximately 2 per cent for every 1000-volt increase in ultor-to-grid-Mo.1 voltage and will decrease by approximately 2 per cent for every 1000-volt decrease in ultor-to-grid-Mo.1 voltage and visual tor-to-grid-Mo.1 voltage and visual voltage and visual voltage and visual voltage and visual voltage and visual voltage and visual voltage voltage visual voltage visual grid-No.1 voltage.

> For x-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TURES at front of this Section

# 210584

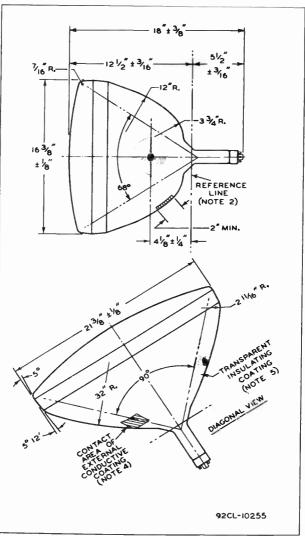
## RGA 2IDSP4

#### PICTURE TUBE



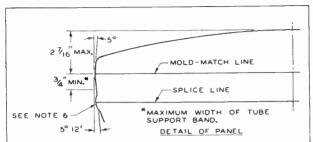
10-59

# RCA) 21DSP4 PICTURE TUBE









NOTE :: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm$  30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) 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 3: 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 2-3/4".

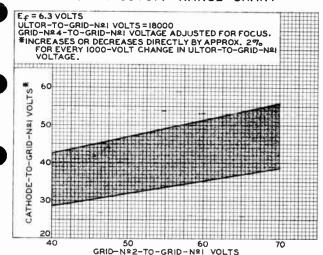
NOTE 4: THE DRAWING SHOWS THE MINIMUM SIZE AND LOCATION OF THE CONTACT AREA OF THE EXTERNAL CONDUCTIVE COATING. THE ACTUAL AREA OF THIS COATING WILL BE GREATER THAN THE CONTACT AREA SO AS TO PROVIDE THE REQUIRED CAPACITANCE. EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

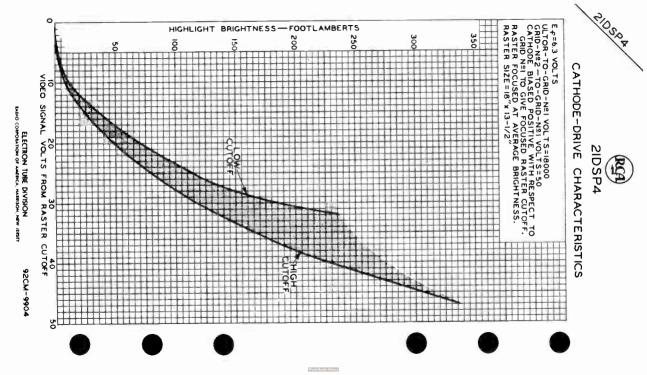
MOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDI-CATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/B", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

## PIDSA.

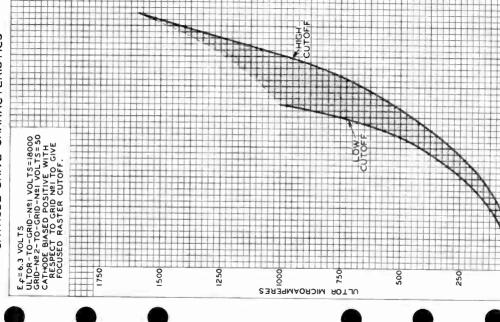
#### RASTER-CUTOFF-RANGE CHART



92CS-99II



# TERISTIC CHARAC CATHODE-DRIVE



40 CUTOF

STER

AA 30 FROM

S

70

SIGNAL

VIDEO



#### Picture Tube

RECTANGULAR GLASS TYPE MAGNETIC FOCUS

ALUMINIZED SCREEN 700 MAGNETIC DEFLECTION

#### Electrical:

	Direct Interelectrode Capacitances:				
	Cathode to all other electrodes			5	pf
1	Grid-No.1 to all other electrodes			6	pf
'	External conductive coating to anode.			∫750 max.	pf
	External contact fit courting to anote.	•	•	\500 min.	pf
	Hoater Current at 6.3 volts			600 ± 60	ma
	Electron Gun			Type Req	uiring
			N	lo Ion Trap	Magnet

#### Optical:

Phosphor (For Curves, see from	11 01	this	Secti	on) -	P4-	- 2u i	TIG	e 1)	me,
							Alu	min	zed
Faceplate, Cylindrical						. F	ii I t	ergl	ass
Light transmission (Appr	ox.)						-		74%

#### Mechanical:

Weight (Approx.).											29 Hrs
Overall Length											
Neck Lenath											7-1/2" ± 3/16"
Projected Area of	S	cri	90	١.				,			248 sq. in.
External Conductiv	/e	Co	oa'	tii	nq	:					
Tuna											Pegular_Rand

Contact area for grounding. . . . . . Near Reference Line For Additional Information on Coatings and Dimensions: See Picture-Tube Dimensional-Outlines and Bulb Ji70 A/C sheets

at front of this section Cap . . . . . . . . Recessed Small Cavity (JEDEC No.J1-21) Base. . . . . . Small-Shell Duodecal 5-Pin (JEDEC Group 4. No. B5-571

Basing Designation for BOTTOM VIEW, . . . . 12N

Pin	1	Heate	er
Pin	2 -	Grid	No.1
Pin	10 -	Grid	No. 2
ette di			

Pin 11 - Cathode

Pin 12 - Heater



Cap - Anode (Grid No. 3. Screen,

Collector) C - External Conductive

Coating

## 21EP4C

Maximum and Minimum Ratings, Design-Maximum Values:												
Unless otherwise specified, voltage val-												
ues are positive with respect to cathode												
ANODE VOLTAGE	volts volts											
Negative peak value	volts volts volts											
Positive peak value 2 max. HEATER VOLTAGE												
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts											
After equipment warm-up period 200 max.  Heater positive with   respect to cathode:   Combined AC and DC voltage	volts volts volts											
Typical Operating Conditions for Grid-Drive Service:												
Unless otherwise specified, voltage values are positive with respect to cathode												
Anode Voltage	volts volts											
Maximum Circuit Value:												

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

Grid-No.1-Circuit Resistance. . . .



1.5 max. megohms

## Monitor Kinescope

NO ION-TRAP MAGNET REQUIRED RECTANGULAR GLASS TYPE ALUMINIZ LOW-VOLTAGE ELECTROSTATIC FOCUS 72° MAGNETIC D	ED SCREEN EFLECTION
Electrical:  Direct Interelectrode Capacitances: Cathode to all other electrodes. 5 Grid No.1 to all other electrodes. 6.5 External conductive coating to anode. \$1500	
11200	min. pf
Optical:	
Faceplate, Spherical	uminized
Mechanical:	. 75.5%
Weight (Approx.)       23.031         Overall Length       23.031         Neck Length       7.500	' ± .188" 52 sq.in. ular-Band ence Line s: u B/F
Base Small-Shell Duodecal 6-Pin, Arrang	lo.J1-21) gement 1,
Basing Designation for BOTTOM VIEW	
Pin 1-Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10-Grid No.2 Pin 11-Cathode Pin 12-Heater Cap-Anode (Grid No.3, Grid No.5, Screen, Collector) C-External Conductive Coating	G <sub>Z</sub>
Maximum and Minimum Ratings, Design-Maximum Values:	
Unless otherwise specified, voltage values are positive with respect to cathode	
Anode Voltage ∫ 22000 ma.	x. volts

## **21EYP4**

Negative value 550 max.	volts volts volts
Negative peak value	volts volts volts volts volts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts volts volts
Typical Operating Conditions for Grid-Drive Service:	
	volts
	volts volts
Maximum Circuit Value:	

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

Grid-No.1-Circuit Resistance. . . . . . 1.5 max. megohms



#### Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 70° MAGNETIC DEFLECTION

F1	ec	ŧ	r	i	ca	1	٠

Direct Interelectrode Capacitances:	
Cathode to all other electrodes	. 5 pf
Grid No.1 to all other electrodes	
External conductive coating to anode	.∫750 max. pf
(Althor Conductive States of States	{500 min. pf
Heater Current at 6.3 volts	. 600 ± 60 ma
Electron Gun	. The Meduiring
A contract of the contract of	vo Ton-Trup Magnet

#### Optical:

Phospho	r (For	Curves,	see	fron	t of	thi	5	Sec	tio	n)	P4	_	Sи	1.1.14	je.	1 y	re,
																	zed
Facer la	te. C	ylindri	cal.											Fil	ter	·g1	ass
Light	tran	smissio	n 14	lop re	nx. ]												74%

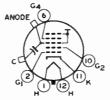
Mechanical:	
Weight (Approx.)	29 lbs
Overall Length	· ± 3/8"
Neck Length	± 3/16"
Projected Area of Screen 248	sq. in.
External Conductive Coating:	
Tyre Regu	ar-Band
Contact area for grounding Near Refere	nce Line
E. A. Wister 1. Lefe-matics on Continue and Dimonsions	

For Additional Information on Coatings and Dimensions: See Picture-Tube Dimensional-Outlines and Bulb Ji70 A/C sheets at front of this section

. . . Pecessed Small Cavity (JEDEC No.J1-21) Base. . . . Small-Shell Duodecal (JEDEC Grour 4, No. E6-63) 

Pin 1-Heater Pin 2-Grid No. 1 Pin 6-Grid No.4 Pin 10 - Grid No. 2 Pin 11 - Cathode

Pin 12 - Heater



(Grid No.3. Grid No.5. Screen. Collector)

Cap - Anode

C - External Conductive Coating

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

Unless otherwise specified, voltage values are positive with respect to cathode

ANCEIE VOLTA	AGE								∠0000	max.	volts
GFID-No.4	FOCUSII	VG)	V0	LT.	AGE:						
Positive	value.								1100	max.	volts
Negative	value.								550	max.	volts

## 21FP4D

GRID-No.2 VOLTAGE . 550 max. GRID-No.1 VOLTAGE: Negative peak value . 220 max. Negative bias value . ip5 max. Positive bias value . 0 max. Positive neak value . 2 max. HEATER VOLTAGE 6.9 max.	volts volts volts volts volts
PEAK HEATER-CATHODE VOLTACE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts volts
Typical Operating Conditions for Grid-Drive Service:  \[ \begin{align*} \lambda \text{rless otherwise specified, voltage values are positive with respect to cathode \]  Anode Voltage   \text{12000}                                                                                                                                                                                                                                                                                                                   \q	volts
Maximum Circuit Value: Grid-No.1-Circuit Pesistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



#### Picture Tube

SHORT RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS 110° MAGNETIC DEFLECTION

ALUMINIZED SCREEN

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

lect		

	Heater Current at 6.3 volts 600 ± 5%	ma
	Heater Warm-Up Time (Average)	seconds
	Direct Interelectrode Capacitances:	
	Grid No.1 to all other electrodes 6	μμί
	Cathode to all other electrodes 5	<i>141</i> f
	External conductive coating to ultor . $\begin{cases} 2000 \text{ max.} \\ 1500 \text{ min.} \end{cases}$	μμf μμf
_	Electron Gun Type Requiring No Ion-Trap	Magnet

#### Optical:

Faceplate								.Fi	Iter	glass
Light trans										
Phosphor (For	Curves,	see front	of	this	Sect	ion)	. P4	 Sulf	ide '	Гуре,
								Α	lumin	nized

#### Mechanical:

Operating Position	Any
Weight (Approx.)	
Overall Length	13-1/8" ± 1/4"
Neck Length	3-7/8" ± 1/16"
Projected Area of Screen	. 262 sq. in.
External Conductive Coating:	

kternal Conductive Coating. Type . . . . . . . . . . . . . . . . . . Regular Band Contact area for grounding . . . . . . Near Reference Line For Additional Information on Coatings and Dimensions:

See Picture-Tube Dimensional-Outlines and Bulb Ji71 G/K sheets at the front of this section Cap. . . . . . . . Recessed Small Cavity (JEDEC No.J1-21)

Arrangement 1 (JEDEČ No.87-208) Basing Designation for BOTTOM VIEW . . . . . . . . . . . . . . . . 8KW

Pin 1 - Heater Pin 3-Grid No.1 Pin 4 - Grid No.4

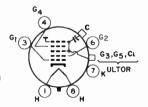
Base . . . . . .

Pin 6-Grid No.2 Pin 7 - Cathode

Pin 8 - Heater

Cap - Ultor (Grid No.3. Grid No.5, Collector) C-External Conductive

Coating



. . . Small-Button Neoeightar 7-Pin.

## **21FDP4**

Maximum Ratings, Design-Maximum Values:		
ULTOR VOLTAGE	20000 max.	volts
GRID-No.4 (FOCUSING) VOLTAGE: Positive value Negative value GRID-No.2 VOLTAGE. GRID-No.1 VOLTAGE: Negative peak value Negative bias value Positive bias value Positive peak value Positive peak value PASH HEATER-CATHODE VOLTAGE: Heater negative with	1100 max. 550 max. 550 max. 400 max. 155 max. 0 max. 2 max.	volts volts volts volts volts volts volts
respect to cathode: During equipment warm—up period not exceeding 15 seconds	450 max. 200 max.	volts volts
Typical Operating Conditions:		
With ultor voltage of and grid-No.2 voltage of	16000 300	volts volts
Grid-No.4 Voltage for focus	+100 to +500	volts
Grid-No.1 Voltage for visual extinction of focused raster	−35 to −72	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms

For x-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section







RECTANGULAR METAL-SHELL TYPE

RECTANGULA	R METAL-	-SHELL TYPE
LOW-VOLTAGE ELECTROSTATIC	F0CUS	MAGNETIC DEFLECTION
	DATA	
General:		
Heater, for Unipotential Ca	thodo:	
Voltage	6.3	ic or dc vol
Current	0.6 ±	10%
Encephite, Spterical		Frosted Filterals
Phosphor (for Curves, see from	t of this	Section) . P4-Sulfide Ty
Deflaction Angle (Approx.)	:	
Dingonal		
Horizontal		
Vertical		
Flectron Gun		ton-irap Type Requiri xternal Single-Field Migno
Tube Dimensions:	L .	KIETIII SIIIIIE-ITETU 18 1911
Maximum overall length .		22-5/-
Greatest width at lig		19-23/32" ± 1/
Greatest beight at lip.		15-5/16" ± 1/-
Diagonal at lig		20-3/4" ± 1/
Neck length		
Radius of curvature of fa		(External surface) 3
Screen Dimensions (Minimum)		10 1/
Greatest width		12 1:/1
Greatest height Diagonal		10 1/1
Operating Position		
Ultor Terminal		
Ultor Terminal Base Small-Shell Duodec	al 6-Pi	n (JETEC Group 4, No. Bt-6
Basing Designation for BU		
D: 4 H .	(6)	M - 1 65 11 11
Pin 1 - Heater Pin 2 - Grid No.1		Metal-Shell Lip - Ultor
Pin 6- Grid No.4	<u> </u>	(Grid No.3.
Pin 10 - Grid No. 2	/#\	Grid No.5.
Pin 11 - Cathode		Collector
Pin 12 - Heater	\d_\d_\	11)
Maximum Ratings, Design-Cen	ter Val:	ues:
ULTOR VOLTAGE		16000 mix. vol
GRID-No.4 (FOCUSING) VOLTAG		
Positive value		
Negative value		500 may. vol
GRID-No.2 VOLTAGE		500 max. vol
GRID-No.1 VOLTAGE:		izb max. vol
Negative-bias value Positive-bias value		
Fositive-reak value		
OSTATOR TO THE VILLE		
		→ Indicates a change

21MP A



### PICTURE TUBE

PEAK HEATER-CATHODE VOLTAGE:		
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

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

	Picture Tube
	PAN-O-PLY-INTEGRAL IMPLOSION PROTECTION 1140 MAGNETIC DEFLECTION NO 10N-TRAP MAGNET REQUIRED LOW-VOLTAGE ELECTROSTATIC FOOJS
)	Direct Interelectrode Capacitances  Carbons to all other electrons 5 pF  or allocator forms lectrons 6 pF  control to a fine control to robe 1500 min—2300 max pF  Heater Current at 6.3 V
	OPTICAL
	Phosphor
	Faceplate Filterglass Light transmi sion ut center (approx.)
	MECHANICAL
	$ \begin{array}{llllllllllllllllllllllllllllllllllll$
	Type (.e.c.:outline lattron of the section) Regular-Band Contict are for grounding
	Pin 1 - Heath r Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 1 - Criston.1 Pin 6 - Griston.1 Pin 7 - Cathode Pir 8 - Heath r  BHR  ANODE  Cap - Anode (Grid No.3, Griston.1 Screer. (coll) torl C - External Considive Costinal
	MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES
<b>N</b>	Voltages are positive with respect to cathode
•	Anode Voltage
	Teg: ve per value.

#### Peak Heater-Cathode Voltage

Heater negative with respect to cathoget			
During equipment warm=up period < 15 seconds		450 max	٧
After equipment warm—up perio:		300 max	٧
Heater positive with respect to cathode:			
Combined AC & DC voltage			٧
DC component		100 max	٧

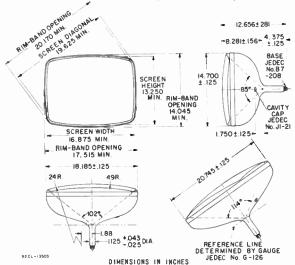
DC component 100 max	٧
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	
Voltages are positive with respect to grid No.1	
Anode Voltage	٧
	٧
Grid-No.2 Voltage 400	٧
Cathode Voltage	٧
For visual extinction of focused raster	
Field Strength 0 to 10	G
Of required adjustable centering magnet	
MAYIMMA CIDCUIT VALUE	

#### MAXIMUM CIRCUIT VALUE

Grid-No.1	Circuit	Resistance		٠		٠	٠			•		1.5	max	M.	
-----------	---------	------------	--	---	--	---	---	--	--	---	--	-----	-----	----	--

A Includes implosion protection hardware.

#### DIMENSIONAL OUTLINE (BULB J165-1/4 A)



The grid-Vo. I voltage required for optimum focus of any individual tube will have avalue anwhere between -100 and \*300 volts with the combined grid-vo. I voltage and video-sinal voltage adjusted to give an anode current of 100 microamperes on a 11.550-inch by 15.500-inch pattern from an RCA-2F21 monoscope, or equivalent.

## Color Picture Tube

New Rare-Earth (Red) Phosphor

#### 70° Round Unity Current Ratios

# HI-LITE Screen 70° Magnetic Deflection

The 21GUP22 is the same as the 21GVP22 except for the following:

Faceplate	Filterglass
Light transmission (Approx.)	72%
Faceplate does not have an integral protective w	indow a
TUBE DIMENSIONS	

 Overall length
 . 25-1/32 ± 3/8 in

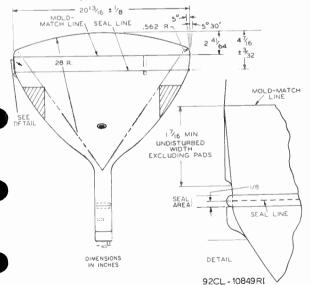
 Diameter
 . 20-13/16 ± 1/8 in

 Weight (Approx.)
 . 36.5 lb

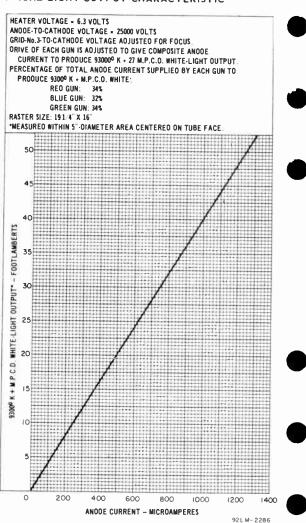
<sup>a</sup> It is recommended that the cabinet be provided with a shatter-proof glass cover over the face of the 21GUP22 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide x-radiation protection when required.

#### DIMENSIONAL OUTLINE

Dimensions shown are only those which are different from the corresponding dimensions for the 21GVP22



#### TYPICAL LIGHT-OUTPUT CHARACTERISTIC





# 21GVP22

#### Color Picture Tube New Rare-Earth (Red) Phosphor 70° Round Antiglare Integral Protective Window HI-LITE Screen Unity Current Ratios 70° Magnetic Deflection EI ECTRICAL Electron Guns, Three with Axes Tilted Toward Tube Axis . . . . . . . . . . Red, Blue, Green Heater, of Each Gun Parallel Connected within Tube with Each of the Other Two Heaters: Current at 6.3 volts . . . . . . . . . . . . . . . . 1.9 Focusing Method . . . . . . . . . . . . . Electrostatic Focus Lens ..... Bipotential Convergence Method . . . . . . . . . . . . . . . Magnetic Deflection Method . . . . . . . . . . . . . . . . Magnetic Deflection Angles (Approx.): 70 deg. deg. 55 Direct Interelectrode Capacitance (Approx.): Grid No.1 of any gun 10 ρF Grid No.3 to all other electrodes ..... 12 pF All cathodes to all other electrodes . . . . . ρF External conductive coating 2500 max. pF to anode (Approx.) . . . . . . . . . . . OPTICAL Faceplate and Protective Window........ Filterglass Light transmission at center (Approx.) ...... 39% 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-New Rare-Earth (Red), Sulfide (Blue & Green) Type Fluorescence and phosphorescence of separate phosphors, respectively. . Red, Blue, Green Persistence of group phosphorescence . . . . Medium Short Dot Arrangement . . . . . . . . . . . . . . . . . Triangular group consisting of



Spacing between centers of adjacent

red dot, blue dot, and green dot

dot trios (Approx.) . . . . . . . . . . . . . . . 0.029 in

# 21GVP22

MECHANICAL Minimum Screen Area (Projected) Bulb Funnel Designation JE	267 sq. in
Bulb Panel Designation JEDI	EC No.FP166-1/2D1
Protective Window Designation JEDI	CC No.FP166-1/2B1
Base Small-Shell	Neodihental 12-pin
Operating Position	ibe Axis Horizontal,
Socket Alden Nos.214NMI	ase pin 12 near top)
	eads), or equivalen
Weight (Approx.)	41 lb
MAXIMUM AND MINIMUM RATINGS, DESIGN-A	
Unless otherwise specified, values a	re for each gun
and voltage values are positive with res	spect to cathode
Anada Valtana	\$27,500 max. volts
Anode Voltage	20,000 min. volts
Total Anode Current,	(20,000
Long-Term Average	1000 max. μA
Grid-No.3 (Focusing Electrode) Voltage . Peak Grid-No.2 Voltage, Including	6000 max. volts
Video Signal Voltage	1000
Grid-No.1 Voltage:	1000 max. volts
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):	
Under operating conditions a	6.9 max. volts
Heden standbar on the S	5.7 min. volts
Under standby conditions <sup>c</sup> Peak Heater-Cathode Voltage:	5.5 max. volts
Heater negative with respect to cathode	
During equipment warm-up period not	
exceeding 15 seconds	450 max. volts
After equipment warm-up period:	
Combined AC and DC value DC component value	200 max. volts
Heater positive with respect to cathode:	200 max. volts
AC component value	200 max. volts
DC component value	0 max. volts
EQUIPMENT DESIGN RANGES	
Unless otherwise specified, values are	o for and an
and voltage values are positive with res	r for each gun
varaco are posttiot with res	πει το εμπομε

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					
	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)					
	Grid-No-2 Current					
	To Produce White of 9300 °K + 27 M.P.C.D.					
	(CIE Coordinates $x = 0.281$ , $y = 0.311$ ):					
_	Red Blue Green					
	Percentage of total anode current					
	supply by each gun (average) 34 32 34 %					
_	Ratio of cathode currents:					
	Min. Typ. Max.					
	Red/blue 0.75 1.10 1.50					
	Red/green					
	Blue/green 0.60 0.91 1.30					
	Displacements, Measured at Center of Screen:					
	Raster centering displacement:					
	Horizontal					
	Vertical					
	Lateral distance between the blue beam and					
	the converged red and green beams <u>±0.40</u> in					
	Radial convergence displacement excluding					
	effects of dynamic convergence (each beam). ±0.50 in					
	Maximum Required Correction for Register <sup>d</sup> (1n-					
	cluding Effect of Earth's Magnetic Field when					
	Using Recommended Components) as Measured					
_	at the Center of the Screen					
	in any Direction 0,005 in max.					
	LIMITING CIRCUIT VALUES					
	High-Voltage Circuits:					
	Grid-No.3 circuit resistance 7.5 max. megohms					
	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, in which the short-					
	circuit current does not exceed 20 mA.					
	Low-Voltage Circuits:					
	Effective grid-No.1-to-cathode-					
_	circuitresistance (each gun) 0.75 max. megohm					
	The low-voltage circuits, including all heater circuits,					
	should be analyzed by assuming the color picture tube heater					
	i and a limit to the receiver charge ground Under					

is connected directly to the receiver chassis ground. Under

### 21GVP22

these conditions the circuits to the elements of all tubes, including the color picture tube, operating from the same heater winding 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 mA total in the assumed picture tube heater ground connection. The leads from all other circuits must be separated from the picture tube leads by a minimum distance of 0.25 inch to prevent energy transfer to the picture tube circuits. Such current limitation will help prevent picture tube damage in case of momentary cascade arcing.

- For maximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts. The series impedance to any chassis connection in the DC biasing circuit for the heater should be between 100,000 ohms and 1 megohm.
- For curve, see Group Phosphor P22-New Rare-Earth (Red), Sulfide (Blue & Green) at front of this section.
- <sup>c</sup> For "instant on" applications, a maximum heater voltage of 5.5 volts (design-maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. All other voltages normally applied to the tube must be removed during standby operation.
- d Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios.

#### X-RADIATION WARNING

Because the 21GVP22 is designed to be operated at anode voltages as high as 27.5 kilovolts (design-maximum value), shielding of the 21GVP22 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

#### TERMINAL DIAGRAM (Bottom View)

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

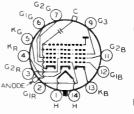
Pin 11 - Grid No.2 of Blue Gun

Pin 12- Grid No.1 of Blue Gun

Pin 13 - Cathode of Blue Gun

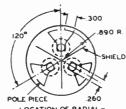
Pin 14 - Heater Cap - Anode

C - External Conductive Coating

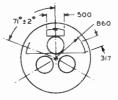


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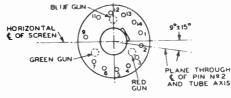




LOCATION OF RADIAL—
CONVERGING POLE PIECES
VIEWED FROM SCREEN END OF GUNS

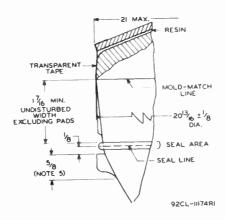


LOCATION OF LATERAL-CONVERGING POLE PIECES WITH RESPECT TO GUNS



BASE BOTTOM VIEW

#### DIMENSIONAL OUTLINE DETAIL



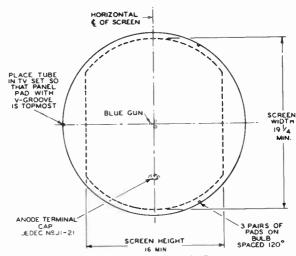
DIMENSIONAL OUTLINE

DIMENSIONS IN INCHES

### 21 MAX. INTEGRAL PROTECTIVE WINDOW MOLD-MATCH LINE 5° 30′ SEAL LINE PANEL SECTION 28 7 R. 25 R. SEE DETAIL 2 1/2 MAX. 20 % MAX → CONTACT AREA OF EXTERNAL CONDUCTIVE COATING (NOTE 3) 10 31/32 ± 3<sub>32</sub> 25 732 INSULATING COATING (NOTE 4) REFERENCE LINE (NOTE I) 6 Ŕ. RADIAL-CONVERGING POLE PIECES -LATERAL-CONVERGING POLE PIECES BASE JEDEC NRBI2-131 (NOTE 2) 4 113/32 +1/4

World Radio History

### DIMENSIONAL OUTLINE (Top View)



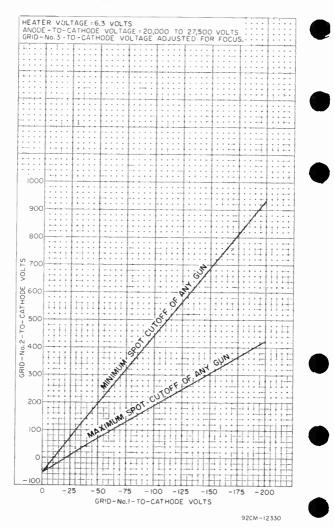
### DIMENSIONS IN INCHES

#### NOTES FOR DIMENSIONAL OUTLINE

- Note 1: With tube neck inserted through flared end of reference-line and neck-funnel-contour gauge JEDEC No. G-150 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 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: The maximum effective width of a funnel pad is 5/8".



#### CUTOFF DESIGN CHART





# **21VAKP22**

# Color Picture Tube

Ultra-Rectangular 4 X 3 Aspect Ratio Electrical	Hi=Lite Matrix Screen Light Neutral Screen Appearance
Electron Guns, Three with A Tilted Toward Tube Axis	xes Red, Blue, Green
Heater, of Each Gun Series Tube with Each of the Othe Current at 6.3 V	
Focusing Method	Electrostatic
Focus Lens	Bipotential
Convergence Method	•
Deflection Method	
Deflection Angles (Approx.)	
Diagonal	
Grid No.3 to all other el-	tance (Approx.): all other electrodes 7.5 pF ectrodes 6.5 pF electrodes 15 pF
Capacitance Between Anode Conductive Coating	and External 2250 max. pF 1750 min. pF
Optical	•
	Filterglass ter (Approx.) 66%
Surface of Safety Panel	Treated to minimize specular reflection
Matrix Phosphor, rare-earth (red Persistence	Aluminized Black opaque material sulfide (blue & green)
Spacing between centers	
Mechanical	0.020 (0.00)
Minimum Screen Area (Proje	cted) 226 sq in (1458 sq cm)
Bulb Funnel Designation .	JEDEC No.J561AO6
Bulb Panel Designation	JEDEC No.FP177-3/4 W2
	Small-Button Diheptar 12-Pin
	(JEDEC No.B12-244)
Basing Designation	JEDEC No.14BE
	Pin No.12 Aligns Approx. with



### 21VAKP22

Operating Position, preferred Anode Bo		Detta
Weight (Approx.)	- 35.5 lb (16.	.0 kg;
Implosion Protection		
Integral Safety Panel JEDEC	No.SP177-1/	4A1
Maximum and Minimum Ratings, Design-Maximu	um Values	4
Unless otherwise specified, values are for each values are positive with respect to cathode.	gun and vo	Itage
Anode Voltage	∮27.5 max.	kV
Anoge voitage	20 min.	kV
Anode Current, Long Term Averageb	1000 max.	μΑ
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:	400	V
Negative bias value	400 max. 200 max.	V
Positive bias value	0 max.	v
Positive peak value	2 max.	V
Heater Voltage (ac or dc):C	,	
Under operating conditions	6.9 max.	V
Onder operating conditions	5.7 min.	V
Under standby conditions <sup>d</sup>	5.5 max.	V
Heater-Cathode Voltage: Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	450 max.	V
After equipment warm-up period:	200	V
DC component value	200 max. 200 max.	v
Peak value	200 IIIdX.	v
Heater positive with respect to cathode:  DC component value	0 max.	V
Peak value	200 max.	v

#### **Equipment Design Ranges**

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

For anode voltages between 20 and 27.5 kV

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



Grid No.2 Voltage for Visual Extinc of Undeflected Focused Spot S	tion See CUTOFF	DESIGN	CHART Figure 3
At Grid No.1 voltage of -75 V At Grid No.1 voltage of -125 V At Grid No.1 voltage of -175 V		80	to 280 V
Maximum Ratio of Grid No.2 Volta Lowest Gun in Any Tube (At grid-N voltage of -100 V)	lo.1 spot cut	off	1.86
Heater Voltage. C Under operating conditions: When standby operation in n When 5.0-V standby operatio Under standby conditionsd	ot utilized . n is utilized <sup>d</sup>		6.3 V 6.0 V 5.0 V
Grid-No.3 Current (Total)			±15 μΑ
Grid-No.2 Current			
Grid-No.1 Current			±5 μΑ
To Produce White Light of	Illum. D 6550° K + 7 M.P.C.D.	-	
X	0.313 0.329	0.281 0.311	
Percentage of total anode curren supplied by each gun (average):			
Red	41	30	% %
Blue	24 35	31 39	70 %
Ratio of cathode currents:  Red/blue:	33	33	~
Minimum	1.35	0.75	
Typical	1.70	0.96	
Maximum	2.20	1.25	
Minimum	0.95	0.60	
Typical	1.15 1.70	0.75 1.10	
Maximum	1.70	1.10	
Minimum	0.50	0.60	
Typical	0.70	0.80	
Maximum	0.95	1.10	
Displacements, Measured at Center	of Screen:		
Raster centering displacement:			
Horizontal			
Vertical		45 in (± 1	1.4 mm)
Lateral distance between the bit	e beam and	Se :	C 4



the converged red and green beams . . .  $\pm$  0.25 in ( $\pm$  6.4 mm)

### 21VAKP22

Radial convergence displacement excluding effects of dynamic convergence
(each beam)
Maximum Required Correction for Register® (Including Effect of Earth's Magnetic Field when Using Recommended Components) as Measured at the Center of the Screen in any Direction
Typical Operation
Heater Voltage 6.3 V
Anode Voltage 25 kV
Grid No.3 Voltage Adjusted for focus
Color Temperature 9300° K + 27 M.P.C.D.
Raster Size
Typical White-Light Output Measured within 5 in (127 mm) diameter area centered on tube face:
At anode current of 1000 $\mu$ A
Limiting Circuit Values
$ \begin{array}{llllllllllllllllllllllllllllllllllll$
Low-Voltage Circuits:  Effective grid-No.1-to-cathode- circuit resistance (each gun) 0.75 max, MΩ
X-Radiation Characteristic
Maximum Anode Voltage at which the X-radiation emitted will not exceed 0.5 mR/h at an anode current of
300 μA

The X-radiation emitted from this picture tube, as measured in accordance with the procedure of JEDEC Publication No.64A will not exceed 0.5 mR/h throughout the useful life of the tube when operated within the Design-Maximum ratings: 27.5 kV anode voltage and 1000 µA anode current. The tube should not be operated beyond its Design-Maximum ratings stated above (such operation may shorten tube life or have other permanent adverse affects on its performance), but its X-radiation will not exceed 0.5 mR/h for anode voltage and current combinations given by the isodose-rate limit characteristics as shown in Figure 1. Operation above the values shown by the curve may result in failure of the television receiver to comply with the Federal Performance Standard for Television Receivers, Sub-Part C of Part 78 of Title 42, Code of Federal Regulations (PL90-602) as published in the Federal Register Vol.34, No. 247, Thursday, December 25, 1969. Maximum X-radiation as a function of anode voltage at 300  $\mu$ A anode current is shown by the curve in Figure 2. X-radiation at a constant anode voltage varies linearly with anode current.



- The mating socket, including its associated, physically-attached hardware end circuitry, must not weigh more than one pound (one-half kilogram).
- b The short-term average anode current should be limited by circuitry to 1500 microemperes.
- 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.
- d The use of a 5-volt standby condition in conjunction with 6-volt operating conditions is recommended to improve the reliability of the color picture tube by extending the emission wear-out life and reducing other gun-related defects. A maximum heater voltage of 5.5 volts (Design-Maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. All other voltages normally applied to the tube must be removed during standby operation.
- e Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios.

#### Notes For Dimensional Outline

- Note 1- With tube neck inserted through flared end of referenceline 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 2-inch (51-mm) circle concentric with blub 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 grounded with multiple contacts.
- Note 4- To clean this area, wipe only with soft, dry, lintless cloth.

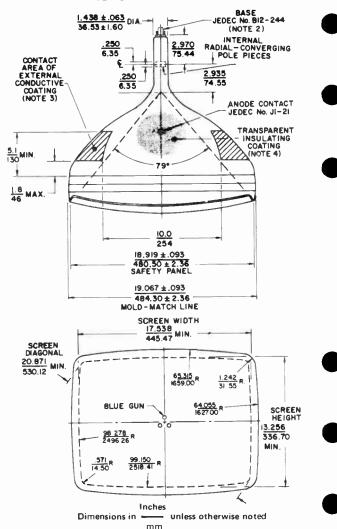
SAGITTAL HEIGHTS AT POINTS  $\frac{.125}{3.18}$  BEYOND EDGE OF MIN. SCREEN

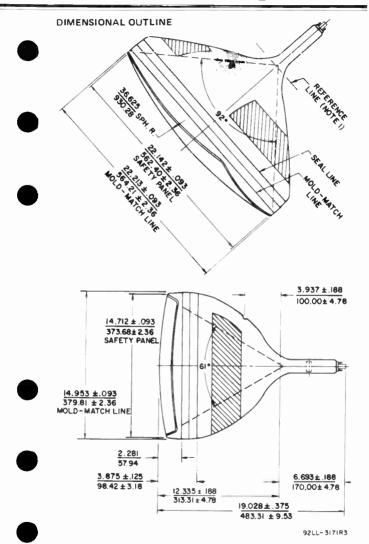
DIAGONAL  $\frac{1.561}{39.65}$ ; HORIZONTAL  $\frac{1.100}{27.94}$ ; VERTICAL  $\frac{0.630}{16.00}$ 



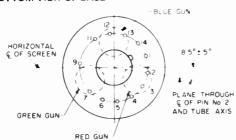
### 21VAKP22

#### DIMENSIONAL OUTLINE





#### **BOTTOM VIEW OF BASE**

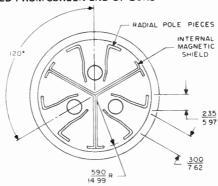


92 5 28 6

#### Base Specification - JEDEC No.14BE

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

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



9205-12835R4



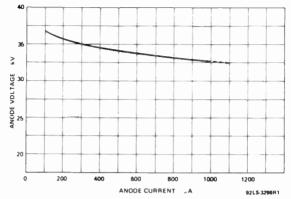


Figure I

X-RADIATION LIMIT CURVE AT A CONSTANT ANODE CURRENT OF 300  $\mu$ A (X-RADIATION AT A CONSTANT ANODE VOLTAGE VARIES LINEARLY WITH ANODE CURRENT) (JEDEC CURVE No. XC-3)

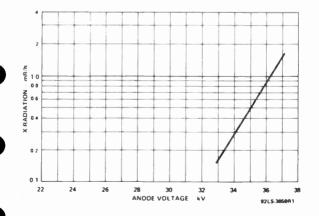
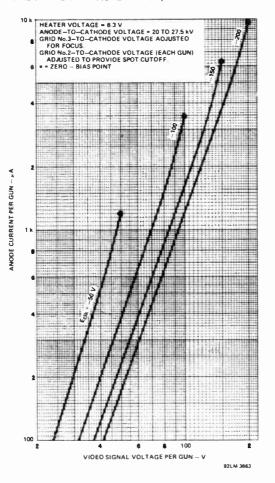
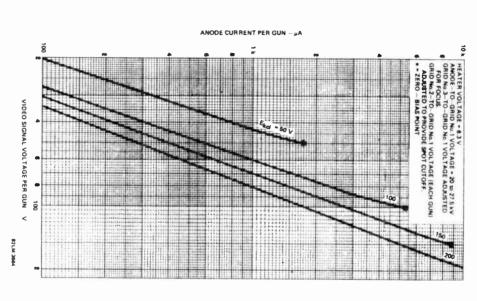


Figure 2

#### TYPICAL DRIVE CHARACTERISTICS, GRID-DRIVE SERVICE



DRIVE SERVICE TYPICAL DRIVE CHARACTERISTICS, CATHODE





#### CUTOFF DESIGN CHART

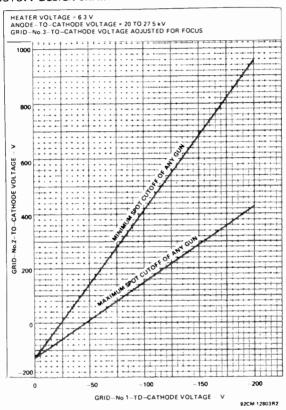
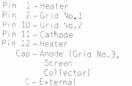


Figure 3

IMPORTANT: Refer to sheet Safety Precautions For Color Picture Tubes at front of this section.

### e

	Picture Tube
MAGNETIC FOCUS NO ION-TRAP MAGNET REQU	IRED MAGNETIC DEFLECTION
ELECTRICAL	
Direct Interelectrode Capacitances Cathode to all other electrodes. Grid %0.1 to all other electrodes. External conductive costing to anome.	5 pF 6 pF 750 max pF
Heater Current at 6.3 V	600 ± 30 mA
OPTICAL	
Phosphor	Filternlass
MECHANICAL	
Weight (Approx.)	. 22.438 ± 0.375 in . 7.500 + 0.188 in
Type. Contact area for grounding. For Additional Information on Coatings an See Picture-Tube Dimensional Outlines a at front of this section	Near Reference Line of Dimensions and Bulb J165 Z sheet
Cap Recessed Small Cav Base Small-Shell Duodecal 5-Pin (JED Basing Designation for BOTTOM VIEW	EC Group 4, No. 85-57)
Pin 1 - Heater An	IODE



Conductive Coating



MAXIM	UM AN	ID MII	N I MUI	M I	RAT	ING	ŝS,	DE	SI	GN-	MA)	(IM	IUM	I VALUE	S	
U	nless	oth	erwi	s e	sp	eci	fi	ed,	υ	olt	age	? z	al	ues		
	are	pos	$\iota \iota \iota \iota \nu$	e i	vit	h i	es	pec	t	to	cal	tho	de			
Anode Volta	age.													20000	max	٧
urid-No.2	volta	qe		•										550	max	٧
Grid-No. 1	orta	ge														
Negative	реак	valu	e											220	max	٧
Negative	bias	valu	e											155	max	V
Positive	DIAS	valu	e											0	max	Ý
Positive	peak	valu	е								Ċ	Ċ	:	2		v

### 21WP4B

Heater Voltage	٧
Peak Heater-Cathode Voltage	
Eurica e : ipment warm-up period not	
**************************************	V
Art r espicitor authors per os 200 max	Ý
Heire positive with respect to dithoda:	
fortine: 4 -n: 0 -olini 200 max	V
DC Component 100 max	¥
TYPICAL OPERATING CONDITIONS FOR GRID-DRIVE SERVICE	
TYPICAL OPERATING CONDITIONS FOR GRID-DRIVE SERVICE  Unless otherwise specified, inlage values	
Unless otherwise specified, inliage values are positive with respect to cathode	٧
Unless otherwise specified, voltage values	٧
Unless otherwise specified, inliage values are positive with respect to cathode  Anode Voltage	V V
Unless otherwise specified, inlage values are positive with respect to cathode  Anode Voltage	V V V
Unless otherwise specified, inlage values are positive with respect to cathode  Anode Voltage	V V V

for the validition in nierbing considerations, see theet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this action



### Picture Tube

LOW-VOLTAGE ELECTROSTATIC FOCUS	70° MAGNETIC DEFLECTION
NO ION-TRAP MAGNET	REQUIREO

#### ELECTRICAL

Direct Interelectrode Capacitano	es									
Cattone to all not relections.										
Grid No.1 to all other electrose	6 pF									
external cru, tile contina to	2500 max pF									
Heater Current at 6.3 V										
Electron Gun	Requiring No lon-Trap Magnet									
OPTICAL										
Phosphor	P4-Sulfide Type, Aluminized									

### Light 'ran mission 'pprc..... MECHANICAL

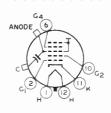
mergine (Approxi)										
Overall Length			٠.	. 22	$\pm$ 438 $\pm$ 0.375 in					
Neck Length				. 7	.500 ± 0.188 in					
Projected Area of Screen					224 sq in					
External Conductive Coating										
Type					. Regular-Band					
Control on the control of				Al	Date of the later					

Contact area for grounding . . . . . . . . Near Reference Line For Additional Information on Coatings and Dimensions See Picture-Tube Dimensional-Outlines in (Bulb J165 Z. Theta at front of the section

Cap. . . . . . . . . . Recessed Small Cavity (JEDEC No.JI-21)
Base . . . Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.86-63) Basing Designation for BOTTOM VIEW . . . . . . . . . . . . . . . . . 12L

Pin 1 - Hater Pin 2-Grid No. 1 Pin r - unis No.4 Pin 11 - sthose Pin 12 - Heatar C:p - Anos (Gri: No.3. G. 11 '.o. ... Colle 'orl C-External Conductive Costina

Weight (Approx )



#### MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Unless otherwise specified, soltage salues are positive with respect to cathode

Anode Voltage Grid-No.4 (Focusing)	 Voltage	 		٠	•	20000 max	٧
Positive value		 				IIOO max	٧
in astive value		 				550 max	٧

### **21XP4B**

Grid-No. 2 Voltage. 550 max V Grid-No. 1 Voltage  Legative peak value. 220 max V Positive bits value. 155 max V Positive bits value. 0 max V Positive bits value. 0 max V Positive bits value. 56.9 max V Heater Voltage 5.7 min V  Peak Heater-Cathode Voltage Heater negative with respect to cathode: Livring equipment warm-up period not exceeding 15 seconds. 450 max V After equipment warm-up period 200 max V nester positive with respect to cathode: Combined AC and DC voltage 200 max V DC (omponent 100 max V  TYPICAL OPERATING CONDITIONS FOR GRID-DRIVE SERVICE Unless otherwise specified, voltage values are positive with respect to cathode  Anode Voltage. 16000 Grid-No. 4 Voltage64 to 352 V Grid-No. 4 Voltage64 to 352 V Grid-No. 1 Voltage28 to -72 V For visual extinction of focused raster															
Combined AC and DC voltage   Combined AC and DC voltage   Value   Va													550	max	٧
Positive birs value													220	max	٧
Positive bis value. 0 max V 2 max V 2 max V 4 max V 2 max V 4 max V 2 max V 4 max V 4 max V 4 max V 5.7 min V 5.7 mi	Megative bias value.											Ċ	155		v
Heater Voltage															v
Heater Voltage													2	max	ý
Peak Heater-Cathode Voltage  Hester negative with respect to cathode: Living equipment warm-up period not exceeding 15 seconds													6.9	max	Ý
Henter negative with respect to cithode:	neater vortage		•	•	•	•		•	•	•	٠	•	5.7	min	V
ivring equipment warm-up period not exceeding 15 reconds	Peak Heater-Cathode Vol	tag	јe												
not exceeding 15 seconds	Heiter negative with	res	5ne	C†	to	C	111	101	е:						
After equipment warm-up period															
TYPICAL OPERATING CONDITIONS FOR GRID-DRIVE SERVICE  Unless otherwise specified, voltage values are positive with respect to cathode  Anode Voltage													450	max	٧
Combined AC and DC voltage	After equipment war	rm-L	ID.	p⊬r	io	d							200	max	٧
TYPICAL OPERATING CONDITIONS FOR GRID-DRIVE SERVICE  Unless otherwise specified, voltage values are positive with respect to cathode  Anode Voltage															
TYPICAL OPERATING CONDITIONS FOR GRID-DRIVE SERVICE  Unless otherwise specified, voltage values are positive with respect to cathode  Anode Voltage	Combined AC and DC	vol	t i	g-									200	max	٧
Unless otherwise specified, voltage values are positive with respect to cathode  Anode Voltage	DC (omponent												100	max	٧
Unless otherwise specified, voltage values are positive with respect to cathode  Anode Voltage															
Anode Voltage	TYPICAL OPERATING	CON	ION	TIC	)NS	F	OR	GR	10	-0	RΙ	۷E	SERV	ICE	
Anode Voltage	Unless otherw	LSE	SI	o e c	ı f	ı e c	d.	vo	lte	1 a e	. ,	al.	ues		
Anode Voltage.       . 16000       V         Grid-No. 4 Voltage.      64 to 352       V         Grid-No. 2 Voltage.       . 300       V         Grid-No. 1 Voltage.      28 to -72       V															
Grid-No. 4 Voltage.       -64 to 352       V         Grid-No. 2 Voltage.       300       V         Grid-No. 1 Voltage.       -28 to -72       V	,												6000		
Grid-No.2 Voltage	Grid-No II Voltage	•		•	•	•	•	• •	•	•	•	cı			
Grid-No.! Voltage	Grid-No. 7 Voltage	•	٠.	•	•	•	•		•	•	•	-0'			
	Grid-No.1 Voltage	•		•	•	•	•	٠.	•	•	•	20			
										•	٠	-20	10 -	12	Ą
101 VISUAL EXTINCTION OF TOCUSED LISTER	TOT VISUAL EXTINCTION	11 0	, ,	OC:	1126	-cu	1 2	516	. 1						
MAXIMUM CIRCUIT VALUE	MAX	X I M	UM	CII	RCL	IJΤ	٧.	ALU	Ε						
Grid-No.1-Circuit Resistance	Grid-No. I-Circuit Resis	star	nce										1.5	max	MO

For X-radiation shielding considerations, see sheet A-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



### Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 70° MAGNETIC DEFLECTION

lect		

Direct Interelectrode Capacitances:	
Cathode to all other electrodes 5	рf
Grid No.1 to all other electrodes 6	pf
External conductive coating to anode \begin{cases} 750 \text{ max.} \\ 500 \text{ min.} \end{cases}	þf þf
Heater Current at 6.3 volts 600 ± 80	nia
Electron Gun Type Requ	iring
No Ion-Trap M	agnet

#### Optical:

Phosphor (For Curves, see	e front of	this	section).	P4-S	
					Aluminized
Faceplate, Spherical.					Filterglass
Light transmission (	Approx.)				75%

#### Mechanical: Waisht (Approx )

weight (Approx.).											24 103
Overall Length											23-1/32" ± 3/8"
Neck Length											7-1/2" ± 3/16"
Projected Area of	S	cre	ee	n.							248 sq. in.
External Conduction	ve	C	oa:	t i	ng	:					
Type											Regular_Rand

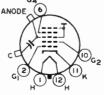
Contact area for grounding. . . . . . Near Reference Line For Additional Information on Coatings and Dimensions: See Picture-Tube Dimensional-Outlines and Bulb Ji70 B/D sheets

at front of this section . . . . Recessed Small Cavity (JEDEC No.J1-21) Base. . . . Small-Shell Duodecal 6-Pin (JEDEC Group 4, No.

B6-63) . . 121 Basing Designation for BOTTOM VIEW.

Pin	1 - Heater	
Pin	2 - Grid No. 1	L
Pin	6 - Grid No. 4	ļ
D: -	40 Call No 1	7

Pin 10 - Grid No. 2 Pin 11 - Cathode Pin 12 - Heater



Cap - Anode (Grid No.3, Grid No.5. Screen, Collector) C-External

Conductive Coating

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

Unless otherwise specified, voltage values are positive with respect to cathode

ANODE VOLTAGE . . . . 20000 max.

## **21YP4B**

GRID-No.4 (FOCUSING) VOLTAGE:	
	volts
	volts
GRID-No.2 VOLTAGE 550 max.	volts
GRID-No.1 VOLTAGE:	
	volts
	volts
	volts
(0.0	volts
	volts
(5.7 1111).	volts
PEAK HEATER—CATHODE VOLTAGE: Heater negative with	
respect to cathode:	
During equipment warm-up period	
	volts
	volts
Heater positive with	
respect to cathode:	
Combined AC and DC voltage 200 max.	volts
	volts
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage val-	
ues are positive with respect to cathode	
Anode Voltage	volts
	volts
	volts
Grid-No.1 Voltage for	
visual extinction of	
focused raster28 to -72	volts
Maximum Circuit Value:	

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

Grid-No.1-Circuit Resistance. . . .



1.5 max. megohms

### Picture Tube

RECTANGULAR GLASS TYPE MAGNETIC FOCUS

ALUMINIZED SCREEN
70° MAGNETIC DEFLECTION

#### Electrical:

Direct Interelectrode Capacitances: Cathode to all other electrodes	pf
Grid No.1 to all other electrodes 6	pf
External conductive coating to anode \begin{cases} \{750 \text{ max.} \\ 500 \text{ min.} \end{cases}	pf pf
Heater Current at 6.3 volts	गांध
Electron Gun Type Requi	
Volc+-Tri⊊ Ma	gnet

### Optical:

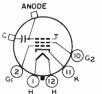
Phosphor (for curves, see front of this section).	
	Aluminized
Faceplate, Spherical	Filterglass
Light transmission (Approx.)	75%

Ergit transmiss		,			. ,									
Mechanical:														
Weight (Approx.).	,													24 lbs
Overall Length														23-1/32" ± 3/8"
Neck Length							,							7-1/2" ± 3/16"
Projected Area of	Sc	ree	n.											248 sq. in.
External Conduction	ve I	Coa	t i	ng	:									
Туре														. Regular-Band
Contact area fo	r g	rou	nd	ing	g.					٠	٠	Νı	ea	r Reference Line
For Additional In	for	mat	iο	n	nc	C	oa:	tir	ngs	5 8	ano	1	Dir	mensions:
See Picture-Tub	e Di	mei	1 5 1	on	al	-0	u t	11	n e	5 0	ını	l B	lu l	b Ji70 B/D sheets
at front of thi	5 5	ect	iο	n										
Cap			Re	ce	556	ed	Sr	na '	11	Ca	av	i t	У	(JEDEC No.J1-21)

Cap .								R	906	essed	Sma	11	Car	۷ì:	tу	(J	ΕĐ	EC	No		J1-	-21,
Base.					ς	ima ì	1-9	She	11	Duod	ecal	5-	-Pii	٦	(JE	DE	C	Gro	guo	4	1,	No.
0	•	•	•	•																		-57
Bas	in	3	De:	sig	gna	itio	n '	for	BO	MOTTO	VIE	₩.										12

Pin	1	-Heate	er
Pin	2	-Grid	No.1
Pin	10	-Grid	No.2
Pin	11	-Catho	ode

Pin 12 - Heater



Cap - Anode
(Grid No.3,
Screen,
Collector)
C - External
Conductive
Coating

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

Unless otherwise specified, voltage values are positive with respect to cathode

ues ar	е	pos	ιī	iv	е	wı	t n	7	e s	pе	cτ	το	catno	a e	
ANODE VOLTAGE															
GRID-No.2 VOLTAGE			٠	٠			٠		٠		٠		550	max.	volts

# **21ZP4C**

GRID—No.1 VOLTAGE:  Negative peak value 220 max.  Negative bias value 155 max.  Positive bias value 0 max.  Positive peak value 2 max.  HEATER VOLTAGE {6.9 max.}  PEAK HEATER—CATHODE VOLTAGE:	
Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts
Typical Operating Conditions for Grid-Drive Service:	
Unless otherwise specified, voltage values are positive with respect to cathode	
Anode Voltage	volts volts
Maximum Circuit Value:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



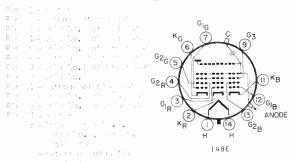
## **Color Picture Tube**

"PERMA-CHROME" ASSEMBLY FOR OPTIMUM FIELD PURITY AND UNIFORMITY DURING WARM-UP
RECTANGULAR TUBE 90° MAGNETIC DEFLECTION ALUMINIZEO TRICOLOR PHOSPHOR-OOT Hi-Lite SCREEN (Utilizing a New Improved Rare-Earth Red-Emitting Phosphor) INTEGRAL FILTERGLASS PROTECTIVE WINDOW
MAGNETIC CONVERGENCE 3 ELECTROSTATIC-FOCUS GUNS  For Use in Color-TV Receivers
ELECTRICAL
Electron Guns, Three
Current it is a volta a
Diagonal
Grid No.1 of any jun to all other lectrods 6 pF Shid No.5 to all other cle trods 6.5 pF All cathods to all other electrods 15 pF strengl conductive coming to anomal (2500 max pF (2000 min pF
OPTICAL
Faceplate and Protective Window
Screen, on Inner Surface of Faceplate
Pho phor (Three ceparate crosses of the crosses of
Fluoristance of the short centre of repartite pholithor, respectively Red, Blue, Green Per intence of aroun shostners reference Medium Short Dot arrangement Each triangular group consists of a red, green, and blue dot spacing between letter of
adjusted the (Actro.) 0.025 in (0.64 mm)

#### MECHANICAL

Tube Dimensions
%e k langth 6.693 ± .188 in (170.0 ± 4.8 mm)
Signard
$\sim$ te ' $\times$ 'th
Or to the it 15.236 + .093 in (387.0 + 2.4 mm)
Minimum Screen Dimensions (Projected)
n 1 - 1
Grante in neight
:
Bulb Funnel Designation JEDEC No.J173-1/2 AIA
Bulb Panel Designation JEDEC No.FP173-3/4 B2
Protective Window Designation JEDEC No.FP172-1/2
Bulb Contact Designation Recessed Small Cavity Cap
(JEDEC No.JI-21)
Pin Position Alignment Pin No.12 Aligns Approx.
with Anode Bulb Contact
Operating Position Anode Bulb Contact on Top
Weight (Approx.)
Base Small-Button Diheptar 12-pin (JEDEC No. B12-244)

#### TERMINAL DIAGRAM (Bottom View)



### MAXIMUM AND MINIMUM RATINGS. DESIGN-MAXIMUM VALUES

Unless otherwise specified, ralues are for each gun and rollage ralues are positive with respect to cathode 127-500 max

Anode Voltage	•	•	20.000	min	٧
Typical Anode Current, Long-Term Average.			. 1000	max	. A
Grid-No.3 (Focusing Electrode) Voltage	٠	•	. 6000	max	¥
Peak Grid-No.2 Voltage. Including Video Signal Voltage			. 1000	max	٧

i eqat	. I Volta												
	v⊢ bli	value.						٠		•		max	
2.31	IVE ODER	ating .	J10"	v 2 w		•				•		max	
		vilue. cvalue.				•	• •	٠		•		max max	
		(AC or I			• •	•		•		•		III d X	
Under	operati	ng cond	ition	sª.							6.9	max	
Under	et indhy	r con∃i+i	nneb								(	max	
		hode Vo				•		•		•	3.3	IIIu	
		versith.		ert te	0 0	a+h.	ode	:					
Dur	ing equi	pment wi	irm-u	p per	ind								
		ting ⊱ :									450	max	
Afte	-r equip	ment aar AC ana (	rm-up	peri	od:								
		m ang i ment vili						•		•		max max	
		ve with									200	III d X	
		t value.						٠.			200	max	
		it value.									0	max	
		- 4 -		T DES			-						
		wise spe											
		lues are										10	
		de volta											
Grid-No.	3 (Focu	sing Ele	ctro	de) Vo	olta	ige.	.:				6.8% anode		
Grid-No.	2 and G	rid-No.1	Volt	tages.					. Se				
		tinction		1							esigr		
	d spot												
		f Grid-N								•		١.	8
		o lowest −:o.i sp			٦y								
		00 volts		# C171 1									
		nt (Tota								-4	5 to	+15	
Grid-No.	2 Curre	nt								-	5 to	+5	, L
		e 9300°K											
		es x = 0		, y =	0.3	311	)						
(CIE Co	tane of		node										
(CIE Co								n	,	n t			
Percer curre	n s.pp		o∃ch.					Re			e Gr		
Percer curre	nt sipp Average	)	each.						}	32		34	
Percer curre aun ( Fitio	nt supp Average of cuth	) ode curr	each • nt :					31	M	32 . n	Тур	34 .M	a
CIE Co Percer curred aun ( Fitio Real	n° supp Average of cuthi blue	)	each • nt :					31		32		34 .// ) l.	a 5
CIE Co Percer curre aun ( Fitio Real	n° supp Average of cutho blue. green .	ote curr	each • nt :					31		32 75 65	Тур 1.10	34 . <i>M</i> ) 1.	5
CIE Co Percer curre aun ( Fatio Red/ Red/ Rouse Displace	Average of cithical in a second cithical in a secon	) ote curr	each ent:	Center				. 31	.M 0.	32 75 65	Тур 1.10	34 . <i>M</i> ) 1.	5
COLE Co Percer curre aun ( Fatio Red/ Red/ Rlue Displace	Average of catholic last a green of gre	ode curr	nt:	Center		F Sc	re	31	M 0. 0.	32 75 65 60	Typ 1.10 1.00 0.91	34 ) I. ) I.	5 5 3
COLE Co Percer curredum ( Fatio Redum Redum Right Displace Right Hori	respp Average of cithi blue green /ireer. ments, l center zont l.	Ode curr	each • nt : • at (	Center nent:	01	F Sc		3L	M 0. 0. 0.	32 75 65 60	Typ 1.10 1.00 0.91	34 ) 1. ) 1.	5 5 3
Percer curredum ( Fatio Redum Redum Blue Displace Riter Vert	Average of cither lie	) ode curr  Measured ing disp	each : nt :	Center	01	f Sc	re	3L	M 0. 0. 0.	32 75 65 60	Typ 1.10 1.00 0.91	34 ) 1. ) 1.	5 5 3
COLE Co Percer curred aur ( Fitio Red/ Red/ River Displace Riter Vert Litera	Average of cithe clue	)ote curr  Measured ing disp	each ent:	Centernent:	of	So Se	rec	3ı.	.47	32 75 65 60 in	Typ 1.10 1.00 0.91 (±11	34 ) 1. ) 1. 1. 1.9 m	5 5 3
COLE Co Percer curredum ( Fation Red/ Red/ Right Pisplace Kiter Vert Literal and to	Average of cithe clie green . / reer ments, lender zont l	Measured ing disp	each  I at (	Centernent:	of Le	So Se	rec	3ı.	.47	32 75 65 60 in	Typ 1.10 1.00 0.91 (±11	34 ) 1. ) 1. 1. 1.9 m	5 5 3
(CIE Oc Percer curredure dure dure Redure Redure Redure Redure Redure Vert Litera and f Radial	Average of cithe clie green . / reer reets, lical italiante converte	)ote curr  Measured ing disp	each  nt:  lat(  placen  placen  placen	Centernent: the blarea	of Le	So Se	rec	3ı.	.47	32 75 65 60 in	Typ 1.10 1.00 0.91 (±11	34 ) 1. ) 1. 1. 1.9 m	. 5 . 3



Maximum Required Correction for Register<sup>c</sup> (Including Effect of Earth's Magnet Field when Using Recommended Components)

#### EXAMPLES OF USE OF DESIGN RANGES

Inless otherwise specified, rollage values are for each gun and are positive with respect to cathode

each gan and are postitive area respect to carnote	
Anode Voltage	٧
Grid-No.3 (Focusing Electrode) Voltage 4200 to 5000	¥
Grid-No.2 Voltage when circuit	
design utilizes grid-No.1 voltage	
of -150 volts for visual extinction	W
of focused spot 285 to 685	¥
Grid-No.1 Voltage for visual	
extinction of focused spot when	
circuit design utilizes grid-No.2	V
voltage of 400 volts95 to -190	•
Heater Voltage 6.3	٧
first * first or 5 * 10"	Ý
Hier Har O . III	

#### LIMITING CIRCUIT VALUES

High-Voltage Circuits

Grid-No.3 circuit resistance. . . . . . . . 7.5 max Mz

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the high-nollage power supply and the grid-No.3 power supply be of the limited-energy type, in which the short-circuit current does not exceed 20 mN.

Lou-Voltage Circuits

Effective grid-No.1-to-cathodecircuit resistance (Each gun). . . . . . . . 0.75 max M

The low-voltage circuits, including all heater circuits, should be analyzed by assuming the color picture tube heater is connected directly to the receiver chassis ground. Inder these conditions the circuits to the elements of all tubes, including the color picture tube, operating from the same heater winding 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 mV total in the assumed picture tube heater ground connection. The leads from all other circuits must be separated from the picture tube leads by a minimum distance of 0.25 inch (6.4 mm) to pievent energy transfer to the picture tube circuits. Such current limitation will help prevent picture tube damage in case of momentary cascade arcing.



- Tor maximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts. The series impedance to any chassis connection in the IX biasing circuit for the heater should be between 100,000 ohms and I megohm.
- b For curve, see 3-old closeft of \$22-1 \times \$24-5 \times \$24-5\$, i.e. 1/2 (Fixe \$4.60-1) at front of this section.
- For "instant on" applications, a maximum heater voltage of 5.5 volts (design-maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. All other voltages normally applied to the tube must be removed during standby operation.
- d Register is defined as the relative position of the beam trios with respect to the associated phosphor-dor trios.

#### GENERAL CONSIDERATIONS

X-Radiation Warning. Because the 22JP22 is designed to be operated at anode voltages as high as 27.5 kilosofts (design-maximum value), shielding of the 22JP22 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

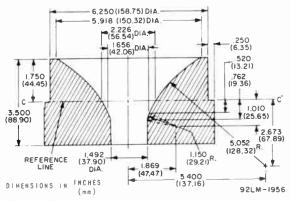
Orientation. The 22:P22 must be operated with tube axis in a horizontal position and with the blue gun uppermost (i.e., the anode contact button on top).

The Deflecting Yoke and tube axes must coincide and the yoke must be free to move along the neck for a distance of approximately 0.5 inch (13 mm) from its most forward position for adjustment purposes. The yoke mount should also provide for a small amount of rotational adjustment.

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.

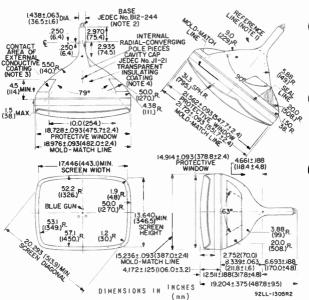
Misregister Compensation. Proper operation of the 22JP22 requires compensation for the effects of extraneous magnetic fields, the earth's magnetic field, and other causes which may produce misregister. Compensation for these effects may be accomplished by the use of a purifying magnet.

#### REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE JEDEC No.GI62



Beference lane is determined by plane C-C' when gauge is seated.

#### DIMENSIONAL OUTLINE



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 on 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 2-inch (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 grounded with multiple contacts.

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

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

for type 22JP22 is the same as that shown for type 25XP22

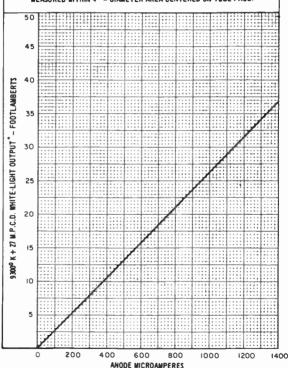


### Typical Light-Output Characteristic

HEATER VOLTAGE : 6.3 VOLTS
ANODE-TO-CATHODE VOLTAGE - 25000 VOLTS
GRID-NO.3-TO-CATHODE VOLTAGE ADJUSTED FOR FOCUS.
DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ANODE
CURRENT TO PRODUCE 9300° K+27 M.C.P.D. WHITE-LIGHT OUTPUT.
PERCENTAGE OF TOTAL ANODE CURRENT SUPPLIED BY EACH GUN
TO PRODUCE 9300° K+27 M.P.C.D. WHITE:

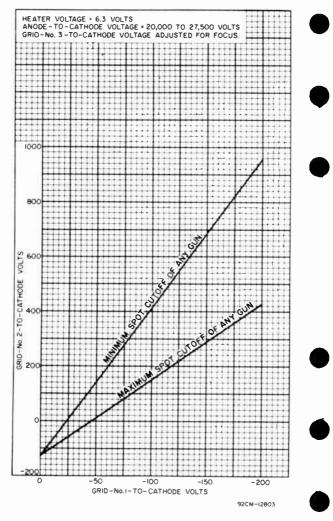
RED GUN : 34% BLUE GUN : 32% GREEN GUN : 34%

RASTER SIZE: 17.446" X 13.640" (443.1 mm X 346.5 mm)
\* MEASURED WITHIN 4" — CHAMETER AREA CENTERED ON TUBE FACE.



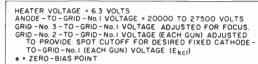
92LM-1989

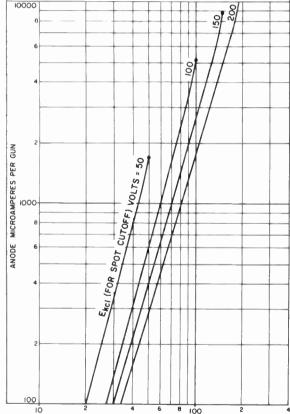
# Cutoff Design Chart



# Typical Drive Characteristics

Cathode-Drive Service





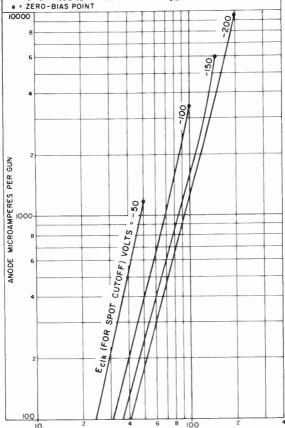
VIDEO SIGNAL VOLTS FROM SPOT CUTOFF PER GUN

92CM-12806

# Typical Drive Characteristics

Grid-Drive Service





VIDEO SIGNAL VOLTS FROM SPOT CUTOFF PER GUN

92CM-12807



# Color Picture Tube

"PERMA-CHROME" ASSEMBLY FOR OPTIMUM FIELD PURITY AND UNIFORMITY DURING WARM-UP

RECTANGULAR TUBE

90° MAGNETIC DEFLECTION

ALUMINIZED TRICOLOR PHOSPHOR-DOT "Hi-Lite" SCREEN
(Utilizing an Improved Rare-Earth Red-Emitting Phosphor)
MAGNETIC CONVERGENCE 3 ELECTROSTATIC-FOCUS GUNS

For Use in Color-TV Receivers

The 22KP22 is the same as the 22JP22 except for the following items:

#### OPTICAL

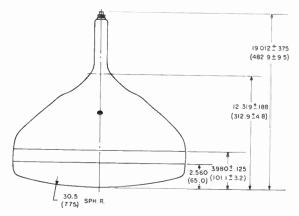
#### MECHANICAL

#### Tube Dimensions

a It is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 22kP22 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal roundition. This safety cover can also provide x-radiation protection when required.

#### DIMENSIONAL OUTLINE

Dimensions shown are only those which are different from the corresponding dimensions for the 22JP22

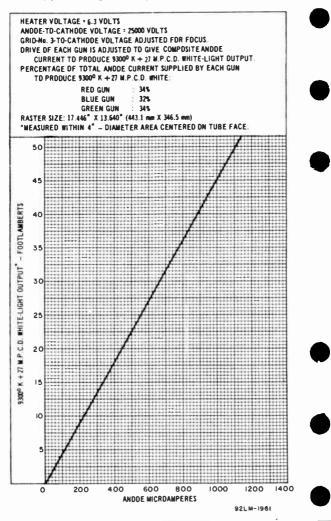


DIMENSIONS IN INCHES

92LS-1299R



# Typical Light-Output Characteristic



# **Color Picture Tube**

Perma-Chrome Banded-Type 90° Rectangular New Rare-Earth (Red) Phosphor	Implosion Protection H1-LITE Screen Unity Current Ratios
ELECTRICAL Electron Guns, Three with Axes	_
Tilted Toward Tube Axis Heater, of Each Gun Series Connected within Tube with Each of the Other Two Heaters:	. Red, Blue, Green
Current at 6.3 Va	. 900 mA
Focusing Method	
Focus Lens	
Convergence Method	
Deflection Method	
Deflection Angles (Approx.):	
Diagonal	
Vertical	
Direct Interelectrode Capacitances (Ap	
Grid No.1 of any gun to all other electrodes	. 6 pF
Grid No.3 to all other electrodes	•
All cathodes to all other electrodes	•
External conductive coating to anode (Approx.)	∫2500 max. pF
OPTICAL	, (-
Faceplate	Filterglass
Light transmission at center (Approx	.) 42%
Surface	Polished
Screen, on Inner Surface of Faceplate:	
Type Aluminized,	Tricolor, Phosphor-Dot
	New Rare-Earth (Red), e (Blue & Green) Type
Fluorescence and phosphorescence of separate phosphors, respectively	Red, Blue, Green
Persistence of group phosphorescene	e Medium Short
Dot Arrangement Triangu red dot,	lar group consisting of blue dot, and green dot
Spacing between centers of adjacent dot trios (Approx.)	. 0.025 in (0.64 mm)



# 22UP22

MECHANICAL		
Minimum Screen Area (Projected): 227 sq Bulb Funnel Designation JEDEC Bulb Panel Designation JED Base Small-Butt Pin Position Alignment Pin No. with A Operating Position	No.J173-1/2 EC No.FP173 on Diheptar 12 .12 Aligns App node Bulb Cor llb Contact on	A1A -3/4 2-pin prox. ntact Top
MAXIMUM AND MINIMUM RATINGS, Design - N Unless otherwise specified, values are for		es
voltage values are positive with respect to	cathode	
Anode Voltage	27,500 max. 20,000 min.	V V
Total Anode Current, Long-Term Average	1000 max.	μΑ
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 Negative operating cutoff value Positive bias value Positive peak value Heater Voltage (ac or dc):	400 max. 200 max. 0 max. 2 max.	V V V
Under operating conditions a	6.9 max. 5.7 min.	V V
Under standby conditions c	5.5 max.	V
Peak 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:		
Combined AC and DC value DC component value	200 max. 200 max.	V V
Heater positive with respect to cathode:		
AC component value DC component value	200 max. 0 max.	v v
EQUIPMENT DESIGN RANGES Unless otherwise specified, values are for evoltage values are positive with respect to evoltage.	cathode	4
For anode voltages between 20,000 and 27,5		
Grid-No.3 (Focusing Electrode) Voltage	of Anode Volt	

Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused Spot See CUTOFF DESIGN CHART
Maximum Ratio of Grid-No.2 Voltages, Highest Gun to Lowest Gun in Any Tube (At grid-No.1 spot cutoff voltage of -100 V)
Heater Voltage:
Under operating conditions 6.3 V Under standby conditions 5.0 V
Grid-No.3 Current (Total)45 to +15 µA
Grid-No.2 Current
To Produce White 9300° K + 27 M.P.C.D. (CIE Coordinates x = 0.281, y = 0.311):
Percentage of total anode current supplied by Red Blue Green each gun (average)
Ratio of cathode currents:       Min.       Typ.       Max.         Red/blue       0.75       1.10       1.50         Red/green       0.65       1.00       1.50         Blue/green       0.60       0.91       1.30
Displacements, Measured at Center of Screen:
Raster centering displacement:
Horizontal ± 0.47 in (± 11.9 mm)
Vertical
Lateral distance between the blue beam and the converged red and green beams ± 0.25 in (± 6.4 mm)
Radial convergence displacement excluding effects of dynamic convergence (each beam) ± 0.37 in (± 9.4 mm)
Maximum Required Correction for Registerd (Including Effect of Earth's Magnetic Field when Using Recommended Components) as Measured at the center of the Screen in any Direction 0.005 in (0.13 mm) max.
LIMITING CIRCUIT VALUES:
High-Voltage Circuits:
Grid-No.3 circuit resistance 7.5 max. MΩ
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, in which the short-circuit current does not exceed 20 mA.
chourt current does not exceed 20 mA.



Low-Voltage Circuits:

Effective grid-No.1-to-cathodecircuit resistance (each gun) ..... 0.75 max. MS

The low-voltage circuits, including all heater circuits, should be analyzed by assuming the color picture tube heater is connected directly to the receiver chassis ground. Under these conditions the circuits to the elements of all tubes, including the color picture tube, operating from the same heater winding 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 mA total in the assumed picture tube heater ground connection. The leads from all other circuits must be separated from the picture tube leads by a minimum distance of 0.25 inch (6.4 mm) to prevent energy transfer to the picture tube circuits. Such current limitation will help prevent picture tube damage in case of momentary cascade arcing.

- <sup>9</sup> For maximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts. The series impedance to any chassis connection in the DC biasing circuit for the heater should be between 100,000 ohms and 1 megohm.
- b For curve, see Group Phosphor-P22-New Rare Earth (Red), Sulfide (Blue & Green) at front of this section.
- <sup>c</sup> For "instanton" applications, a maximum heater voltage of 5.5 volts (design-maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. 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.

#### X-RADIATION WARNING

Because the 22UP22 is designed to be operated at anode voltages as high as 27.5 kilovolts (design-maximum value), shielding of the 22UP22 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

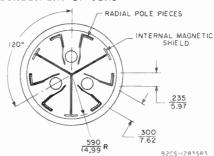
#### BASE SPECIFICATION - JEDEC No. 14BE

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

#### BOTTOM VIEW OF BASE



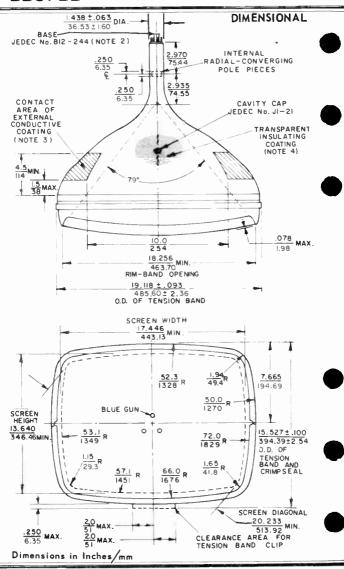
# LOCATION OF RADIAL-CONVERGING POLE PIECES VIEWED FROM SCREEN END OF GUNS

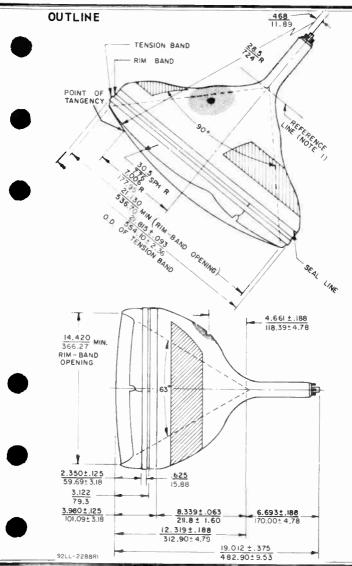


#### NOTES FOR DIMENSIONAL OUTLINE

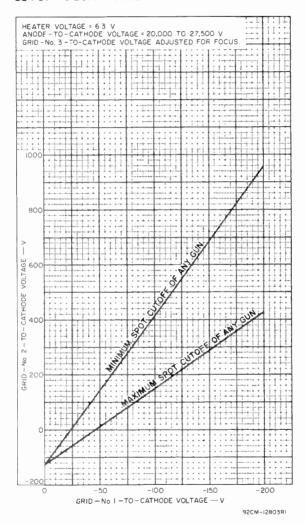
- Note 1: With tube neck inserted through flared end of reference-line and neck-funnel-contour gauge JEDEC No.G162 and with tube seated in gauge, the reference line is determined by the intersection of the plane C-C' of the gauge with the glass funnel.
- Note 2: Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. Bottom circumference of base will fall within a 2-inch (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 grounded with multiple contacts.
- Note 4: To clean this area, wipe only with soft, dry, lintless cloth.

# 22UP22





#### CUTOFF DESIGN CHART



# Color Picture Tube

Perma-Chrome Banded-Type Implosion Protection 90° Rectangular HI-LITE Screen New Rare-Earth (Red) Phosphor Unity Current Ratios
This data sheet is to be used in conjunction with data for RCA-22UP22.

For general data, maximum and minimum ratings, equipment design ranges, limiting circuit values, x-radiation warning, and base specification of the 22WP22, refer to the 22UP22 except as noted below.

#### MECHANICAL

Tube Dimensions (excluding mounting lugs):

Diagonal . . . . . . . 21.971 ± .093 in (558.06 ± 2.36 mm)

Greatest

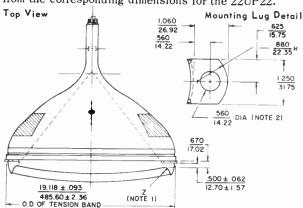
Width . . . . . . . . . 19.118  $\pm$  .093 in (485.60  $\pm$  2.36 mm)

Greatest Height (including tension-

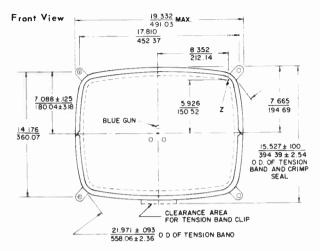
band clip) . . . . . 15.527 ± .100 in (394.39 ± 2.54 mm)

#### DIMENSIONAL OUTLINE

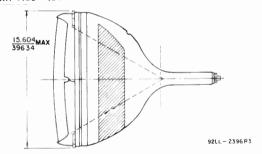
Dimensions shown are only those which are different from the corresponding dimensions for the 22UP22.



#### DIMENSIONAL OUTLINE (Cont'd)



Front Side View



Dimensions in Inches unless otherwise noted

Note 1: "Z" is located on the outside surface of the faceplate, on the screen diagonal at a point .125" beyond the minimum screen. This point is used as a reference for the mounting lugs.

Note 2: The tolerance of the mounting lug holes will accommodate mounting screws up to 0.375 in (9.5 mm) in diameter when positioned on the true hole centers.

# Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS ALUMINIZED SCREEN MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

E	lectrical:
H F D	leater Current at 6.3 volts
	Diagonal 92° Horizontal 80° Vertical 65°
	Grid No.1 to all other electrodes 6 $\mu\mu$ f Cathode to all other electrodes 5 $\mu\mu$ f
F	External conductive coating to ultor. $\begin{cases} 2500 \text{ max.} & \mu\mu\text{f} \\ 1700 \text{ min.} & \mu\mu\text{f} \end{cases}$ Hectron Gun Type Requiring No Ion-Trap Magnet
	Optical:
F	Caceplate
	Fluorescence
М	lechanical:
•	ube Dimensions:       18" ± 3/8"         Overall length.       20-1/2" + 1/16" - 1/8"         Greatest width.       20-1/2" + 1/16" - 1/8"         Greatest height       16-1/2" ± 1/8"         Diagonal.       23-25/64" + 3/32" - 1/8"         Neck length       5-1/2" ± 3/16"         Curvature of faceplate (Radii):
	Center
W	Greatest width   19-1/4"   Greatest height   15-1/8"   15-1/8"   15-1/8"   15-1/8"   15-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"   16-1/8"

# **23AHP4**

	(J	-Shell Duodecal t Fin EDEC Group 4, BC 2031
Pin 1 - Heater Pin 2 - Grid No.1 Pin 6 - Grid No.4 Pin 10 - Grid No.2 Pin 11 - Cathode Pin 12 - Heater		Can - Ultor (Grit No.3, Grid No.5, Collector) C - External Conductive Coating
	GRID-DRIVE* SERVICE	

Unless otherwise specified, voltage values are positive with respect to cathode
Maximum and Minimum Ratings. Design-Maximum Values:

maximum and minimum katings, Design-Maximum Values:		
ULTOR VOLTAGE	volts	1
GRID-No.4 (FOCUSING) VOLTAGE:	V01 (S	
Positive value	volts	
Negative value	volts	
GRID-No 2 VOLTAGE \$550 max.	volts	
(200 11111.	volts	
GRID-No.1 VOLTAGE:	1 :	
Negative-peak value	volts	
Negative-bias value	volts	
Positive-peak value 2 max.	volts	
(6.0	volts	
HEATER VOLTAGE	volts	
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts	
Typical Operating Conditions:		
With ultor voltage (Ecsh) of 18000	volts	
and grid-No.2 voltage (Ec2k) of 400	volts	
Grid-No.4 Voltage for focus 0 to 400 Grid-No.1 Voltage for visual	volts	
extinction of focused raster*36 to -94 Field Strength of Adjustable	volts	
	ausses	
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance 1.5 max. m	nenohms	
	CADINIS	



#### CATHODE-DRIVE SERVICE

I'nless otherwise stecified, voltage values are justine with respect to grid No. 1

are jostification to specification and the s	
Maximum and Minimum Ratings, Design-Vaximum Values:	
## TOR TO=GMID N .1 V LTAGE	
(11000 - 111)	volts
CIMID TO 4-TO GRID NO. 1 (FOCHSING) VOLTAGE:	volts
Politive vilue	
(= / =	
GR!D=in.2=D= 4.[1=in., VOITAGE	
GRIT-SOL -19-CATHORE VOLLAGE	
LATH DE-IU-GRIDEN . I VILLAGE.	
Portive-formation	
Politive-tris value	
Negative-bas value 0 max.	
hesative-post value Z max.	
HEATER WOLTAGE	
FEAR HEATER-CATHODE VOLTAGE:  Heater constitutable  Encountering to astrone:  Encount imment airment period  rot exception 15 econis	volts volts
Typical Operating Conditions: With ultor-to-grid-No.1	
voltage (Ec. g <sub>1</sub> ) of 18000 and grid-No.2-to-grid No.1	volts
voltage $(Ec_2g_1)$ of 400 Grid-No.4-te Grid No.1	volts
Voltage for focus	volts
focused rister	volts
	gausses
Maximum Circuit Values:	

Grid-No.1-Circuit Resistance. . . . . . . 1.5 max. megohms

Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.

See Raster-Cutoff-Range Chart for Grid-Drive Service.

Distance from Reference Lime for suitable PM centering magnetshould not exceed 2-1/4". The specified centering magnet compensates only for the effect which mechanical tube tolerances may have on the location of the undeflected focused spot with respect to the center of the tube

The grid-No.4 (or jrid-No.4-to-grid-No.1) voltage required for optimum focus of any individual tube will have a value anywhere between 0 and 400 olts, is independent of ultor current and will remain essentially constant for values of ultor (or ultor-to-grid-No.1) voltage or grid-No.2 (or grid-No.2-to-grid-No.1) voltage within design-maximum ratings shown for these items.

# **23AHP4**

face. Maximum field strength of adjustable centering magnet equals:

$$\sqrt{\frac{E_{C5k} \text{ or } E_{C5g_1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 10 \text{ gausses}$$

The equipment manufacturer must determine and supply additional compensation for the effects of the earth's magnetic field and extraneous fields due to choice of circuitry and components. The additional compensation should preferably be applied as part of the magnetic field of the deflecting yoke.

Cathoule drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

• See Raster-Cutoff-Range Chart for Cathode-Drive Service.

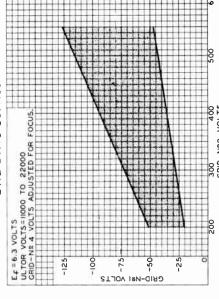
#### OPERATING CONSIDERATIONS

 $\it X-Ray~Warning.$  When operated at ultor voltages up to initiovoits, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this  $\it t_{\rm MF}$ -permits operation atvoltages as high as 22 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

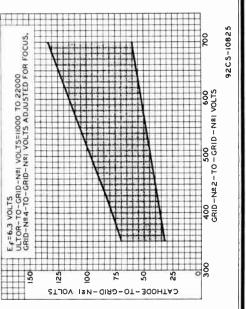
Shatter-Proof Cover Over the Tube Face. Following conventional picture tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this picture tube to protect it from being struck accidentally and to protect against possible damage resulting from tube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



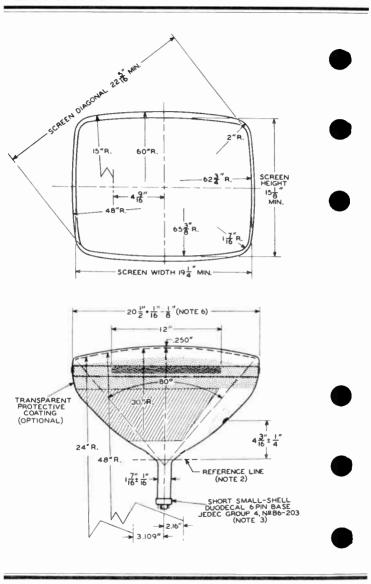
# CHARTS Service OFF-RANGE RASTER-CUTOFF-R Grid-Drive

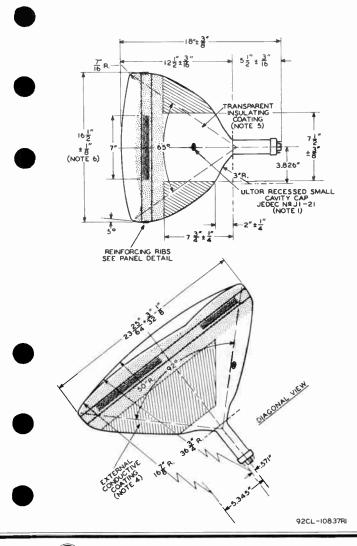


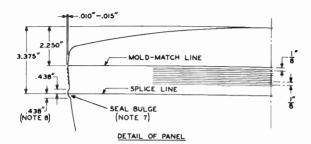
# Cathode-Drive Service











NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF \$30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-116 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BERIGIDLY MOUNT-ED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

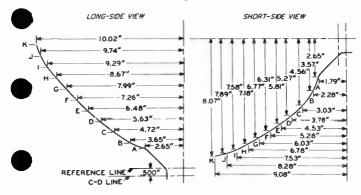
NOTE 5: TO CLEAN THIS AREA, WIPEONLY WITH SOFT DRY LINTLESS CLOTH.

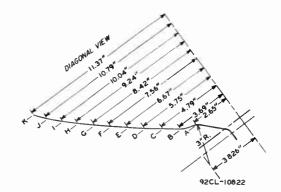
NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE IN-DICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/B", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMEN-SIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

NOTE 8: AREA BETWEEN MOLD-MATCH LINE AND SEAL BULGE IS 1/2" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.

#### BULB-CONTOUR DIMENSIONS





NOTE: PLANES A THRU K ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS FROM THE C-D LINE. THESE COORDINATES DESCRIBE THE BULB EXTERNAL CONTOUR IN PLANES THROUGH THE TUBE AXIS AND THE RESPECTIVE FACEPLATE AXES.

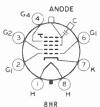


# Picture Tube

	NO ION-TRAP MAGNET REQUIRED LOW-VOLTAGE ELECTROSTATIC FOCUS 110° MAGNETIC DEFLECTION
	ELECTRICAL
	Direct Interelectrode Capacitances
	Cathog to all other electrode
_	Grid No.1 to all other electrodes 6 pF
	External conductive coating to anode
	/ II/UU MIN NE
	Heater Current at 6.3 V 600 ± 30 mA Heater Warm-up Time (Average)
	Electron Gun
	was the same of the same
	OPTICAL
	Phosphor
	for curves, see front of this section
	Faceplate
	Light transmission (Approx.)
	MECHANICAL
	Weight (Approx.)
	Overall Length
	Neck Length
	Projected Area of Screen
	Type Regular-Band
	contact area for grounding Near Reference Line
	For Additional Information on Coatings and Dimensions
	See Picture-Tube Dimensional-Outlines and Bulb 1187 E sheets
	at front of this section
	Cap Recessed Small Cavity (JEDEC No.JI-21)
	Base Small-Button Neoeightar 7-Pin,
	Arrangement I (JEDEC No.87-208) TERMINAL DIAGRAM (Bottom View)
	Pin 1 - Heater Pin 2 - Cria No.1
	MIN Z - Cria No. 1

Pin 3-Grid No.2 Pin 4-Grid No.4 Pin 6 - Grid No. 1 Pin 8 - Heater Cap - Anode (Grid No.3. Grid No.5, Screen, Collector) C - External Conductive

Coating



MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUE	MAXIMUM	MINIMUM	MAXIMUM AND	RATINGS,	DESIGN-MAXIMUM	VALUES
---------------------------------------------------	---------	---------	-------------	----------	----------------	--------

Unless otherwise specified, voltage values are positive with respect to cathode

ure posti														
Anode Voltage													{22000 max  12000 min	V
Grid-No.4 (Focusing) V													•	
Positive value													1100 max	٧
Negative value														٧
Grid-No.2 Voltage													550 max	V
oria-no.2 vortage	•	•	•	•	•	•	•	•	•		•	•	200 min	٧
Grid-No.l Voltage													•	
Negative peak value.													220 max	٧
Negative bias value.													155 max	٧
Positive bias value.													0 max	٧
Positive peak value.										÷			2 max	٧
Heater Voltage													∫6.9 max  5.7 min	٧
				•	•	•	•	•	•	•	•	•	\5.7 min	٧
Peak Heater-Cathode Vo														
Heater negative with										3.				
During equipment A														
exceeding 15 seco													450 max	٧
After equipment wa												•	200 max	٧
Heater positive with	re	esp	e e	c t	to	0 0	tat	: hc	od e	2:				
Combined AC and DC	V	o i t	a	ge			٠						200 max	٧
DC component													100 max	٧

#### TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

linless otherwise specified, voltage values are positive with respect to grid Vol

with positions and		
Anode Voltage	16000	٧
Grid-No.4 Voltage	0 to 400	٧
Grid-No.2 Voltage		٧
	43 to 78	٧
For visual extinction of	tocused raster	

		MAXIMUM CIRCUIT VALUE	
Grid-No.l	Circuit	Resistance 1.5 ma	x MΩ



# **23ASP4**

# Picture Tube

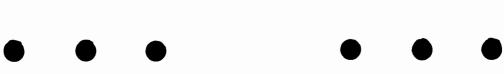
RECTANGULAR GLASS TYPE ALUMINIZED SCREEN LOW-VOLTAGE ELECTROSTATIC FOCUS MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The  $23ASP_4$  is the same as the  $23AHP_4$  except for the following items:

Mechanical:
-------------

Tube Dimensions:													
Overall longth										1/"	4	£ 3.	/8"
Neck length	,				,		,		4-1	./2"	±	3/	16"



# **23BDP4**

# Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 92° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

The 23BDP4 is the same as the 23YP4 except for the following item:

Optical:

Surface of Protective Panel . . . . . . Treated to reduce specular reflection



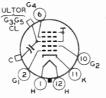
RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSIATIC FOCUS LOW GRID-No.2 VOLTAGE

ALUMINIZED SCREEN 920 MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

	GENERAL DATA
	Electrical:
	Heater Current at 6.3 volts 600 ± 30 ma Meater Airm-Up Time (Average)
	Cathole to all other electroles 5 $\mu\mu$ f (2500 max. $\mu\mu$ f
	External consistive costing to alter . 1700 min. Hust
)	Electron Gun
	Optical:
	Fisceplite
	Mechanical:
	Operating Position         Any weight (increase)           Overall Length         18-1/8" ± 3/8           Neck Length         5-5/8" ± 3/16"           Projected Area of occen         282 sq. in.
	External Conductive Coating: Tyre
)	at the front of this section Cip

Pin 1 - Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10 - Grit No. 2 Pin 11 - Cathode Pin 12 - Hester



Cap - Ultor (Grid No.3. Grid No.5, Collector) C-External Conductive Costing

# **23BJP4**

Maximum and Minimum Ratings, Design-Maximum Values:	
	14
ULTOR-TO-GRID-No.1 VOLTAGE	volts volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:	VUILS
Positive value 1250 max.	volts
Negative value 450 max.	volts
	volts
GRID-No.2 TO-GRID-No.1 VOLTAGE	volts
GRID-No.2-TO-CATHODE VOLTAGE 70 max.	volts
CATHODE-TO-GRID-No.1 VOLTAGE:	
Positive peak value 220 max.	volts
Positive bias value 154 max.	volts
Negative bias value 0 max.	volts
Negative peak value 2 max.	volts
HEATER VOLTAGE	volts
1 J./ IIIII.	volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with	
respect to cathode:	
During equipment warm-up period not exceeding 15 seconds 450 max.	-14-
not exceeding 15 seconds 450 max.  After equipment warm-up period 200 max.	volts
Heater positive with	volts
respect to cathode 200 max.	volts
	VOILS
Typical Operating Conditions:	
With ultor-to-grid No. 1 voltage of 20000	volts
and grid-No.2-to-grid-No.1 voltage of 50	volts
Grid-No.4-to-Grid-No.1 Voltage for focus. 0 to 400	volts
Cathode-to-Grid-No.1 Voltage for visual	<b>\$0113</b>
extinction of focused raster 36 to 54	volts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section

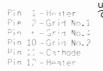


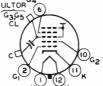
BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW GRID-No.2 VOLTAGE ALUMINIZED SCREEN 92° MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

### With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

GENERAL DATA
Electrical:
Hester Current at 1.5 volts
Grit No.1 to all other electrode
External conductive coating to ultor. $\begin{cases} 2500 \text{ max.} & \mu\mu t \\ 1700 \text{ min.} & \mu\mu t \end{cases}$
Electron Gun Type kequiring No Ion-Trap Magnet
Optical:
Faceplate and Protective Pages . Filterglass Light transmission (Approx.)
Mechanical:
Operating Position         Any default (Aisros.)           Overall Length         18-7/16" ± 7/16"           Neck Length         5-5/8" ± 3/16"           Projecte: Area of preen         282 sq. in.           External Conductive Coating:
Type
See Picture-Tube Dimensional - Outlines and Bilb Ji87 D/G sheets at the front of this section
Car
Fising Designation for BOTTOM VIEW





Cap - Ultor
(Grid No.3
Grid No.5,
Collector)
C - External
Conductive
Coating

# **23BKP4**

Maximum and Minimum Ratings, Design-Maximum	n Values:	
ULTOR-TO-GRID-No.1 VOLTAGE	{25000 max. 15000 min.	
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE: Positive value. Negative value. GRID-No.2-TO-GRID-No.1 VOLTAGE. GRID-No.2 TO-CATHODE VOLTAGF. CATHODE-TO-GRID-No.1 VOLTAGE: Positive peak value Positive bias value Negative bias value	12500 max. 400 max. {225 max. 40 min. 70 max. 220 max. 154 max. 0 max. 2 max.	volts volts volts volts volts volts volts volts volts
Negative peak value	2 max. ∫6.9 max. ∫5.7 min.	
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds. After equipment warm-up period Heater positive with respect to cathode	450 max. 200 max.	volts volts
Typical Operating Conditions:		
With ultor-to-grid-No.1 voltage of and grid-No.2-to-grid-No.1 voltage of Grid-No.4-to-Grid-No.1 Voltage for focus. Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster	20000 50 0 to 400 36 to 54	volts volts volts
Maximum Circuit Values:		

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this section

Grid-No.1-Circuit Resistance. . . . . . 1.5 max. megohms



BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

#### Electrical:

Heater Current at 6.3 volts 450 ± 5%	ma
	seconds
Direct Interelectrode Capacitances:	
Grid No.1 to all other electrodes 6	μμf
Cathode to all other electrodes , 5	أعينا
External conductive coating to ultor . $\left\{ \begin{array}{l} 2500 \text{ max.} \\ 2000 \text{ min.} \end{array} \right.$	μμ.f μμ.f
Electron Gun Type Requiring No Ion-Trap	Magnet

#### Optical:

Faceplate and	d Protec	ctive F	Panel							.Fi	lte	rg	ass
Light tran	smission	n (Appi	rox.)										40%
Phosphor (For	Curves,	see fro	nt of	this	Se	ecti	on)	P4 -	—Ş	ul f	ide	· Ty	pe,
										Δ	Jum	i n	ized

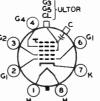
#### Mechanical:

operating rosition .						٠	Any
Weight (Approx.)							32-1/2 lbs
Overall Length							15-3/16" ± 3/8"
Neck Length							. 5-1/8" ± 1/8"
Projected Area of Scr	ee	n.					282 sq. in.
External Conductive C							
Type							Regular Band

Contact area for grounding . . . . Near Reference Line For Additional Information on Coatings and Dimensions: See Picture-Tube Dimensional-Outlines and Bulb Ji87 A sheets at the front of this section

Cap. . . . . . Recessed Small Cavity (JEDEC No.J1-21)
Base . . . . . . . . Small-Button Neoeightar 7-Pin,
Arrangement 1 (JEDEC No.B7-208)

Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode Pin 8 - Heater



Cap-Ultor
(Grid No.3,
Grid No.5,
Collector)
C-External
Conductive
Coating

# 23BQP4

Maximum and Minimum Ratings, Design-Maximum Values:	
ULTOR VOLTAGE	volts
GRID-No.4 (FOCUSING) VOLTAGE: Positive value	volts
Negative value 550 max.	volts
GRID-No.2 VOLTAGE	volts
Negative peak value	volts
Positive bias vilue. 0 max. Positive peak vilue. 2 max. PEAK HEATER-CATHODE VOLIAGE:	
Heater negative with respect to cathode: During equipment warm-up period	
not exceeding 15 seconds 450 max. After equipment warm-up period 200 max.	
Heater positive with respect to cathode 200 max.	volts
Typical Operating Conditions:	
With ultor voltage of 16000 and grid-No.2 voltage of 300	volts volts
Grid-No.1 voltage for focus 0 to 400 Grid-No.1 Voltage for visual	volts
extinction of focused raster35 to -72	volts
Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



# **23BTP4**

## Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 920 MAGNETIC DEFLECTION

The 23BTP4 is the same as the 23YP4 except for the following item: Maximum and Minimum Ratings. Design-Maximum Values:

(25000 max. Anode (Ultor) Voltage. . .

# **23CBP4**

# Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE ALUMINIZED SCREFN LOW-VOLTAGE FLECTROSTATIC FOCUS 1100 MAGNETIC DEFLECTION

The 23CBP4 is the same as the 23BQP4 except for the following item: Optical:

Surface of Protective Panel. .Treated to reduce specular reflection

# 23CGP4

# Picture Tube

CONTROLLED HEATER WARM-UP TIME

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN LOW-VOLTAGE ELECTROSTATIC FOCUS 920 MAGNETIC DEFLECTION

The 23CGPA is the same as the 23AHPA except for the following item:

Electrical:

450 ± 20 ma Heater Current at 6.3 volts. .



BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE FLECTROSTATIC FOCUS

General:

ALUMINIZED SCREEN MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### DATA

	general:	
	Direct Interelectrode Capacitances: Grid No.1 to all other electrodes 6 ## Cathode to all other electrodes 5 ## (2500 ##)	np ec if
	External conductive coating to ultor {2000 min. ##	
	Faceplate and Protective Panel	ss )% oe ed
	Fluorescence. Whit Phosphorescence Medium Shot Persistence Medium Shot Focusing Method Electrostat Deflection Method Magnet	te rt ic
	Deflection Angles (Approx.): Diagonal	90 20
D	Overall length	5" 5" 8"
	Radius at center Radius at ed	gе
	In plane of diagonal deflection 50-1/4" See Dimensional Outli	
	In plane of hori- zontal deflection 50-1/4" 35-1/4" In plane of verti-	
	cal deflection 45-1/2" 35" Radius of curvature of faceplate (Internal surface):	
	Radius at center Radius at ed.	
		ge
	In plane of diago- nal deflection 39-1/2" 31-1/2" In plane of hori-	
	zontal deflection 39-3/4" 26-1/2"	

	Radius at	center R	adius at edge
In plane of verti- cal deflection Screen Dimensions (Minimum		# 11 *	18-1/2"
Greatest width. Greatest height Diagonal. Projected area. Weight (Approx.) Operating Position. Cap. Rec. Rulb. J187 Base. Small-Rutte	essed Small Fitted wit on 'eoeight	Cavity (JF h Protectiv ar 7-Pin, A	15-1/4" 22-5/16" . 282 sq. in. 33 lbs Any DFC No.JI-21) e Panel FP198 rri angement 1, FC No.R7-208)
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode Fin 8 - Hester	7	Cap -	

#### GRID-DRIVE\* SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

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

ULTOR VOLTAGE	120000 12000			
GRID-No.4 (FOCUSING) VOLTAGE:	(12000	•	VOI (3	
Positive value	1000	mix.	volts	
Megative value	500	mix.	volts	
GPID-10.2 VOLTAGE	500	max.	volts	
GRID-No.1 VOLTAGE:				
Negati.e-peak value	200	max.	volts	4
Negative-bias value	140	max.	volts	1
Positive-bias value	()	max.	volts	
Positive-peak value	2	max.	volts	
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect to cathode:				
During equipment warm-up period not				
exceeding 15 selongs	410	max.	volts	
After equipment warm-up seriod	180	Max.	volts	1
Heater rositive with respect to cathode .	180	max.	volts	•

### Equipment Design Ranges:

With any ultor voltage (E\_{c,k}) between 12000  $^{\bullet}$  and 20000 volts and grid-Ko.2 voltage (E\_{c,k}) between 200 and 500 volts

Grid-No.4	Vol	tac	ie	fo	٥r								
focur≢.							٠		٠	0	to	400	volts



	Grid-No.1 Voltage (E <sub>C K</sub> ) for visual extinction of focused raster	
	Grid-No.2 Current15 to +15 $\mu a$ Field Strength of Adjust- able Centering Magnet $lacktriangle$ 0 to 8 gausses	
	Examples of Use of Design Ranges:	
	With ultor voltage of 18000 volts	
	and grid-No.2 voltage of 400 volts Grid-No.4 Voltage for	
	focus*	
	focused raster44 to -94 volts Grid-No.1 Video Drive from Raster Cutoff (Black level):	
	White-level value 44 to 94 volts	
	Maximum Circuit Values:	
	Grid-No.1-Circuit Resistance 1.5 max. megohms	
	CATHODE-DRIVE SERVICE	
	Unless otherwise specified, voltage values	
	are positive with respect to grid No. 1	
	Maximum and Minimum Ratings, Design-Center Values:	
	(20000 max, volts	
	ULTOR-TO-GRID-No.1 VOLTAGE	
	VOLTAGE:	
	Positive value 1000 max. volts  Negative value 500 max. volts	
	GRID-No.2-TO-GRID-No.1 VOLTAGE 640 max. volts	
	GRID-No.2-TO-CATHODE VOLTAGE 500 max. volts CATHODE-TO-GRID-No.1 VOLTAGE:	
	Positive-peak value 200 max, volts	
	Positive-bias value	
	Negative-bias value 0 max. volts	
h	Negative-peak value 2 max. volts PEAK HEATER-CATHODE VOLTAGE:	
	Heater negative with respect to cathode:	
	During equipment warm-upperiod not exceeding 15 seconds 410 max. volts	
		-

# 23CP4

After equipment warm-up period Heater positive with respect to cathod		
Equipment Design Ranges:		
With any ultor-to-grid-No.1 voltage (i and 20000 volts and grid-No.2-to-grid- between 225 and 640 to	-No.1 voltage 1	
Grid-No.4-to-Grid-No.1  Voltage for focus* Cathode-to-Grid-No.1 Volt- age (E <sub>kg </sub> ) for visual ex- tinction of focused	0 to 400	volts
	ster-Cutoff-Rai r Cathode-Drive	
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative) Same	value as determ except video du	mined for
Grid-No.4 Current	-25 to +25	μa
Grid-No.2 Current Field Strength of Adjustable	-15 to +15	μa
Centering Magnet♦	0 to 8	gausses
Examples of Use of Design Ranges:		
With ultor-to-grid- No.1 voltage of and grid-No.2-to-grid-	18000	volts
No.1 voltage of	400	volts
Grid-No.4-to-Grid-No.1 Voltage for focus*	0 to 400	volts
focused raster	42 to 78	volts
White-level value	-42 to -78	volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms
Grid drive is the operating condition in whith grid-No.1 potential with respect to car		
This value is a working design-center minim	m. The equivalen	nt absolute

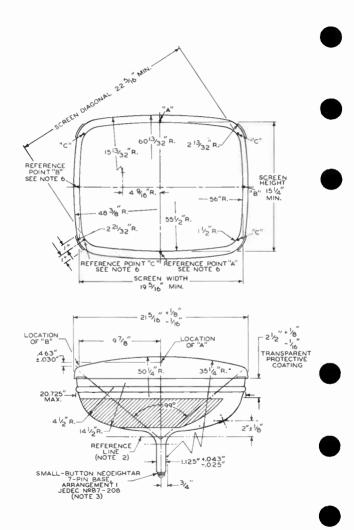
This value is a working design-center minimum. The equivalent absolute wintamum ultor (or ultor-to-grid-No.1) voltage is 11,000 volts below which the serviceability of the 23CPU will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor (or ultor-to-grid-No.1) voltage is never less than 11,000 volts.

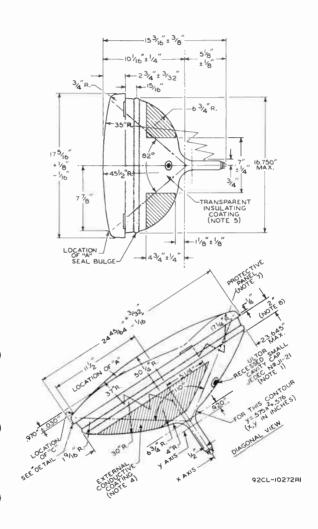
The grid-No.4 (or grid-No.1-to-grid-No.1) voltage required for optimum focus of any individual tube may have a value anywhere between 0 and 400 volts; is independent of ultor current; and will remain essentially constant for values of ultor (or ultor-to-grid-No.1) voltage, or grid-No.2 (or grid-No.2-to-grid-No.1) voltage, within design ranges shown for these items.



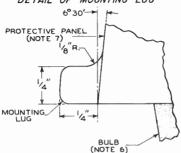
- pistance from Reference Line for Suitable PM centering magnet should not exceed 2-1/4. Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.
- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No. 1 and the other electrodes.

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section









NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF \$\frac{1}{2}\$ 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC No.G-126 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATEDIN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS OF THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: REFERENCE POINTS A, B, AND C ARE PROVIDED FOR USE IN DESIGN OF A MASK CONTOURED FOR CLOSE FIT TO THE PROTECTIVE PANEL.

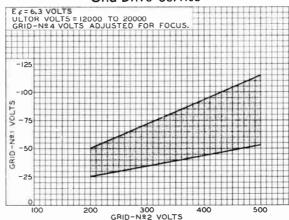
NOTE 7: THE CENTER OF THE PROTECTIVE PANEL MAY BE ECCENTRIC WITH RESPECT TO THE AXIS OF THE TUBE ENVELOPE. ASSOCIATED SHIFT OF THE PROTECTIVE PANEL ALONG ITS MINOR AND/OR MAJOR AXIS WILL NOT EXCEED 1/16".

NOTE 8: KEEP THIS CIRCUMFERENTIAL AREA FREE OF MOUNTING HARDWARE.

NOTE 9: ADEQUATE TUBE SUPPORT IS OBTAINED BY CLAMPING TO THE MOUNTING LUGS PROVIDED AT EACH CORNER OF THE PROTECTIVE PANEL. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.



### RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-10312

### Cathode-Drive Service



92CS-10313

### **AVERAGE DRIVE CHARACTERISTICS**

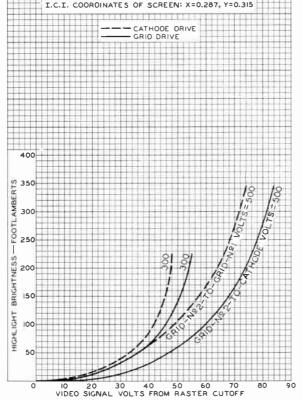
CATHODE-DRIVE SERVICE Er = 6.3 VOLTS ULTOR-TO-GRID-NºI VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº I TO GIVE FOCUSED RASTER CUTOFF RASTER FOCUSED AT AVERAGE BRIGHTNESS.

RASTER SIZE = 18"x 13/2"

GRID-DRIVE SERVICE Ef = 6.3 VOLTS ULTOR VOLTS = 16000 GRID Nº I BIASED NEGATIVE WITH

RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS.

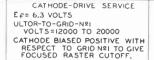
RASTER SIZE = 18"x 131/2"



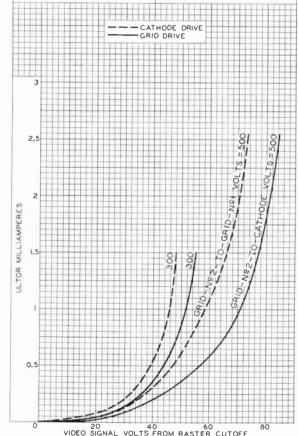
92CM-10318



### **AVERAGE DRIVE CHARACTERISTICS**



GRID-DRIVE SERVICE E f = 6.3 VOLTS ULTOR VOLTS = 12000 TO 20000 GRID NºI BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF.



92CM-10317



RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS ALUMINIZED SCREEN
94° MAGNETIC DEFLECTION

Low-Grid-No.2-Voltage Type for Cathode-Drive Operation

#### GENERAL DATA

#### Electrical:

Die tintermiectrode Capacitince :	
Cuthour to all other Electrodic	rt.
Cris No.1 to all other electrode	րք
	p.f
(i O min.	p f
Teater Current at e.p. olt 000±30	m 1
heiter Airmello Time (verage)	SHLOND'S
Notice in	Vagnet.

#### Optical:

Phosphor	(For	Curv	es,	See	fron	t of	1hi	5 5	rot	I on	)	P4	 0.1	il f	i le	- 1 y	pe.
														100	i un	'ni	ze £
Fac⇔plate	e													H.	're	· g1	asc
Light t																	

#### Mechanical:

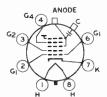
-Weight LAD	DF^X./.													6	1	ΙD	5
Overall La	ngth										1.	1-5	,/64	" +	51	16	11
Neck Lingt	th													כ" כ	+ 1	78	119
Projected	Area of	S		er									282	5	1.	1	
Externil	on tucti	VP	10	10	in	a t											

Type. Regular-Band
Contact area for grounding. Near Reference Line
For Additional Information on Coating Dimensions, and Deflection Angles:

See Picture-Tube Dimensional-Jutlines and Bulb J187 Hi sheets at the front of this section.

Arrangement 1, ()EDE: No.87-208
Basing Designation for BOTTOM VIEW. . . . . . . . . . 8HI

Pin 1-Heater Pin 2-Grid No.1 Pin 3-Grid No.2 Pin 4-Grid No.4 Pin 6-Grid No.4 Pin 7-Cathoda Pin 8-Heater



(Grid No.3, Grid No.5, Screen, Collector) C-External Conductive

Cap - Anode

# **23DAP4**

	Unless o	theru	1150	51	bec 1	fi	еd,	υ	olt	age va	lues	
	are pos									grid	No. 1	
NODE VOL	TAGE									{23000 10000	max.	volts
							•			10000	min.	volts
Positiv	VOLTAGE	:								1100		
Mogativ	e value.			•		٠	٠		•		max.	volts
Negativ	e value.			*			٠	•			max.	volts
RID-No.2	VOLTAGE										max.	volts
ATHODE V										(40	min.	volts
		· Luc								_		1.
Mogativ	e peak va	lue		٠		٠	•	٠.			max.	volts
Positiv	e bias va	ilue		٠		•					max.	volts
Pacition	e bias v	1100				٠	•				max.	volts
F 051 (1V)	e peak va	riue		٠	• •	•					max.	volts
EATER VO	TAGE										max.	volts
	R-CATHOD									(5.7	min.	volts
	negat ive				- 4							
Durin	g equipme	with m	16:	spe	Cl	-10	Ca.	the	ае	:		
not	exceedir	. 15	21111	-up	de	11(	Z			450	max.	1 +
After	equipmer	19 IJ	rm_i	, OII	us.						max.	volts
Heater i	ositive	arith	FO	s no nh	pei c+	+00			do	. 200	max.	volts
Combin	ned AC &	00.00	-1 e:	s pc	CL	CO	C I	(11)	ue			. 1 .
DC Cor	ponent.	DC V	OIC	19 E		•	٠				max.	
DC COI	ponent.			•		•	•	٠.		100	max.	volts
/pical 0	perating	Cond	iti	ons	fo	r (	at	hod	de-	Drive :	Service	4:
	Unless o											
	are pos	1 t 1 7/	e w	1 t.	, ,,	051	eu	+	to	arid	No 1	
node Volt												1.
id No 1	nge Voltage			٠		٠				18000		volts
1 10-NO.4	voitage"									100		volts
rid-No.2	Val+200									50		volts

Anode Voltage 18000	volts
Grid-No.4 Voltage <sup>a</sup>	volts
Grid-No.2 Voltage 50	volts
Cathode Voltage for visual	
extinction of focused raster 35 to 55	volts
Field Strength of required	
adjustable Centering Magnet 0 to 12	gausses
No. 1- At the t	300000

#### Maximum Circuit Value:

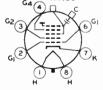
Grid-No.1 Circuit Resistance. ... . 1.5 max. megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between -100 and +300 volts.



LOW-YOLTAGE ELECTROSTATIC FOCUS  NO ION-TRAP MAGNET REQUIRED  RECTANGULAR GLASS TYPE  Low-Grid-No.2-Voltage—for Cathode-Drive Operation
Electrical:
Direct Interelectrode Capacitances: Cathode to all other electrodes
Heater Current at 6.3 volts
Optical:
Phosphor (For curves, see front of this section) .P4—bulfide Type, Aluminized
Faceplate
Mechanical:
Meight (Approx.)       25 lbs         Overall length       14.87%" ± .26%"         Neck length       5.12%" ± .12%"         Project-3 Area of Screen       232 cm.in.         External Conductive Coating:
Type
Cao
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode



Pin 8-Heater

Cap - Anode (Grid No.3. Grid No.5, Screen, Collector C-External Conductive Coating

Maximum Circuit Value:

Grid-No.1 Circuit Resistance . . . .

Maximum and Minimum Ratings, Design-Maximum Values:	
Unless otherwise specified, voltage values	
are positive with respect to Grid No. 1	(
	volts
Anode Voltage	volts
Grid-No.4 (Focusing) Voltage:	
Positive value	volts
Negative value 400 max.	volts
Grid-No.2 Voltage	volts
Grid-No.2 to Cathode Voltage	volts
( 40 min.	volts
Cathode Voltage:	volts
Positive peak value	volts
TUSTITIVE DIAS VALUE	
negative pras varue	
regative pear value	
Heater Voltage	
Peak Heater-Cathode Voltage:	*0713
Heater negative with respect to cathode:	
During equipment warm-up period not	
exceeding 15 seconds 450 max.	volts
After equipment warm-up period 300 max.	volts
Heater positive with respect to cathode . 200 max.	volts
Typical Operating Conditions for Cathode-Drive Service	:
Unless otherwise specified, voltage values are positive with respect to grid No.1	
12000	volts
Allode voltage	volts
Grid-vo.4 voitage.	volts
GITG-NO.2 VOITage.	VOI (S
Cathode Voltage for	
visual extinction of	volts
focused raster 34 to 52	

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front on this Section



1.5 max. megohms

### PAN-O-PLY - INTEGRAL IMPLOSION PROTECTION

(Provided by Formed Rim and Welded Tension Bands around Periphery of Tube Panel — No Separate Safety-Glass or Integral Protective Window Required)
RECTANGULAR GLASS TYPE ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS 92° MAGNETIC DEFLECTION
NO ION-TRAP MAGNET REDUIRED

#### Electrical:

Direct Interelectrode Capacitances:	
Cathode to all other electrodes	nf
Grid Vo.1 to all other electrodes	pf
External conductive costing to anode. \$\int 2500 may.	pf
1:7(() min	p.f
Heater Current at 1.3 volts 1:0 + 20	ma
neiter wirm- s time (Average)	se onds
Flectron Gur	Viane*

#### Optical:

Phosphor (For	Curves, se	e tret (f	tri Section)	.P:bultim Type,
Faceplate.				iluminize:
Liebs son				· · · · · · Ilterglass
ridu, cese	mer or :	ii nester	(-ppro) .	

### Mechanical:

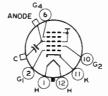
Weight (Appro)				 	 		. 29 lt -
Overall Length .				 	. 1	9 000"	+ 4750
Neck Length				 	 	1.500"	± .198"
Projected Area of External Conducti	ve Co	en. Datin	a:	 	 • •	. 282	ea, ir.

See Picture-Tube Dimensional-Outlines and Bulb  $Jih\gamma_{-}J$  sheets at the front of this section.

Pin 1 waste

	1	er
Pin	2 - Gric	1 40.
Pin	5-Gri	1 No.
Pin	10 - Gri;	10.
Pin	11 - Catr	lode

Pin 11 - Cathode Pin 12 - Heater



(Grid No.3, Grid No.5, Screen, Collector) C = External Cond. five Coating

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

Unless otherwise specified, voltage values	
are positive with respect to cathode	
Anode Voltage	volts volts
Grin-No.4 Voltage:         1100 max.           Positive value         550 max.           Negative value         550 max.           Grid-No.2 Voltage         200 min.	volts volts volts volts
Grid-No.1 Voltage:  Negative peak value. 220 max.  Negative bias value. 155 max.  Positive bias value. 0 max.  Positive peak value. 2 max.  Heater Voltage. 6.9 max.  5.7 min.	volts volts volts volts volts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts
Combined AC & DC voltage 200 max. DC Component 100 max.	volts volts

### Typical Operating Conditions for Cathode-Drive Service:

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

Anode Voltage				20000	volts
Grid-No.4 Voltage				200	volts
Grid-No.2 Voltage				400	volts
Cathode Voltage for visual					
extinction of focused raster				36 to 78	volts
Field Strength of required					
adjustable Centering Magnet.				0 to 12	gauss

#### Maximum Circuit Value:

Grid-No.1 Circuit Resistance . . . . . . 1.5 max. megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front on this Section



a includes implosion protection hardware.

The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between 0 and +u00 volts with the combined grid-No.1 voltage and video-signal voltage adjusted to give an anode current of 200 microamperes on a 13-1/2-inch by 18-inch pattern from an RCA-2F21 monoscope, or equivalent.

#### PAN-O-PLY -- INTEGRAL IMPLOSION PROTECTION

(Provided by Formed Rim and Welded Tension Bands around Periphery of Tube
Panel---No Separate Safety-Glass or Integral Protective Window Required)
RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS
92° MAGNETIC DEFLECTION
NO 10N-TRAP MAGNET REQUIRED

Low-Grid-No. 2-Voltage-for Cathode-Drive Operation

#### Electrical:

Direct Interelectrode Capacitances: Cathogo to all other electrodes	ρf
Grid No.1 to all other electrodes 6	pf
Luterest conductive coaling to anode [2500 max.	pf
(1700 min.	pf
Heater Current at 6.3 volts 600 ± 30	ma
Heater Warm-up Time (Average)	seconds
Fiectron Gun Type Requiring No Ion-Trap	Magnet
Ontinals	

#### Uptical

Phosphor (For	Curves, s	ee front	of this	Section)	.P4	-ŝı	
							Aluminized
Faceplate .							Filterglass
Light tran							

#### Mechanical:

Weight (Approx.)									29 105
Overall Length.								18.125"	± .375"
Neck Length								5.625"	± .125"
Projected Area o	f S	cre	en.					. 282	∍q. in.
External Conduct									
T				-				Dogu	lar Rand

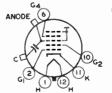
Type. Regular—Band
Contact area for grounding. Near Returence Line
For Additional Information on Coatings, Dimensions, and Deflection Angles:

See Picture-Tube Dimensional-Outlines and Bulb Ji87 J sheets at the front of this section.

Pin 1-Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10-Grid No.2

Pin 11 - Cathode

Pin 12 - Heater



Cap - Anode (Grid No.3, Grid No.5, Screen, Collector)

C - External Conductive Coating

# **23ENP4**

Maximum and Minimum Ratings, Design-Haximum Values:	
Unless otherwise specified, voltage values	
are positive with respect to grid No. 1	
Anode Voltage	volts
Grid-10.4 Voltage: Positive value	volts volts volts
Cathole Voltage:  "egit ve peak value.  Negative bias value.  Positive bias value.  100 max.  Fositive peak value.  Heater voltage.  Peak Wilder Cathole Voltage.  Peak Wilder Cathole Voltage.  Solution To the peak value.  150 max.  6.9 max.  5.7 min.	.olts volts volts volts volts
Peak Heater—Tathoge Voltage:  "Continue and it is with respect to natronal During endiment warm-up perior not exceeding 15 second 450 may.  After endiment warm-up perior 300 mm.  Heater positive with respect to natronal Commission ADC voltage 200 mm.  Do Temponent 100 mm.	vol's .ol's volts
Typical Operating Conditions for Cathode-Drive Service:	
Unless otherwise specified, voltage values	
are positive with respect to grid Vo.1	
Anode voltage.  Grid-No.1 voltage.  Cathore oltage for virual extinction of focused raster.  2000  200  200  200  200  200  200	volts volts
Field Strength of roquired	VOLUS

### 

Field Strength of required

Grid-No.1 Circuit Resistance..... 1.5 max. megohms

For Y-rasintion shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



Includes implosion protection hardware.

b The grid-No.a voltage required for optimum focus of any individual tube will have a value anywhere between 0 and #100 volts with the combined of the state of the state of the state of the state of the state of the Current 200 microamperes on a 13-1/2-inch by 18-inch pattern from an RCA-2F21 monoscope, or equivalent.

BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW GRID-No.2 VOLTAGE

General:

ALUMINIZED SCREEN MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

#### DATA

Heater, for Unipotential Cathode:  Voltage (AC or DC)
Total light transmission (Approx.)
Fluorescence
Diagonal
Overall length
In plane of diago-
In plane of diago-
nal deflection 50-1/4" See Dimen- sional Outline
In plane of hori- zontal deflection 50-1/4"  In plane of verti- 35-1/4"
cal deflection 45-1/2" 35" Radius of curvature of faceplate (Internal surface):
Radius at center Radius at edge
In plane of diago- nal deflection 39-1/2" 31-1/2"

	Radius at center	Radius at edge
In plane of hori- zontal deflection . In plane of verti-	39-3/4"	26-1/2"
cal deflection		18-1/2"
Screen Dimensions (Minimum Greatest width. Greatest height Diagonal. Projected area. Weight (Approx.). Operating Position. Cap. Rec Bulb. J187 Base. Small-But Basing Designation for B	essed Small Cavity Fitted with Protecton Neoeightar 7-Pi	15-1/4" 22-5/16" 282 sq. in. 33 lbs Any (JEDEC No.J1-21) tive Panel FP198 n Arrangement 2, JEDEC No.B7-219)
Pin 2 - Internal Connection— Do Not Use Pin 3 - Cathode Pin 4 - Heater Pin 5 - Heater Pin 6 - Grid No. 1 Pin 7 - Grid No. 2		n 8-Grid No.4  p-Ultor (Grid No.3, Grid No.5, Collector) C-External Conductive Coating

### CATHODE-DRIVE SERVICE

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

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

ULTOR-TO-GRID-No.1 VOLTAGE	20000 12000	max.	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:			
Positive value	1000	max.	volts
Negative value	500	max.	volts
GRID-No.2-TO-GRID-No.1 VOLTAGE	64	max.	volts
CATHODE-TO-GRID-No. 1 VOLTAGE:			
Positive-peak value	200	max.	volts
Positive-bias value	140	max.	volts
Negative-bias value	0	max.	volts
Negative-peak value	2	max.	volts
PEAK HEATER-CATHODE VOLTAGE:	- fin		******
Heater negative with respect to cathode:			
During equipment warm-up period not			
	440		1.
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 any ultor-to-grid-No. and 20000 volts and grid-No between	1 voltage (Ec5 0.2-to-grid No 40 and 64 volt	.i voltage (	12000 • Ec <sub>281</sub> )
Grid-No.4-to-Grid-No.1 Volt for focus* Cathode-to-Grid-No.1 Voltag (E <sub>kg.1</sub> ) for visual extinc-	e	0 to 400	volts
tion of focused raster. Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value	See Raste	er-Cutoff-Ran	ige Chart
(Peak negative)	video drive i	determined is a negative -25 to +25 -15 to +15	for Ekg1 e voltage μα μα
Centering Magnet		0 to 8	gausses
Examples of Use of Design R	anges:		
With ultor-to-grid- No.1 voltage of and grid-No.2-to-grid-	16000	18000	volts
No. 1 voltage of	50	50	volts
Grid-No.4-to-Grid-No.1 Voltage for focus* Cathode-to-Grid-No.1	. 0 to 400	0 to 400	volts
Voltage for visual extinction of focused raster	. 32 to 47	34 to 49	volts

#### Maximum Circuit Values:

Video Drive from Raster Cutoff (Black level): White-level value. . . .

Grid-No.1-Circuit Resistance . . . . . . . 5 max.

-32 to -47 -34 to -49

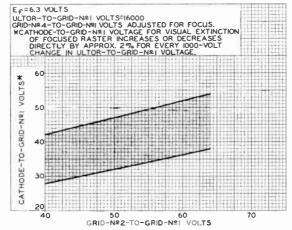
- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid Wo.1 and the other electrodes.
- Inis value is a working design-center minimum. The equivalent absolute minimum ultor-to-grid-No.1 voltage is 11.000 volts below which the serviceability of the 23EPu will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor-to-grid-No.1 voltage is never less than 11,000 volts.
- The grid-No.4-to-grid-No.1 voltage required for focus of any individual tube may have a value anywhere between 0 and 400 volts.
- Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/m². Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

volts

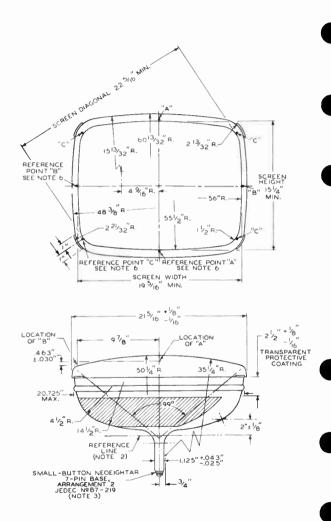
For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

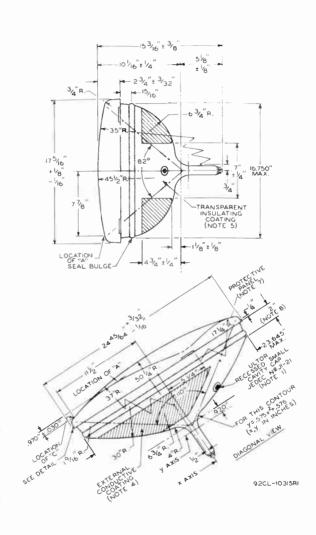


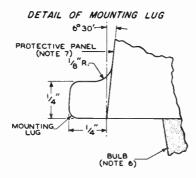
## RASTER-CUTOFF-RANGE CHART Cathode-Drive Service



92CS-9945RI



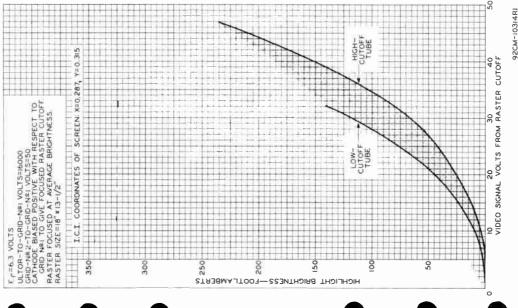




- NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN B MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN B.
- NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC NO.G-126 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS OF THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".
- NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.
- NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.
- NOTE 6: REFERENCE POINTS A,B, AND C ARE PROVIDED FOR USE IN DESIGN OF A MASK CONTOURED FOR CLOSE FIT TO THE PROTECTIVE PANEL.
- NOTE 7: THE CENTER OF THE PROTECTIVE PANEL MAY BE ECCENTRIC WITH RESPECT TO THE AXIS OF THE TUBE ENVELOPE. ASSOCIATED SHIFT OF THE PROTECTIVE PANEL ALONG ITS MINOR AND/OR MAJOR AXIS WILL NOT EXCEED I/IG".
- NOTE 8: KEEP THIS CIRCUMFERENTIAL AREA FREE OF MOUNTING HARDWARE.
- NOTE 9: ADEQUATE TUBE SUPPORT IS OBTAINED BY CLAMPING TO THE MOUNTING LUGS PROVIDED AT EACH CORNER OF THE PROTECTIVE PANEL. TUBE MOUNTING AND YOKE SUPPORT CLAMPS MUST BE SPACED FROM THE TUBE BY USE OF CUSHIONING PADS MADE OF MATERIAL SUCH AS ASPHALT—IMPREGNATED FELT, OR EQUIVALENT.

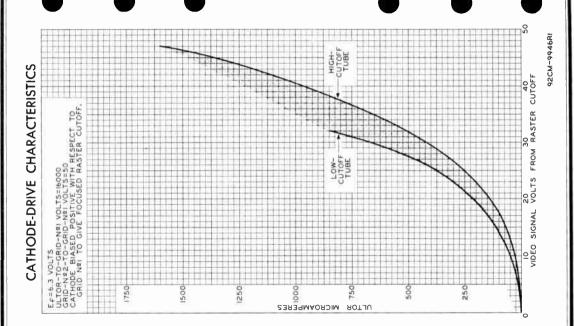


# CTERISTICS CHARA CATHODE-DRIVE





## 23EP4







PAN-O-PLY-INTEGRAL	IMPLOSION	PROTECTION
--------------------	-----------	------------

(Provided by Formed Rim and Welded Tension Bands Around Periphery of Tube Panel - No Separate Safety-Glass or Integral Protective Window Required)

1140 MAGNETIC DEFLECTION LOW-VOLTAGE ELECTROSTATIC FOCUS FLECTRICAL

Direct Interelectrode Capacitances	
Cithode to all other electroins 5	pF
Sripho.1 to all other electrose 6	pΕ
External confuctive costing to anose1700 min-2500 max	pF
Heater Current at 6.3 volts	ñÅ
Heater Warm-Up Time (Average)	S
Electron Gun Type Requiring No Ion-Trap Mag	net
OPTICAL	
Phosphor	zed

,				
	sem front of this			
Faceplate .			 	Filterglass
Light Tran	nsmission (Appro	ox.)	 	42%

#### MECHANICAL

Weight (Approx.).							28 lb
Overall Length							14.531 ± 0.281 in
Neck Length							5.125 ± .125 in
							282 sq in
External Conductiv							
Type							Modified-Band

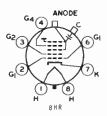
Contact area for grounding. . . . . . Near Reference Line For Additional Information on Coatings and Dimensions

Ser Picture-Tube Dimensional-Outlines and Bulb J187L rest at front of this ection

Cap . . . . . . . . . . . Recessed Small Cavity (JEDEC Mo.JI-21) . . . . . . Small-Button Neoeightar 7-Pin, Arrangement I, (JEDEC No.87-208)

TERMINAL DIAGRAM (Bottom View)

Pin 2 - Grid to.1 Pin 3 - grid 40.2 Pin 4 - Grid No.4 Pin 6 - arid Ne.1 P' . 7 - athor Cap - Anote (Grid No. 5, Grid No.b. Screen. Costing



Indicates a change.

Electronic Components and Devices

#### MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Unless otherwise specified, voltage values are positive with respect to cathode

Anode Voltage 11000 min—23000 max	V
Grid-No.4 (Focusing) Voltage	
Positive calle	٧
healthe libe 550 max	٧
Grid-No.2 Voltage 200 min—550 max	٧
Grid-No.1 Voltage	
'require prosk volum 220 max	٧
Negitive bias value 155 max	¥
Positive tias value 0 max	٧
Portice prokadae 2 max	٧
Heater Voltage 5.7 min—6.9 max	٧
Peak Heater-Cathode Voltage	
Heater negative with respent to disthoge:	
During equipmer* warm—up performat	
ce-ding 1'	٧
Atter a signer to Agrme apprecion. 300 max	¥
Herter position with respect to cathoom:	
Combined AC and DC voltage 200 max	٧
Tomponent 100 max	٧
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	
Unless otherwise specified, voltage values	
are positive with respect to grid No. 1	
Anode Voltage 18000	٧
Grid-No.4 Voltage <sup>b</sup> 200	v
0.14 No. 0 %-14-1-	· ·

centering magnet. . . . . . . . . . . . . 0 to 12

MAXIMUM CIRCUIT VALUE

Field Strength of required adjustable

Grid-No.1 Circuit Resistance . . . . 1.5 max MΩ

a External conductive coating and implosion protection hardware must be grounded.

b The grid-No.1 voltage required for optimum focus of any individual tube will have a value anywhere between 0 and +400 volts with the combined grid-No.1 and video-signal-voltage adjusted to give a 200-microampere anode current.

Yor '-'::'ation stilling considerations, see sheet

X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES

If from of this section



## **23ERP4**

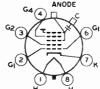
## Picture Tube

ì	PAN-O-PLY TYPE
	1140 MAGNETIC DEFLECTION LOW GRID-No.2 VOLTAGE
	The 23ERP4 is the same as the 23EQP4 except for the following items:
	ELECTRICAL
	Heater Current at 6.3 V 600 ± 30 mA
)	MECHANICAL

External Conductive Coating
Type (see car outlier, ) as front of this ection). Regular-Band
Contact area for grounsing.... Near Reference Line



71000
PAN-O-PLY - INTEGRAL IMPLOSION PROTECTION
{Provided by Formed Rim and Welded Tension Bands around Periphery of Tube Panel—No Separate Safety-Glass or Integral Protective Window Required }  RECTANGULAR GLASS TYPE ALUMINIZED SCREEN LOW-VOLTAGE ELECTROSTATIC FOCUS IIO MAGNETIC DEFLECTION NO ION-TRAP MAGNET REQUIRED
Electrical:
Direct interelectrose Dapad tanuar:  Cathode to all other electrodes
Heater Current at 6.5 volts
Optical:
Phosphor for curves, see front of this Section)P4Sulfide Type,
Faceplate
Mechanical:
Weight (Apprn>)
Type
Cap Pecessed Cmall Cavity (JEDEC No.J1-21) Base
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4



Maximum	and Minimum Rating	gs, Design-Maximum Values:
	Unless otherwise	specified, voltage val-
	ues are bositive	with respect to cothodo

are positive with respect to	cuinoae	
Anode Voltage	23000 max.	volts
Grid=No.4 Voltage:		volts
Positive value	1100 max.	volts
Negative value	,550 max.	VC) tc
Grid-No.2 Voltage	∫550 max.	volts
	1200 min.	volts
Grid-Vo.1 Voltage:		
Negative peak value	220 max.	volts
Negative bias value	155 max.	volts
Poritive bias value	O mav.	volta
Positive peak value	2 max.	volta
Heater Voltage	J€.9 m=x.	valts
	₹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 perion	300 max.	volts
Heater positive with respect to cathode:		
Combined AC & Dr Voltage	200 max.	volts
DC Companent	100 max.	volts

#### Typical Operating Conditions for Cathode-Drive Service:

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

received and reduced to grad post	
Anode Voltage 18000	volts
Grid-No.4 Voltage	volt
-Grid-No.Z Voltage	volts
Cathode voltage for visual	
extinction of focused rister 28 to 62 Field Strength of required	-olts
adjustable fentering Magnet 0 to 12	gauss
	.,

#### Maximum Circuit Value:

Grid-No.1 Circuit Resistance. . . . . . 1.5 max. megohms

For Y-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

<sup>\*</sup> includes implosion protection hardware.

The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between 0 and + #00 volts with the combined grid-No.1 voltage and video-signal voltage adjusted to give an anode current of 200 microamperes on a 13-1/2-incr. by 19-inch pattern from an RCA-2F21 monoscope, or equivalent.

	PAN-O-PLY TYPE WITH MOUNTING LUCS 94° MAGNETIC DEFLECTION LOW-GRID-No.2 VOLTAGE LOW-VOLTAGE ELECTROSTATIC FOCUS CATHODE-DRIVE TYPE
	ELECTRICAL
	Direct Interelectrode Capacitances  ( ithough to all other electrode
	OPTICAL
•	Phosphor
	MECHANICAL
	Weight (Approx.)
	ont: '::::::for arounding
	Cap Recessed Small Cavity (JEDEC No.JI-21) Base Small-Button Neoeightar 7-Pin,

#### TERMINAL DIAGRAM (Bottom View)

Pin 1 - M. 12-4

Pin 2 - Cristo. 1

Proposition 1

Proposition 2

Pin 4 - Cristo. 1

Pin 5 - Pristo. 1

Pin 7 - Citros

Pin 8 - Arose (cristo. 7

(risto. 1) - Cree.

olistor 1

oritin 1 - Cristo. 1

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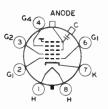
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Arrangement I, (JEDEC No. 87-208)

8 H R

#### MAXIMUM AND MINIMUM RATINGS. DESIGN-MAXIMUM VALUES

Voltages are fositive with respect to Grid No. 1

Anode Voltage 11000 min—23500 max	٧
Grid-No.4 Voltage	
Politike v 1 1250 max	٧
1. 1:11	٧
Grid-No.2 Voltage 20 min-70 max	٧
Cathode Voltage	
Legative peak alue 2 max	V
1 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	v
Politic til ville	v
	¥
	¥
Heater Voltage 5.7 min—6.9 max	٧
Peak Heater-Cathode Voltage	
herter regitive with respect to sthop:	
luning lungment withe with 100 ≤ 1 s . 450 max	٧
After a signment warm-according 300 max	٧
to tet to five with the fitter them:	
ombirilà si colti 200 max	٧
om: or : * 100 max	٧
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	

Anode Voltage									٧
Grid-No.4 Voltageb								200	٧
Grid-No. 2 Voltage.								50	٧
Cathode Voltage								34 to 52	٧

#### MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance . . . . . . . . . . . 1.5 max Max

1-KM ATTIVE FRANK A LEWS FELL (TREDF-KA) TOBES



a Includes implosion protection hardware,

b The grid-No, is clear tequired for opticum focus of any individual tube will have a value anywhere between 0 and 100 volts with the combined grid-No.1 voltage and videos signal voltage adjusted to give an anote outrent of 200 tring pression a 15-12 inch by 18-inch pattern from an RGA-2P21 monoscope or equivalent.

#### PAN-O-PLY -- INTEGRAL IMPLOSION PROTECTION

(Provided by Formed Rim and Welded Tension Bands around Periphery of Tube Panel—No Separate Safety-Glass or Integral Protective Window Required )

RECTANGULAR GLASS TYPE

ALUMINIZEO SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS

110° MAGNETIC OEFLECTION

NO ION-TRAP MAGNET REQUIRED

Low-Grid-No. 2-Voltage-for Cathode-Orive Operation

#### Electrical:

Direct Interelectrode Capacitinces:	
Cathode to all other electrodes	pf
Grid No.1 to all other electrodes 6	pf
External conductive conting to anode a. \$2500 max.	pf
1700 min.	pf
Heater Current at 6.3 volts 450 ± 20	ma
Heater Warm-Up Time (Average)	seconds
Electron Gun	Magnet

#### Optical:

PROSPROT (+c	or Curves,	see front	01 1012	26011011)	.145	ullide Type,
						Aluminized
Faceplate.	. <b></b>					.Filterglass
						42%

#### Mechanical:

Amight (Approx.)		 								. 2	8 1	bs
Overall Length .							1	4.	375"	±	. 28	31"
Nock Length								5.	125"	$\pm$	.1	25"
Projected Area o												
Fyternal Conduct												

Type Regular—Band Contact area for grounding Near Reference Line For Additional Information on Coatings, Dimensions, and Deflection Angles:

See Picture-Tube Dimensional-Outlines and Bulb Ji87 K sheets at the front of this section.

Basing Designation for BOTTO'' VIEW.......8HR

Pin	1 - Heater
	2-Grid No.1
Pin	3-Grid No.2
Pin	4 - Grid No.4
Pin	6-Grid No.1
Pin	7 - Cathode

PIN	4 - 6, rid No.4	
Pin	6-Grid No.1	
Pin	7 - Cathode	c <sub>2</sub> (2)
Pin	8 - Heater	- X
		(1)

	ANODE
G4(4	کی ہد
G23/	(Oc)
c <sub>(5)</sub>	A OK

(Grid No.3, Grid No.5, Screen, Collector) C - External

Cap - Anode

C - External Conductive Coating

## **23FDP4**

Maximum and Minimum Ratings, Design-Maximum Values:	
Unless otherwise specified, voltage values	
are positive with respect to grid No. 1	
Anode Voltage	volts volts
Grid-No.4 Voltage:	
Positive value 1250 max.	volts
Negative value 400 max.	volts
Grid-No.2 Voltage	volts
	volts
Cathode Voltage:	,
Negative peak value 2 max.	volts
Negative bias value 0 max.	volts
Positive bias value 100 max.	volts
Positive peak value	volts
Heater Voltage	volts
to.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 300 max.	volts
Heater positive with respect to cathode:	
Combined AC & DC voltage 200 max.	volts
DC Component 100 max.	volts

#### Typical Operating Conditions for Cathode-Drive Service:

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

wie positive with i	е.	21.	e c	ı	10	grid no.i	
Anode Voltage						18000	volts
Grid-No.4 Voltage*						200	volts
Grid-No.2 Voltage						50	volts
Cathode Voltage for visual							
extinction of focused raster						34 to 52	volts
Field Strength of required							
adjustable Centering Magnet.	٠	٠				0 to 12	gauss

#### Maximum Circuit Value:

Grid-No.1 Circuit Resistance . . . . . 1.5 max. megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



 $fantsymbol{a}$  Includes implosion protection hardware.

The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere betaeen 0 and +000 volts with the combined grid-No.1 voltage and video-signal voltage adjusted to give an andoc current of 200 microamperes on a 13-1/2-inch by 18-inch pattern from an RCA-2F21 monoscope, or equivalent.

## 23FMP4

## Picture Tube

PAN-O-PLY-INTEGRAL IMPLOSION PROTECTION

(Provided by Formed Rim and Welded Tension Bands around Periphery of Tube Panel—No Separate Safety-Glass or Integral Protective Window Required)

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN
LOW-VOLTAGE ELECTROSTATIC FOCUS 1100 MAGNETIC DEFLECTION
NO 10N-TRAP MAGNET REQUIRED

The 23FMP4 is the same as the 23ETP4 except for the following item:

Electrical:

Heater Current at 6.3 volts. . . . . . . . . 450 ± 20 ma



	I ICIOI E TODE
FILLED-RIM TYPE	LOW GRID-No.2 VOLTAGE
least letaellested Consitered	
rect Interelectrode Capacitances Cathor to all other electrodes Grillolto :ll other electrodes	5 pF 6 pF
fixternal on surfive costing to anoma	1700 min-2500 max pF
Heater Current at 6.3 V	450 ± 20 mA
Electron Gun	
OPTICAL	
Phosphor	
To curves, see front of this ection aceplate.	Filterglass
light transmission at centur (Approx.	
MECHAN I CAL	
Weight (Approx.)	29 15
verall Length	. 14.250 ± .281 ir
Neck Length	282 sa ir
External Conductive Coating	
Type ( m. mroutly: lattritudity	Regular-Band
Cap Recessed Small C	Cavity (JEDEC No.JI-21
Base Small-Bu	itton Neoeightar 7-Pin.
Arrangemen	nt I, (JEDEC No.B7-208)
TERMINAL DIAGRAM (Bottom	n View)
Pir i - Heater	ANODE
Pin 2 = Ori + No.1	G4 4 D
Pin 3 = Sri: No.2 Pin 1 = 2 1 10.4	7 7 7 7 5
Pin u = arid No.1	(3) ( <u> </u>
Pin 7 - ithod	
Pin 8 - Heuter	2 7 17.
Cip - inoin (Gris 10.3, Grid Gri	(2) T <sub>K</sub>
Christernal Conjuctive	1 8
Costina	H 8HR H

#### MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

Voltages are positive with respect to grid No. 1

Anode Voltage						11000 min—23000 max	٧
Grid-No.4 Voltage							
Positive valu.						1250 max	٧
hegitive vilur.						400 max	٧
Grid-No.2 Voltage						25 min-60 max	٧
Cathode Voltage							
'argit' ic pelik vi	,1	į ne				2 max	٧
Yegitive bir v						0 max	٧
Postin bir .:						100 max	٧
Posit . + Disk	1	, .				150 max	٧
Heater Voltage						5.7 min-6.9 max	v

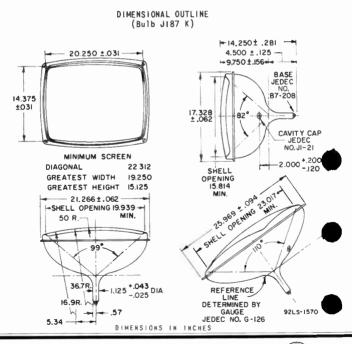


Peak Heater-Cathode Voltage Heater require with respect to cathodes:	
During equipment warm-up period < 10 s 450 max	٧
After equipment warm-up period 300 max	v
Heater positive with respect to dathora:	
Combined AC & DC voltage 200 max	٧
DC component 100 max	٧
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	
Voltages are positive with respect to grid No.1	
Anode Voltage	٧
Grid-No.4 Voltage 0 to 400	Ý
Grid-No.2 Voltage 50	٧
Cathode Voltage 32 to 50	٧
For visual extinction of foculer raster	
Field Strength 0 to 10	G
Of required adjustable centering magnet	
MAXIMUM CIRCUIT VALUE	

1.5 max

MO

Grid-No.1 Circuit Resistance. . . . a Includes implosion protection hardware.



	Ticiore Tobe
FILLED-RIM TYPE	OO MAGNETIC DEFLECTION
Direct Interelectrode Capacitances  Catlode to all other electrode  Gristool to all other electrode  External conductive costing to anode a Heater Current at 6.3 V Heater Warm-Up Time (Average)  Electron Gun Type Requir	6 pF 1700 min—2500 max pF 600 ± 30 mA
OPTICAL	
Faceplate	alfide Type, AlumInized
MECHANICAL	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Weight (Approx.)	14.875 + .281 in 5.125 + .125 in 282 sq in
Cap	. Near Reference Line Cavity (JEDEC No.JI-21) Itton Neoeightar 7-Pin, It I, (JEDEC No.B7-208)
- ANODE	•
Pir 1 - M. Car  Pin 2 - C - i y in. i  D - C g - i y in. i  Pin 1 - Grid No. 1  Div C y - i y in. i  Pir 7 - C - i o p  Pir 8 - i o y in.	C:p - Anodo (Gristos) (Gristos) Screen (olletor) Colletor) Condition (outral
MAXIMUM AND MINIMUM RATINGS, DESIG	N-MAXIMUM VALUES
Voltages are positive with resp	ect to cathode
Anode Voltage	11000 min—23000 max V 1100 max V 550 max V 200 min—550 max V
Grid-No.1 Voltage  The intide (Fire Volta)  The gride time volta  Portive time volta  For the presente  Heater Voltage.	220 max V 155 max V 0 max V 2 max V 5.7 min—6.9 max V

Peak Heater-Cathode Voltage			
Heater negative with respect to cathode:  During equipment warm-up period ≤ 15 s.  After equipment warm-up period		450 300	
Heater positive with respect to cathode: Combined AC & DC voltage.		200	

#### TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE

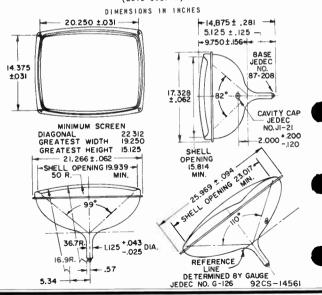
Voltages are positive with respect to grid No. 1

Anode Voltage	18000 V
Grid-No.2 Voltage	300 V
Cathode Voltage	28 to 62 V
For visual extinction of focused rater  Field Strength	
Of required adjustable centering magnet	

#### MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance. . . . . . . . . . 1.5 max MC

#### DIMENSIONAL OUTLINE (8ulb J187 K)



a includes implosion protection hardware.

SHORT RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 1140 MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

Electrical:	E	lec	tr	ica	1:
-------------	---	-----	----	-----	----

Cathode to all other electrodes 5	
	f
Grid No.1 to all other electrodes 6	f
External conductive coating to anode. \( \begin{cases} 2500 max & p \\ 1700 min & p \end{cases} \)	f
1700 min.	f
Heater Current at 6.3 volts 600 ± 60 m	а
Heater Warm-Up Time (Average)	S
Electron Gun Type Requiring No Ion-Trap Magne	t

#### Optical:

Phosphor (for curv	es, see front of	this Section).	P4-Sulfide Type,
			Aluminized
Faceplate	<b></b>		Filterglass
Light transmiss	sion (Approx.).		78%

#### Mechanical:

Weight (Approx.).												٠			24	lbs	
Overall Length								13-	10	1/	161	١.	F 5	/16'	' -	1/4"	
Neck Length	i				,								4-	3/8	· ±	1/8"	
Projected Area of	S	cr	ee	n.									,	282	sa.	in.	
External Conductiv																	
_					,									1 1		Dood	

Contact area for grounding. . . . . . Near Reference Line For Additional Information on Coatings and Dimensions:

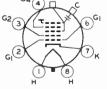
See Picture-Tube Dimensional-Outlines and Bulb Ji87 B sheets at front of this section 

. . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No. B7-208) Basing Designation for BOTTOM VIEW. . . . . . . . . . 8HR

ANODE

Pin 1-Heater Pin 2-Grid No. 1 Pin 3-Grid No. 2 Pin 4 - Grid No. 4 Pin 6 - Grid No. 1 Pin 7 - Cathode

Pin 8 - Heater



Grid No.5. Screen. Collector C - External Conductive Coating

(Grid No.3.

Cap - Anode

## **23FP4A**

Maximum and Minimum Ratings, Design-Maximum Values:								
Unless otherwise specified, voltage val-								
ues are positive with respect to cathode								
ANODE VOLTAGE	volts							
GRID-No.4 (FOCUSING) VOLTAGE: Positive value								
Negative value	volts							
GRID-No.2 VOLTAGE	volts							
GRID-No.1 VOLTAGE:	volts							
Negative peak value 200 max.								
Negative bias value								
Positive bias value 0 max.	volts							
Positive peak value 2 max. HEATER VOLTAGE	volts							
HEATER VOLTAGE	volts volts							
Heater negative with respect to cathode: During equipment warm-up period								
not exceeding 15 seconds 450 max.								
After equipment warm-up period 200 max. Heater positive with respect to cathode:	volts							
Combined AC and DC voltage 200 max.	volts							
DC component 100 max.	volts							
Typical Operating Conditions for Grid-Drive Service:								
Unless otherwise specified, voltage val-								
ues are positive with respect to cathode								
Anode Voltage	volts							
Grid-No.4 Voltage 0 to 400	volts							
Grid-No.2 Voltage	volts							
	VOITS							
Maximum Circuit Value:								

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

Grid-No.1-Circuit Resistance. . . . . . 1.5 max. megohms



	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
PAN-O-PLY TYPE NO ION-TRAP MAGNET REQUIRED	LOW-VOLTAGE ELECTROSTATIC FOCUS
Heater Current at 6.3 V Heater Warm-Up Time (Average	rodes
0	PTICAL
Phosphor For curves, see front of the faceplate	
Light transmission at cont	er (Antro)./ 42%
MEG	CHANICAL
Overall Length  Neck Length  Projected Area of Screen.  External Conductive Coating <sup>a</sup>	
Contact area for grounding Cap Reces	Near Reference Line sed Small Cavity (JEDEC No.JI-21) Small-Button Neoeightar 7-Pin, Arrangement I, (JEDEC No.B7-208)
TERMINAL DIA	RAM (BOTTOM VIEW)
	ANODE
Pir 1 - Hester Pir Gris Nr.: Pin 3 - Fris No.: Pin 4 - Gris No.: Pin 7 - Cathode Fir 5 - Mester	Cip - Anode  /arid /  Gris hos.  /creen.  Col'-rour)  Conductive  Costing
MAXIMUM AND MINIMUM RAT	INGS, DESIGN-MAXIMUM VALUES
loltages are positii	e with respect to cathode
Grid-No.4 Voltage For it is enabled Grid-No.2 Voltage	
Grid-No.1 voltage  Nedative peak value  Positive bias value  Positive bias value	0 max V
Heater Voltage	5.7 min — 6.9 max V

Heater Voltage. . .

5.7 min - 6.9 max

Peak Heater-Cathode Voltage Heater regarise with respect to cathode: During equipment warm-up period ≤ 15 s 450 max  V
After equipment warm-up period 300 max V Heater positive with respect to cathode:
Combiner AC & DC voltage 200 max
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE
Voltages are positive with respect to grid No.1
Anode Voltage
For visual extinction of focused raster
Field Strength 0 to 12 G Of required adjustable centering magnet
MAXIMUM CIRCUIT VALUE
Grid-No.1 Circuit Resistance 1.5 max MC2
The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between 0 and *100 volts with the combined grid-No.1 voltage and video-signal voltage adjusted to give an anode current of 200 microamperes on a 13-1/2-inch by 18-inch pattern from an RCA 2F21 monoscope, or equivalent.
DIMENSIONAL OUTLINE
FOR PICTURE TUBE UTILIZING BULB JIB7K WITH MOUNTING LUGS
- 14,875 ± 281
→ 9750° 156 → 5125
15.650  14.480 2 188  15.650  16.650 2 125  RIM-BAND OPENING 15.930 MIN  CAVITY CAP CAPE CAP LEDEC
MINIMUM SCREEN DI AGONAL 22 312 GREATEST WIDTH 19 250 GREATEST HEIGHT 15 125  - 20 650 1,125 - RIM-BAND OPENING 19 900 MIN. 19 900 MIN. 16 98

REFERENCE LINE DETERMINED BY GAUGE JEDEC NO. G-126

92CL- 13501

--1125 +.043 DIA.

BASE JEDEC No.B7-208

DIMENSIONS IN INCHES

## **23HFP4A**

## Picture Tube

#### PAN-O-PLY-INTEGRAL IMPLOSION PROTECTION

(Provided by Formed Rim and Welded Tension Bands Around Periphery of Tube Panel - No Separate Safety-Glass or Integral Protective Window Required)

LOW-VOLTAGE ELECTROSTATIC FOCUS 1100 MAGNETIC DEFLECTION NO ION-TRAP MAGNET REQUIRED

The 2MFP4A is the same as the 23ETP4 except for the following items:

#### ELECTRICAL

Heater current at 6.3 volts. . . . . . . . . . 450 ± 20 mA

#### MECHANICAL

External Conductive Coating

Contact in a for grounding . . . . . Near Reference Line



				Pic	ture	Tuk	эe
PAN-Û	-PLY TY				SS CTROSTAT	TIC FO	cus
Direct Interelectro Cathone to all ot Grid No.1 to all External conductiv Heater Current at 6 Heater Warm-Up Time Electron Gun	other elections of the coation of th	ctroles lectroding to an	des	1700 mi 4	50 ± 20		pF pF pF mA s
Phosphor		OPTICA		lfide l	ype, Al	umlei:	7 6 d
For curves, see faceplate	ront of	this s	section		Fil		
Light transmissio							
		ECHANI					
eight (Approx.) verall Length eck Length rojected Area of S xternal Conductive	creen.	 				±.125	in in
Type (see CRT OUTLI Cortact area for Cap	ground's	rg essed S Sπ	imall C mall-Bu	. Near avity ( tton Ne	Refere JEDEC Noeighta	ence L lo.JI-2 ir 7-P	ine 21) in,
TER)	MINAL DI				IEDEC No	.8/-2	J8 )
Pir 1-Heater Pin 2-Grid No.1 Pin 3-Grid No.2 Pin 4-Grid No.2 Pin 6-Grid No.1 Pin 7-Cathode Pin 8-Heater	G <sub>4</sub> G <sub>2</sub> G <sub>1</sub> 2	ANO	ODE ODE ODE	S <sub>I</sub>	Grid Scr- Coll C-Exter	No.5 No.5 ector mal	)
MAXIMUM AND M	INIMUM R	8 HR ATINGS	. DEST	SN-MAXII	MUM VALI	HES	
Voltages ar							
node Voltage					n-2300		٧
Grid-No.4 Voltage Positive value Negative value Grid-No.2 Voltage .		· · • ·		5	00 max 50 max n-550	max	V V
Grid-No.1 Voltage Negative peak val Negative bias val Positive bias val	ue	· · · ·			20 max 55 max 0 max		V V
Positive peak val Heater Voltage	Le .			5.7 mi	2 max n-6.9	max	V

A G G C F

#### Peak Heater-Cathode Voltage

Heater regative with respect to cathode:		
During equipment warm-up period ≤ 15 s	450 max	٧
After equipment warr-up period	300 max	٧
Heater positive with respect to cathode:		
Combined AC & DC voltage	200 max	٧
DC component	100 max	Ý
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE		
TITICAL OFERATING CONDITIONS FOR CATHODE-DRIVE	SEKAICE	
Voltages are positive with respect to grid	No. 1	
node Voltage	18000	٧
rid-No.4 Voltage <sup>b</sup>	200	Ý
irid-No.2 Voltage	300	Ý
athode Voltage	28 to 62	٧
For visual extinction of focused raster		
ield Strength	0 to 12	G
Of required sojustable centering magnet		

#### MAXIMUM CIRCUIT VALUE

Grid-No.1 Circuit Resistance. . . . . 1.5 max

X-RADIATION FRECAUTIONS FOR CATHODS-RAY TUBES DIMENSIONAL OUTLINE (Bulb J187 K With Mounting Lugs)

#### 21,266 - 14.875 ± .281 -- 4 5,125 9750 20402 ± 188 ±156 ±.125 2000

16650

±125

RIM-BAND

**OPENING** 

15.930

15650 14480 ±188 MINIMUM SCREEN

GREATEST WIDTH

GREATEST HEIGHT 15.125

20.650 ± 125 RIM-BAND OPENING 19.900 MIN 36 7R

50 R

99

DIAGONAL

16.9 R

CAP JEDEC 26,000 MAX. No.J1~21 23625\* 25 HIM-TANK OFF WIN

821

DIMENSIONS IN INCHES

- Indicates d change.

92CL | 15887

1.125 +.031 DIA. 570 BASE +5.34 - JEDEC No. B7 - 208

22.312

19.250

REFERENCE LINE DETERMINED BY GAUGE JEDEC No.G-126

+.200

-120

CAVITY

Includes implosion protection hardware.

The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between 0 and +400 volts with the combined grid-No.1 voltage and video-signal voltage adjusted to give an anode current of 200 microamperes on a 13-1/2-inch by 18-inch pattern from an BCA-2F21 monoscope, or equivalent.

## **23HUP4A**

## Picture Tube

PAN-O-PLY TYPE LOW-GRID-No.2 VOLTAGE LOW-VOLTAGE ELECTROSTATIC FOCUS 110° MAGNETIC DEFLECTION

#### ELECTRICAL

Direct I	nterelec	trode C	apaci	tance	2 S				
	. to :11							5	pF
	o.1 to :1							6	pF
5 x * < ffr	1 con is	1 0	atic:				1700	min-2500	max pF
Heater C	urrent a	t 6.3 v	olts					450 ± 20	mA
Heater W	arm-Up T	ime (Av	erage	:)				11	S
Electron	Gun			Туре	Req	uiri	ng No	Ion-Trap	Magnet
Focus Le	ns,							Unipo	tential
Electron	Gun	ì .		Туре	Req	uiri	ng No	lon-Trap	Magnet

#### OPTICAL

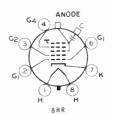
Phosphor		P4—\$u1fi	de	Type,	. Aluminize	d
For iries, in tront of	tris	· ction				
Faceplate					Filterglas	S
Filt that in Hon there	*	prioz.l.			42	%

#### MECHANICAL

Weight (App	rox.).								28	1ь
Overall Len	gth							14.125	± .281	in 🗢
Neck Length								4.375	t - 125	in 🕳
Projected A									282 sq	in
External Co	nductiv	e Coa	ting	<sub>J</sub> a						
, Dr								Re	gular-Ba	an d
Corr.		200					M	and Dafa	1	

#### TERMINAL DIAGRAM (Bottom View)

Pin . -theather
Pin 2 - Granian.
Pir 3 - Granian.
Pir 3 - Granian.
Pir 1 - ar a tho.
Pir 4 - ar a tho.
Pir 7 - tatho.
Pir 8 - be ar
a - from (ania to.)
collector
( - atomal Conia tive
Collector)



#### MAXIMUM AND MINIMUM RATINGS. DESIGN-MAXIMUM VALUES

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

are positive with respect to great no. 1	
Anode Voltage	٧
	v
Politice val	•
Negitive value 400 max	V
Grid-No.2 Voltage 20 min—60 max	٧
Cathode Voltage	
Negative peak value 2 max	V
Negative bias value 0 max	V
Positive bias value 100 max	V
Positive pesk value 150 max	V
Heater Voltage 5.7 min-6.9 max	v
Peak Heater-Cathode Voltage	•
Heater negative with respect to cathode:	
During equipment warm-up perio:	
	V
After equipment warm-up perios . 300 max	٧
Heater positive with respect to cathode:	
Combined AC and DC voltage 200 max	V
DC omportion 100 max	٧
TYPICAL OPERATING CONDITIONS FOR CATHODS BRIVE SERVICE	
TYPICAL OPERATING CONDITIONS FOR CATHODE-DRIVE SERVICE	
Unless otherwise specified, rollage values	
are positive with respect to grid No.1	
Anode Voltage	V
	v
Grid-No.4 Voltage 200	,
Grid-No.2 Voltage	V
Cathode Voltage	¥
For virual estimation of today are to	

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance . . . . . . .

. . . . . . 0 to 12

Field Strength of required adjustable

centering magnet. . . .

For -- radiation sri-fairs on 'der: 'ns. He sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



a Includes implosion protection hardware.

Includes implosion protection narrowser.

The grid-No.4 voltage required for optimum focus of any individual tube will have a value anywhere between 0 and +400 volts with the combined grid-No.1 voltage and video-signal voltage adjusted to give an anode current of 200 microamperes on a 18.5-inch by 18-inch pattern from an RtA-2F21 monoscope, or equivalent.

## **23HWP4A**

## Picture Tube

110° MAGNETIC DEFLECTION LOW GRID-No.2 VOL	TAGE
ELECTRICAL	
Direct Interelectrode Capacitances	
Cathode to all other electroses 5	ρF
Gris vo.1 to all other electrose 6	ρF
External conjuctive costing to	
anod-a,	ρF
Heater Current at 6.3 V	mA
Heater Warm-Up Time (Average) 11	S
Electron Gun Type Requiring No Ion-Trap Ma	anet
OPTICAL	3
Phosphor	ized
For curve, extront of this section	1200
Faceplate Filterg	lass
Light tours soon at center (Approvidence of the content of the con	
MECHANICAL	
	8 1b
Overall Length	
Neck Length 5.125 ± .12	
Projected Area of Screen 282 s	
External Conductive Coating	
Type (See (BT OUTLINES lat front of this section) Regular-	Band
Lontactar 1 tor grounding Near Reference	
Cap Recessed Small Cavity (JEDEC no.JI	-21)
8ase Small-Button Neoeightar 7-	Pin,
Arrangement I. (JEDEČ No.87-	208)
TERMINAL DIAGRAM (Sottom View)	
Pin 1 - Heater Anoge (a) - Anoge	
Fin 2-2' 1'.J., G4(4) 17 6 (G. J'n	5
Philagristo.	
Pin 1 - art 1 30 d G2 - X GG Scrup	
611.c.	r }
Pir 7 - C - hose	
on:. i	
<u> </u>	
8 H R	
MAXIMUM AND MINIMUM RATINGS. DESIGN-MAXIMUM VALUES	
Voltages are positive with respect to grid No. 1	
Anode Voltage	٧
Grid-No.4 Voltage	•
Politive value 1250 max	٧
10 max	v
Grid-No.2 Voltage 30 min—70 max	v
Cathode Voltage	•
** 1 1 1 1 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1	V
Verstise til value O max	V
	V

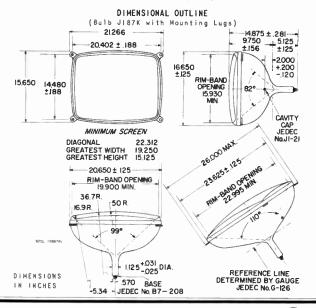
PAN-O-PLY TYPE WITH MOUNTING LUGS

150 max

Heater Voltage Peak Heater-Cathode Voltage				min-	—6.9 max	٧
Heater negative with relow During equipment warm-up After equipment warm-up Heater positive with reloe	perio	d≤ 15 1	s .		450 max 300 max	V
Ombined AC % (XC voltage DC omponent	: : :	: : :	:::		200 max 100 max	٧
Voltages are positive Anode Voltage	with	respe	ct to	grid		٧
Grid-No.4 Voltage Grid-No.2 Voltage			: :		0 to 400 50	V V
for visual extinction of fi Field Strength	ocus <b>e</b> c	rast			32 to 50 0 to 10	V G
Oʻreqird ajjastable cen MAXIMUM	CIRCUI	T VAL	.UE			
Grid-No.   Circuit Resistance					1.5 max	M.2

For X radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section

Includes implosion protection hardware.



BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS LOW-GRID-NO.2 VOLTAGE ALUMINIZED SCREEN 110° MAGNETIC DEFLECTION CATHODE-DRIVE TYPE

With Heater Having Controlled Warm-Up Time

GENERAL DATA	
Electrical: Direct Interelectrode Capacitances: Cathode to all other electrodes Grid No.1 to all other electrodes External conductive coating to anode. Heater Current at 6.3 volts	5 pf 6 pf {2500 max. pf 2000 min. pf 450 ± 25 ma 11 seconds
Optical: Phosphor (For curves, see front of this section) Faceplate and Protective Panel Light transmission (Approx.)	Filterglass
Mechanical:  Weight (Approx.)	
н	Can - Anode

		н
Pin	2 - Cathode	H_ (4) GI
Pin	3 - Heater	(3) (5)
Pin	4 - Heater	7 K
Pin	5 - Grid No.1	K(2) [===7] (6)G4
Pin	6-Grid No.4	
Pin	7 - Grid No. 2	
		c C C C C C C C C C C C C C C C C C C C
		**************************************
		ANODE

Cap - Anode
(Grid No.3,
Grid No.5,
Screen,
Collector)
C - External
Conductive

Coating

Maximum and Minimum Ratings, Design-Maximum Values:						
Unless otherwise specified, voltage val-	_					
ues are positive with respect to grid No. 1						
ANODE VOLTAGE	volts volts					
GRID-No.4 (FOCUSING) VOLTAGE: Positive value	volts					
Negative value	volts volts					
144 min.	volts					
CATHODE VOLTAGE: Negative peak value 2 max. Negative bias value 0 max.	volts					
Positive bias value	volts					
	volts volts					
HEATER VOLTAGE	volts					
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds						
Typical Operating Conditions for Cathode-Drive Service:						
Unless otherwise specified, voltage val-						
ues are positive with respect to grid No. 1						
Anode Voltage	volts volts volts					
Maximum Circuit Value:						
Grid-No.1-Circuit Resistance 1.5 max. m	negohms					

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS ALUMINIZED SCREEN MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

Electrical:
Heater Current at 6.3 volts 600 ± 30 ma Heater Warm-Up Time (Average)
External conductive coating to ultor. \\ \begin{pmatrix} 2500 max & \mu if \\ 1700 min & \mu if \end{pmatrix}
Focusing Method
Diagonal
Optical:
Faceplate
Fluorescence
Mechanical:
Tube Dimensions: Overall length
Center Intermediate Edge
External surface 50" - 36-3/4" Internal surface 30" 48" 24" Screen Dimensions (Minimum):
Greatest width

## 23MP4

(Peak positive) .

Base Small-Button Neop	
Basing Designation for BOTTOM V	(JEDEC No.87-208)
Fin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode Pin 8 - Heater	Cap-Ultor (Grid No.3, Grid No.5, Collector) C-External Conductive Coating
GRID-DRIVE . S	SERVICE
Unless otherwise specifi	
are positive with res	spect to cathode
Maximum and Minimum Ratings, Desig	n-Maximum Values:
ULTOR VOLTAGE	
DETOR VOLTAGE	111000 min. volts
GRID-No.4 (FOCUSING) VOLTAGE:	•
Positive value	
Negative value	
GRID-No.2 VOLTAGE	\\ 550 max. volts \\ 200 min. volts
GRID-No.1 VOLTAGE:	(200 Min. Voits
Negative-peak value	220 max. volts
Negative-bias value	
Positive-bias value	0 max. volts
Positive-peak value	2 max. volts
HEATER VOLTAGE	∫6.9 max. volts
	iii ∫5.7 min. volts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up per	riod
not exceeding 15 seconds.	
After equipment warm-up peri	iod 200 max. volts
Heater positive with	200
respect to cathode	200 max. volts
Equipment Design Ranges:	
With any ultor voltage $(E_{C,5}k)$ be and $grid-No.2$ voltage $(E_{C,2}k)$ be	tween 11000 and 22000 volts etween 220 and 550 volts
Grid-No.4 Voltage	_
for focus	0 to 400 volts
of focused raster Se	Raster-Cutoff-Range Chart for Grid-Drive Service
Grid-No:1 Video Drive from	for Gria-prive Service
Raster Cutoff (Black level):	
White level value	
(Peak nositive)	Same value as determined



positive voltage

.... Same value as determined for  $E_{\text{Clk}}$  except video drive is a

_	Grid-No.4 Current25 to +25 Grid-No.2 Current15 to +15	µа µа
	Field Strength of Adjustable Centering Magnet* 0 to 8	gausses
	Examples of Use of Design Ranges:	
	With ultor voltage of 18000 and grid-No.2 voltage of 400	volts volts
_	Grid-No.4 Voltage for focus 0 to 400 Grid-No.1 Voltage for visual	volts
	extinction of focused raster36 to -94 Grid-No.1 Video Drive from Raster Cutoff (Black level): White level value	volts
	Maximum Circuit Values:	
_	Grid-No.1-Circuit Resistance 1.5 max.	megohms
	CATHODE-DRIVE♦ SERVICE	
	Unless otherwise specified, voltage values	
	are positive with respect to grid No. 1	
	Maximum and Minimum Ratings, Design-Naximum Values:	1.
	ULTOR-TO-GRID-No.1 VOLTAGE	volts
	GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE: Positive value	volts
	Negative value 400 max.	volts
	GRID-No.2-TO-GRID-No.1 VOLTAGE	volts
	GRID-No.2-TO-CATHODE VOLTAGE 550 max.	volts
	CATHODE-TO-GRID-No.1 VOLTAGE: Pcsitive-peak value	volts
	Positive-bias value	volts
	Negative-bias value 0 max.	volts
	Negative-peak value 2 max.	volts
	HEATER VOLTAGE	volts
	PEAK HFATER-CATHODE VOLTAGE: Heater negative with respect to cathode: During equipment warm-up period	volts
	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 any ultor-to-grid-No.1 voltage $(E_{C,5g,1})$ between	11000
	and 22000 volts and grid-No.2-to-grid-No.1 voltage	Ec281)
	between 225 and 700 volts	
	Grid-No.4-to-Grid-No.1 Voltage for focus • 0 to 400	volts
_		



	er-Cutoff-Range Chart Cathode-Drive Service
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level): White-level value (Peak negative)Same value	alue as determined for
Grid-No.4 Current	-15 to +15 μa
Centering Magnet*  Examples of Use of Design Ranges:  With ultor-to-grid-	•
No.1 voltage of and grid-No.2-to- grid-No.1 voltage of	18000 volts 400 volts
Grid-No.4-to-Grid-No.1 Voltage for focus Cathode-to-Grid-No.1 Voltage for visual extinction	. 0 to 400 volts
of focused raster	. 36 to 78 volts
White-level value	36 to -78 volts
Grid-No.1-Circuit Resistance	. 1.5 max. megohms
▲ Grid erive is the operating condition in whi	

- the grid-wo.1 potential with respect to cathode.
- Individual tubes will have satisfactory focus at some value of grid-no.4 (or grid-no.4-to-grid-no.1) voltige between 0 and 400 volts under conditions with the combined bias voltage and video-signal voltage adjusted to produce an ultor current of 200 microamperes.
- Distance from Reference-Line for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the the center of the tube face.
- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid wo.1 and the other electrodes.

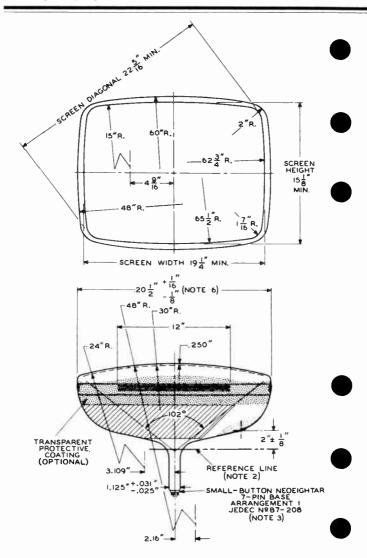
#### OPERATING CONSIDERATIONS

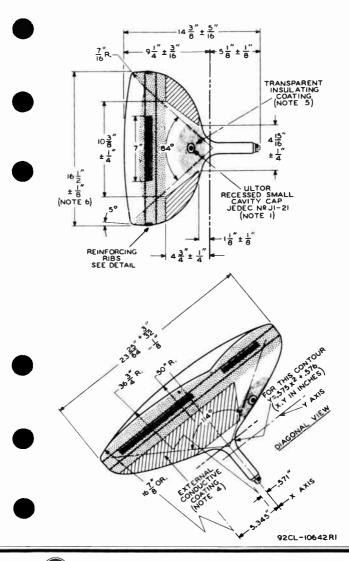
X-Ray Warning. when operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 22 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation may be needed to protect against possible injury from prolonged

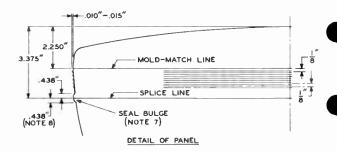


exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

Shatter-Proof Cover Over the Tube Face. Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this 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.



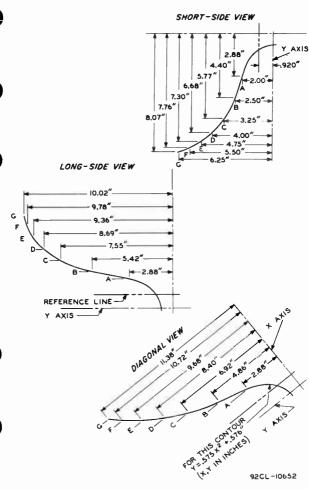




- NOTE I: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.
- NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC NO.G-126 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BERIGIDLY MOUNT-ED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUITRY CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".
- **MOTE 4:** EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.
- MOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRYLINT-LESS CLOTH.
- NOTE 6: MEASURED AT THE MOLD-MATCH LINE.
- NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE IN-DICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN I/B", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN I/16" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMEN-SIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.
- NOTE 8: AREA BETWEEN MOLD-MATCH LINE AND SEAL BULGE IS 1/2" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF ASPHALT, IMPREGNATED FELT OR EQUIVALENT.

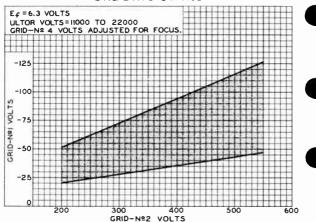


#### BULB-CONTOUR DIMENSIONS



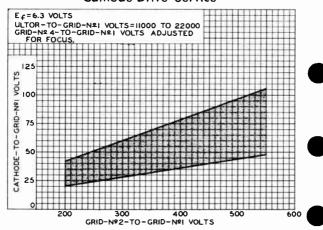
NOTE: PLANES A THRU G ARE NORMAL TO THE TUBE AXIS AND AT FIXED LOCATIONS FROM THE Y AXIS. THESE COORDINATES DESCRIBE THE BOGIE-BULB EXTERNAL CONTOUR IN PLANES THROUGH THE TUBE AXIS AND THE RESPECTIVE FACEPLATE AXES.

### RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service



92CS-10620RI

#### Cathode-Drive Service



92CS-1062IRI



#### AVERAGE DRIVE CHARACTERISTICS

CATHODE -DRIVE SERVICE

F.F. = 6.3 VOLTS

ULTOR-TO-GRID-NºI VOLTS = 16000

CATHODE BIASED POSITIVE WITH

ULTOR-TO-GRID-NºI VOLTS = 16000
CATHODE BIASED POSITIVE WITH
RESPECT TO GRID NºI TO GIVE
FOCUSED RASTER CUTOFF.
RASTER FOCUSED

RASTER FOCUSED
AT AVERAGE BRIGHTNESS.

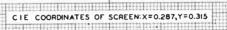
RASTER SIZE = 18"x 131/2"

GRID-DRIVE SERVICE E f = 6.3 VOLTS

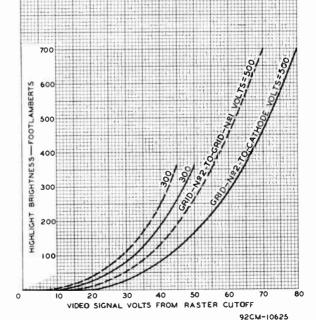
ULTOR VOLTS = 16000
GRID Nº I BIASED NEGATIVE WITH
RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.

RASTER FOCUSED AT AVERAGE BRIGHTNESS.

RASTER SIZE = 18"x13 5"



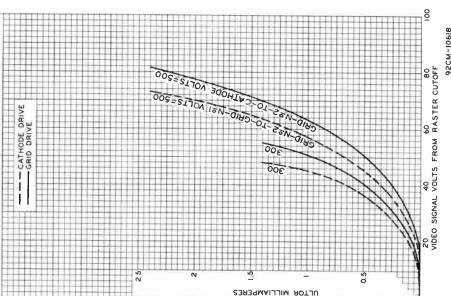
--- CATHODE DRIVE



# CHARACTERISTICS DRIVE AVERAGE



GRID-DRIVE SERVICE
Lf=6.3 VOLTS
ULTOR VOLTS=11000 TO 22000
GRID RR BIASED NEGATIVE WITH
REPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.



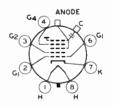


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#### Picture Tube

RECTANGULAR GLASS TYPE ALUMINIZED SCREEN LOW-VOLTAGE ELECTROSTATIC FOCUS LOW GRID-No. 2 VOLTAGE CATHODE-DRIVE TYPE
Electrical:
Direct Interelectrode Capacitances: Grid No 1 to all other electrodes. 6 pf Cathode to all other electrodes. 5 pf External conductive coating to anode 2500 max. pf 1700 min. pf
Heater Current at 6.3 volts
Optical:
Phosphor (For curves, see front of this Section) P4—Sulfide Type
Faceplate
Mechanical:
Weight (Approx.)
External Conductive Coating: Type
at front of this section Cap Recessed Small Cavity (JEDEC No.J1-21) Base Small-Button Neoeightar 7-Pin, Arrangement 1 (JEDEC No.B7-208) Basing Designation for BOTTOM VIEW 8HR
basing besignation for bollow VIEW 80K
Pin 1 - Heater

Pin 2 - Grid No.1
Pin 3 - Grid No.2
Pin 4 - Grid No.2
Pin 6 - Grid No.1
Pin 7 - Cathode
Pin 8 - Heater
Cap - Anode (Grid No.3,
Grid No.5, Screen,
Collector)
C - External
Conductive Coating



Maximum and Minimum Ratings, Design-Maximum Values:			
Unless otherwise specified, voltage values are positive with respect to grid No.1			
Anode Voltage	volts volts		
Grid-No.4 (Focusing) Voltage:   Positive value	volts volts volts		
Cathode Voltage:  Negative peak value.  Positive bias value.  Positive peak value.  Positive peak value.  Positive peak value.  Heater Voltage.  2 max. 6.9 max. 5.7 min.	volts volts volts volts volts volts		
Peak Heater-Cathode voltage: Heater negative with respect to cathode: During equipment warm-up period not	volts volts volts volts		
Typical Operating Conditions for Cathode-Drive Service:  Unless otherwise specified, voltage values are positive with respect to grid No. 1			
Anode Voltage	volts volts volts		
Maximum Circuit Value: Grig-No.1 Circuit Resistance 1.5 πax. m	egohms		

For X-radiation shielding consideration, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section



#### Picture Tube

BI-PANEL RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

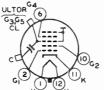
ALUMINIZED SCREEN 92° MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

#### GENERAL DATA

E1	ectrical:
He	pater Current at 6.3 volts 600 ± 5% manusater Marm-Ur Time (Average)
A LI	lectron Gun Type Requiring No Ion-Trap Magnet
0p	otical:
	aceplate and Protective PanelFilterglass Light transmission (Approx.)
Me	echanical:
We Ov Ne Pi	rerating Position
	Aternal Conductive Coating: Type
● C:	at the front of this section  ap

Pin 1-Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10 - Grid No. 2 Pin 11 - Cathode Pin 12 - Heater



Cap - Ultor (Gria No.3, Grid No.5, C - External Conductive Coating

(JEDEC Group 4, No. B6-203)

#### 23YP4

Maximum and Minimum Ratings, Design-Maximu	ım Values:	
ULTOR VOLTAGE	(22000 max.	volts
	12000 min.	volts
GRID-No.4 (FOCUSING) VOLTAGE:		
Positive value	1100 max.	volts
Negative value	550 max.	volts
GRID-No.2 VOLIAGE	550 max.	volts
GRID-No.1 VOLTAGE:		
Negative peak value	220 max.	
Negative bias value	155 max.	
Positive bias value	0 max.	
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm—up period not exceeding 15 seconds	450	-14-
After equipment warm-up period	450 max.	
Heater positive with	200 max.	volts
respect to cathode	200 may	
	ZUU IIIdX.	VULLS
Typical Operating Conditions:		
With ultor voltage of	16000	volts
and grid-No. 2 voltage of	300	volts
Grid-No.4 Voltage for focus		
Grid-No.1 Voltage for visual extinction	0 10 400	V01(3
of focused raster	-35 to -72	volts
	J5 (0 12	
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance	1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



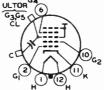
#### Picture Tube

RECTANGULAR GLASS TYPE
LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 90° MAGNETIC DEFLECTION

	TOWN TO CHARLE CECCHOOLATTO TOOGS 30 MAGNETTO DEL EEUTTON
	GENERAL DATA
	Electrical:
_	Heater Current at 6.3 volts 600 ± 10% ma Direct Interelectrode Capacitances:
	Grid No.1 to all other electrodes 6 μμf Cathode to all other electrodes 5 μμf
	External conductive coating to ultor
	Electron Gun Type Requiring No Ion-Trap Maynet
	Optical:
	Faceplate, Spherical
	Mechanical:
	Operating Position.
	Type
	at the front of this section
	Cap
	(JEDEC Group 4, No.B6-203) Small-Shell Ouodecal 6-Pin, Arrangement 1 (JEDEC Group 4, No.86-63) Basing Designation for BOTTOM VIEW

Pin 1-Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10-Grid No.2 Pin 11-Cathode Pin 12-Heater



Cap - Ultor (Grid No.3, Grid No.5, Collector) C - External Conductive Coating

#### **24AEP4**

Maximum Ratings, Design-Yaximum Values:	
ULTOR VOLTAGE	volts
Positive value 1100 max.	volts
Negative value	volts
GRID-No.2 VOLTAGE	volts
GRID-No.1 VOLTAGE:	1.
Negative bias value 155 max.	
Positive bias value 0 max.	
Positive peak value 2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with	
respect to cathode:	
During equipment warm-up period	
not exceeding 15 seconds 450 max.	
After equipment warm-up period 200 max.	volts
respect to cathode 200 max.	volts
Typical Operating Conditions:	
With ultor voltage of 18000	volts
and grid-No.2 voltage of 300	volts
Grid-No.4 Voltage for focus50 to +350	volts
Grid-No.1 Voltage for visual	VO113
extinction of focused raster28 to -72	volts
Maximum Circuit Values:	
Grid-No.1-Circuit Resistance 1.5 max.	megohms

For X-radiation shielding considerations, see sheet
X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this section





## CAALIDA

PECTANGULAR GLASS TYPE LOW-VOLTAGE FOCUS

ALUMINIZED SCREEN MAGNETIC DEFLECTION

DATA			
General:			
Heater, for Unicotential Cathode: Voltage 6.3 Current 0.6 ± 10% Direct Interelectrode Capacitances: Crid No.1 to all other electrodes Cathode to all other electrodes External conductive coating to ultor .  faceplate, Spherical	6 μμτ 5 μμτ 2500 max. μμτ 2000 min. μμτ Filterglass		
Phosphor (for curves, see front of this Section).  Fluorescence. Phosphorescence Persistence Focusing Method Deflection Method Deflection Angles (Approx.):	White		
Diagonal	No Ion-Trap Magnet		
Greatest height	22-11/16" ± 1/8" . 18-1/2" ± 1/8"		
Grentest width. Greatest height Diagonal Projected area. Weight (Approx.). Mounting Position Cap Recessed Small Cavity Bulb. Base Small-Butt			
Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.4 Pin 6 - Grid No.1 Pin 7 - Cathode Pin 8 - Heater	Cap - Ultor (Grid No.3, Grid No.5, Collector) C - External Conductive Coating		





#### PICTURE TUBE

#### GRID-DRIVE\* SERVICE

Unless otherwise specified, voltage values are positive

Unless otherwise specified, with respec	t to cathode		tive
Maximum Ratings, Design-Center	Values:		
ULTOR VOLTAGE. GRID-No.4 VOLTAGE: Positive value.		{20000 max. 12000 min. 1000 max.	volts
Negative value		500 max. 500 max.	volts
Negative peak value Negative bias value Positive bias value Positive peak value		200 max. 140 max. 0 max. 2 max.	volts volts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect During equipment warm-up p not exceeding 15 seconds After equipment warm-up pe Heater positive with respect	eriod  riod	410 max. 180 max. 180 max.	volts
Equipment Design Ranges:		200 1101	70115
With any ultor voltage $(E_{C_5k})$ and grid-No.2 voltage $(E_{C_2k})$	between 120 between 20	00 and 20000 00 and 500 v	volts
Grid-No.4 Voltage for Focus <sup>®</sup> Grid-No.1 Voltage (Ec.k) for Visual Extinc- tion of Focused Raster.	-50 to See Raster		volts
Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value			
(Peak positive)	Same valu Ec <sub>i</sub> k exce	e as determi pt video dri positive	ve is a
Grid-No.4 Current Grid-No.2 Current Field Strength of Adjust-	-25 to -15 to		μa μa
able Centering Magnet*  Examples of Use of Design Range	0 to	8	gausses
		_	
With ultor voltage of and grid-No.2 voltage of	14000 300	16000 400	volts
Grid-No.4 Voltage for Focus	-50 to +350	-50 to +350	volts
Grid drive is the operating condit the grid-No.1 potential with respe	ion in which tect to cathode.	he video signa	l varies
• § * See next page.			

#### PICTURE TUBE

	_
Grid-No.1 Voltage for Visual Extinction of Focused Raster28 to -72 -36 to -94 volt Grid-No.1 Video Drive from Raster Cutoff (Black Level): White-level value 28 to 72 36 to 94 volt	
Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max. megohn	ns
CATHODE-DRIVE® SERVICE	
Unless otherwise specified, voltage values are positive	Į
with respect to grid No. 1	
Maximum Ratings, Design-Center Values:	
ULTOR-TO-GRID-No.1 VOLTAGE	
GRID-No.4-TO-GRID-No.1 VOLTAGE:   Positive value	s
Positive peak value	s
not exceeding 15 seconds 410 max. volt After equipment warm-up period 180 max. volt Heater positive with respect to cathode . 180 max. volt	s
Equipment Design Ranges:	
With any ultor-to-grid-No.1 voltage (Ecsg.) between 12000 and 20000 volt	s
and grid-No.2-to-grid-No.1 voltage $(E_{C_2g_1})$ between 225 and 640 volt	s
Grid-No.4-to-Grid-No.1 Voltage for Focus§50 to +350 volt	t s
Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.	e
This value is a working design-center minimum. The equivalent absorber with eximisus ultor-or ultor-to-grid-No.1 voltage is 11000 volts, be low which the serviceability of the 2MANP will be impaired. The equipment designer has the responsibility of determining a minimudesign value such that under the worst probable operating condition involving supply-voltage variation and equipment variation the absorber with the supply-voltage variation and equipment variation the absorber with the supply-voltage variation and equipment variation the absorber with the supply-voltage variation and equipment variation the absorber with the supply-voltage variation and equipment variation the absorber with the supply voltage variation and equipment variation the absorber voltage variation and equipment variation the absorber voltage variation and equipment variation the absorber variation voltage variation and equipment variation the absorber variation variation the absorber variation vari	ems
*,§: See next page.	





Cathoge-to-Grid-No.1 Voltage (E <sub>Kg1</sub> ) for Visual Extinction of Focused Paster		-Cutoff-Rang		
Cathode-to-Grid-No.1 Video Drive from Paster Cutoff (Black Level):	jer Ca	thode-Drive	Service	
White-level value (Pear negative)	Ekq, exce	e as determi pt video dri negative	ve is :	
Grid-No.4 Current	-25 to	+25 +15	μα μα qausses	
Examples of Use of Design Ranges:				
With ultor-to-grid-No.1 voltage of and grid-No.2-to-grid-No.1	14000	16000	volts	
voltage of	3 20	400	volts	
Grid-No.4-to-Grid- No.1 Valtage for Focus Cathode-to-Grid-No.1 Voltage for Visual	-50 to +250	−50 ts +350	volts	
Extinction of Focuse: Raster	28 to 60	36 to 78	volt	

#### Maximum Circuit Values:

Video Drive from Raster Cutoff (Black Level):

Grid-No.1-Circuit Resistance. . . . . . 1.5 max. megonms

White-level value. . . . -28 to -60 -36 to -78

For X-ray shielding considerations, see sheet
X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES
at front of this Section

volte

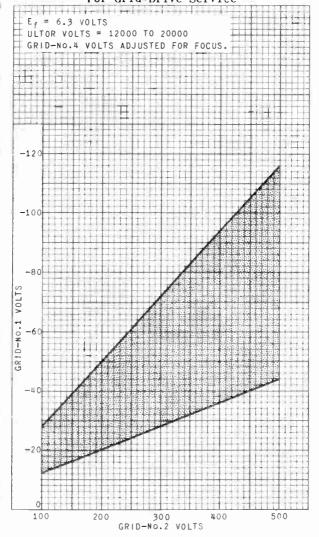
Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/4°. Fuluding extraneous 'ields, the center of the undeflected focused spot will fall within a circle having a 7/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

of the spot from the center of the table sectors of the spot from the center of the table of the spot focus of any individual tube is independent of ultor current and will remain essentially constant for values of ultor oltage (or ultor-togrif-No.1 voltage) or grid-No.2 voltage (or grid-No.2-to-grid-No.1 voltage) within design ranges shown for these items.



34AHP4

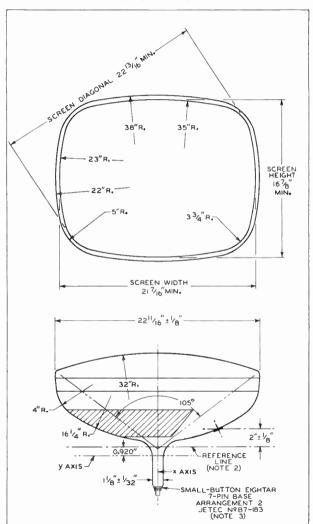




**ELECTRON TUBE DIVISION** RADIO COPPORATION OF AMERICA, HARRISON, NEW JERSEY ZAAHPA

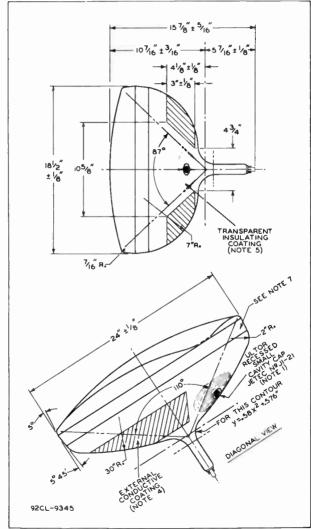
#### (**RCA**) 24AHP4

#### PICTURE TUBE



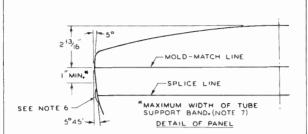








#### PICTURE TUBE



NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF + 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC NO. 126 (SHOWN AT FRONT OF THIS SECTION) 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 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREE-LY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

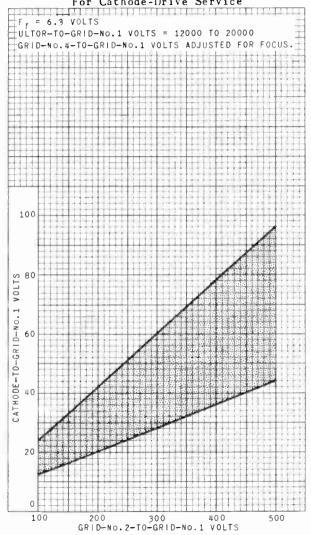
NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICAT-ED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD—MATCH LINE.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS I" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.



## 24AHP4

#### RASTER-CUTOFF-RANGE CHART For Cathode-Drive Service



24AHP4

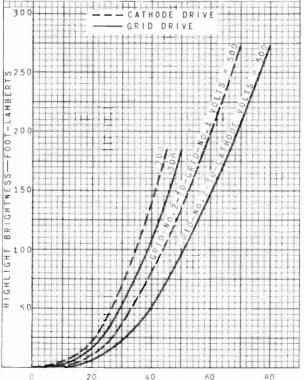


#### AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE Ef = 6.3 VOLTSULTOR-TO-GRID-No. 1 VOLTS = 16000CATHODE BIASED POSITIVE WITH RESPECT TO GRID No.1 TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED

AT AVERAGE BRIGHTNESS. RASTER SIZE = 21" x 16"

GRID-DRIVE SERVICE  $E_f = 6.3 \text{ VOLTS}$ ULTOR VOLTS = 16000 GRID NO.1 BLASED NEGA-TIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 21" x 16"



VIDEO SIGNAL

VOLTS FROM RASTER CUTOFF

#### AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE

Ef = 6.3 VOLTS

ULTOR-TO-GRID-NO.1
VOLTS = 12000 TO 20000

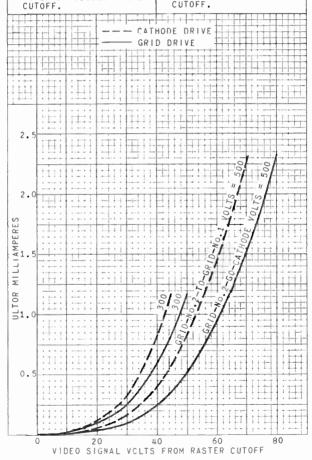
CATHODE BIASED POSITIVE WITH RESPECT TO GRID NO.1 TO GIVE FOCUSED RASTER GRID-DRIVE SERVICE

Ef = 6.3 VOLTS

ULTOR VOLTS =

12000 TO 20000

GRID NO.1 BLASED NEGATIVE
WITH RESPECT TO CATHODE
TO GIVE FOCUSED RASTER
CUTOFF.







## 24AUP4 PICTURE TUBE

PARUSA

RECTANGULAR GLASS TYPE

LOW-VOLTAGE ELECTROSTATIC FOCUS

With heater having controlled warm-up time

DATA		
General:		
Heater, for Unipotential Cathode:  Voltage 6.3 ac or dc volts  Current 0.6 ± 5%		
Direct Interelectrode Capacitances: Grid No.1 to all other electrodes 6 $\mu\mu$ f Cathode to all other electrodes 5 $\mu\mu$ f External conductive coating to ultor . {2500 max. $\mu\mu$ f [1700 min. $\mu\mu$ f Faceplate, Spherical Filterglass Light transmission (Approx.)		
Phosphor (For curves, see front of this Section).         P4—Sulfide Type Aluminized Fluorescence.           Fluorescence.		
Radius of curvature of faceplate (External surface) . 40"     Screen Dimensions (Minimum):		





#### PICTURE TUBE

Basing Designation for BOTTOM VIEW	
Pin 1-Heater Pin 2-Grid No.1 Pin 6-Grid No.4 Pin 10-Grid No.2 Pin 11-Cathode Pin 12-Heater	Cap - Ultor (Grid No.3, Grid No.5, Collector) C - External Conductive Coating
GRID-DRIVE* SERV	IICE
Unless otherwise specified, voltag	
Maximum Ratings, Design-Center Values	
	(20000 max, volts
ULTOR VOLTAGE	12000 min. volts
GRID-No.4 (FOCUSING) VOLTAGE: Positive value	. 1000 max. volts
Positive value	500 max. volts
GRID-No.2 VOLTAGE	500 max. volts
Negative-peak value	. 200 max. volts
Negative-bias value	
Positive-bias value	0 max. volts
Positive-peak value PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathor During equipment warm-up period not exceeding 15 seconds After equipment warm-up period Heater positive with respect to cathor	. 410 max. volts . 180 max. volts
Equipment Design Ranges:	1
With any ultor voltage (Ecsk) betwee	n 12000 and 20000 volts
and grid-No.2 voltage (Ec2k) betw	veen 200 and 500 volts
Grid-No.4 Voltage for focus§ Grid-No.1 Voltage (L <sub>C1k</sub> ) for visual extinction of	75 to +400 volts  Raster-Cutoff-Range Chart for Grid-Drive Service
	e value as determined for except video drive is a positive voltage25 + #25 #4

4-59

•,§: See next page.



# RAPUBB

#### PICTURE TUBE

Grid-No.2 Current	-15 t	u +15		سر
Field Strength of Adjustable Centering Magnett	0 t	0 8		gausse
Examples of Use of Design Ranges:				
With ultor voltage of	180	000		volt:
and grid-No.2 voltage of	30			volt.
Grid-No.4 Voltage for focus	-	+400		volt
Grid-No.1 Voltage for visual	75 (	, .,		
extinction of focused raster	-35 t	0 -72		volt
Grid-No.1 Video Drive from				
Raster Cutoff (Black Level):				
White-level value	35 t	o 72		volt
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance		1.5 m	ax.	megohm
ALTHARE AD 445				
CATHODE-DRIVE® S				
Unless otherwise specified, volto with respect to g		es are	posi	tive
Maximum Ratings, Design-Center Value		00000		1.
JLTOR-TO-GRID-No.1 VOLTAGE		20000	max.	
GRID-No.4-10-GRID-No.1 VOLTAGE:	(	12000°	min.	VOIT
Positive value		1000	max.	volt
Negative value		500	max.	
GRID-No.2-TO-GRID-No.1 VOLTAGE		640	max.	
GRID-No.2-TO-CATHODE VOLTAGE		500	max.	volt
CATHODE-TO-GRID-No.1 VOLTAGE:		200		. 1 .
Positive-peak value		200	max.	
Positive-bias value		140	max.	
Negative-bias value		2	max.	
PEAK HEATER-CATHODE VOLTAGE:		2	IIId X •	V011
Heater negative with respect to car	thode:			
During equipment warm-up period				
not exceeding 15 seconds		410	max.	volt
After equipment warm-up period.		180	max.	
Heater positive with respect to have	thode.	180	max.	volt
Equipment Design Ranges:				
With any ultor-to-grid-No.1 volta	or (Fair	.) bet	ween	12000
and 20000 volts and grid-No. 2-to-g	rid-No.	volta	ge (E	(201)
between 225 and 6.				281
Grid-No.4-to-Grid-No.1 Voltage	,			
for focus§	-7	5 to +	400	volt
Cathode-to-Grid-No.1 Voltage				
(E <sub>kq1</sub> ) for visual extinction				
of focused raster See	Raster-	Cutoff	-Rang	e Char
	for Cat			
▲,⊕,ਊ,†,•: See next page.				

24AJP4



#### PICTURE TUBE

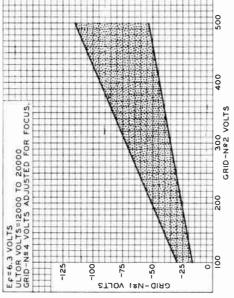
	name value as determined for kg1 except video drive is a negative voltage25 to +25 μa15 to +15 μa			
Examples of Use of Design Ranges:				
With ultor-to-grid- No.1 voltage of and grid-No.2-to-grid-	18000 volts			
No.1 voltage of	300 volts			
Grid-No.4-to-Grid-No.1 Voltage for focus	-75 to +400 volts			
age for visual extinction of focused raster Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black Level)	33 to 60 volts			
White-level value	-33 to -60 volts			
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance	1.5 max. megohms			
Grid drive is the operating condition the grid-No.1 potential with respect t	o cathode.			
This value is a working design-center late minisum ultor-or ultor-to-grid-k low which the serviceabilitored which the serviceabilitored with the worship working supply-voltage variation and lute minimum ultor-or ultor-to-grid-11,000 volts.	minimum. The equivalent abso- bl voltage is 11.000 volts, be- 24AUP4 will be impaired. The lility of determining a minimum t probable operating conditions d equipment variation the abso- sol voltage is never less than			
§ The grid-No.4 voltage or grid-No.4-to focus of any individual tube is indeperemain essentially constant for values grid-No.1 voltage) or grid-No.2 voltage) within design ranges shown for histance from Reference Line for suit	-grid-No.1 voltage required for indent of ultor current and will s of ultor voltage (or ultor-to- age (or grid-No.2-to-grid-No.1			
Voltage! within design ranges shown to Distance from Reference Line for suit not exceed 2-1/4". Excluding extraneo deflected focused spot will fall wit radius concentric with the center of t that the earth's magnetic field can ca tion of the spot from the center of th	r these items. able PM centering magnet should us fields, the center of the unhin a circle having a 1/2-inch tube face. It is to be noted use as much as 1/2-inch deflectube face.			
Cathode drive is the operating condivaries the cathode potential with resp trodes.				
For X-ray shielding consid X-RAY PRECAUTIONS FOR C	ATHODE-RAY TUBES			

World Radio History

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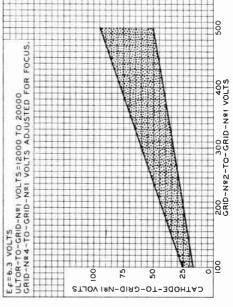
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S AR IJ -CUTOFF-RANGE GRID-DRIVE SERVICE ď



# CATHODE-DRIVE SERVICE

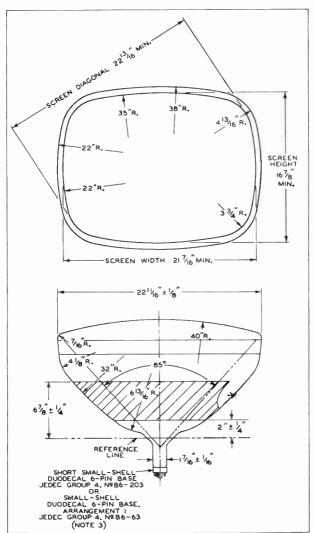
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ELECTRON TUBE DIVISION

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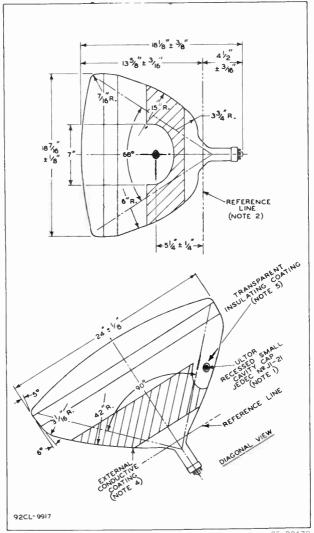
## 24AUP4 PICTURE TUBE





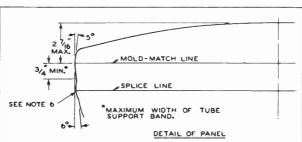
28 ALIDA

#### PICTURE TUBE



240174





- NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.
- NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JEDEC NO.G-116 (SHOWN AT FRONT OF THIS SECTION) 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 3: 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 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.
- NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.
- NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE IN-DICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.





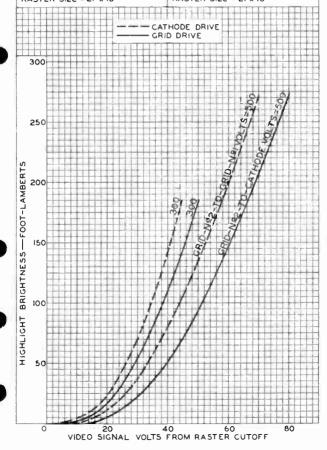
#### AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE E ≠ = 6.3 VOLTS ULTOR-TO-GRID-NºI VOLTS = 16000 CATHODE BIASED POSITIVE WITH RESPECT TO GRID Nº I TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED

RASTER SIZE = 21"x 16"

AT AVERAGE BRIGHTNESS.

GRID-DRIVE SERVICE Ef = 6.3 VOLTS ULTOR VOLTS = 16000 GRID Nº 1 BIASED NEGATIVE WITH RESPECT TO CATHODE TO GIVE FOCUSED RASTER CUTOFF. RASTER FOCUSED AT AVERAGE BRIGHTNESS. RASTER SIZE = 21"x 16"



## 4AUP4

# CHARACTERISTICS DRIVE AVERAGE

CATHODE-DRIVE SERVICE
E<sub>f</sub>=6.3 VOLTS
ULTOR-TO-GRID-N81 VOLTS=
ULTOR TO-GRID-N81 VOLTS=
CATHODE BIASED POSITIVE W
RESPECTTO GRID N81 TO GIV
FOCUSED RASTER CUTOFF.

GRID-DRIVE SERVICE

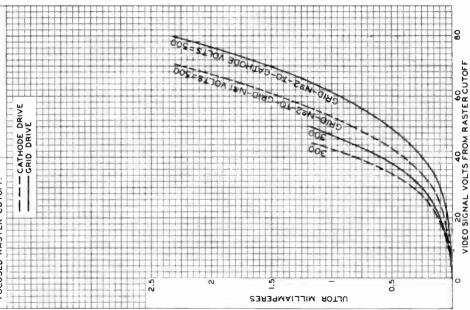
E.F.=6.3 VOLTS

ULTOR VOLTS=12000 TO 20000

GRID Nº! BIASED NEGATIVE, WITH

RESPECT TO CATHODE TO GIVE

FOCUSED RASTER CUTOFF.



# Picture Tube

NO ION-TRAP MAGNET REQUIRED

RECTANGULAR	GLASS TYPE			ALUM
LOW-VOLTAGE	ELECTROSTATIC	FOCUS	1100	MAGNETI

ALUMINIZED SCREEN

#### Electrical:

Direct Interelectrode Capacitances:		
Cathode to all other electrodes	5	pf
Grid No.1 to all other electrodes	6	pf
External conductive coating to anode .	∫2500 max.	pf
External conductive courting to anote:	1700 min.	pf
Heater Current at 6.3 volts	600 ± 30	ma
Houter Warm-up Time (Average)	11	seronds
Electron Gun Type Requiring	No Ion-Trap	Magnet

#### Optical:

Phosphor (For curves, see	front of this S	section)	.P4—Sulfide Type, Aluminized
Faceplate Light transmission			Filterglass

#### Mechanical:

Weight (Approx.)					. 26-	-1/2	lbs
Overall Length							
Neck Length							
Projected Area of Screen					332	sq.	in.
External Conductive Coating:							
Tues				9.7	lod i f	_ha	Rand

Contact area for grounding . . . . Near Reference Line For Additional Information on Coatings and Dimensions:

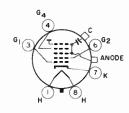
See Picture-Tube Dimensional-Outlines and Bulb J192 C/D sheets at front of this section.

Pin 1 - Heater Pin 3 - Grid No.1 Pin 4 - Grid No.4 Pin 6 - Grid No.2 Pin 7 - Cathode

Pin 8 - Heater

Cap - Anode (Grid No.3,
Grid No.5, Screen,
Collector)

C - External Conductive Coating



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

Unless otherwise specified, voltage values are positive with respect to cathode

Anode Voltage		. 20000	max. volts
Grid-No.4 (Focusing)	Voltage:		
Positive value		. 1100	max. volts
Negative value			max. volts

# **24BEP4**

Crid-No.2 Voltage. 550 max. Crid-No.1 Voltage: 'vegative peak value. 220 max. Negative bias value. 154 max. Positive bias value. 0 max.	volts volts volts
Positive peak value. 2 max. heater Voltage . {6.9 max.} Peak Hcater-Cathode Voltage.	
Heater negative with respect to cathode:  During equipment warm—up period  not exceeding 15 seconds 450 max.  After equipment warm—up period 200 max.  Heater positive with respect to cathode 200 max.  Typical Operating Conditions for Cathode-Drive Service:	volts volts volts
Unless otherwise specified, voltage values are positive with respect to grid No.1	
Anode Voltage. 16000 Grid—No.4 Voltage. 200 Grid—No.2 Voltage. 400 Cathode Voltage for visual extinction of focused raster. 42 to 78	volts volts volts
Maximum Circuit Value: Grid-No.1 Circuit Resistance 1.5 max. n	negohms
For X-radiation shielding considerations, see shee	a f

For X-radiation shielding considerations, see sheet

X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES

At front of this section



# Picture Tube

RECTANGULAR GLASS TYPE MAGNETIC FOCUS	ALUMINIZED SCREEN 90° MAGNETIC DEFLECTION
Electrical:	
Heater Current at 6.3 volts	6 pf
Electron Gun	Type Requiring No
Optical:	
Faceplate, Spherical Light transmission (Approx.) Phosphor/for curves, see front of this sec	759
Mechanical:	
Operating Position  Weight (Approx.)  Overall Length  Neck Length  Projected Area of Screen  External Conductive Conting:  Type  Contact area for grounding  For Additional Information on Coa  Deflection Angles:  See Picture-Tube Dimensional-Out  sheets at the front of this sect  Cap  Recessed Small  Base Small-Shell Duodecal 5-Fin in  Basing Designation for BOTIOM VIEW  ANODE	
Pin 1 - Heater Pin 2 - Grid No.1 Pin 10 - Grid No.2 Pin 11 - Cathoge Pin 12 - Heater	Cap-Anode (Grid No.3, Collector) C-External Conductive Coating

# **24CP4B**

Maximum Circuit Values:

Gris-No.:-Circuit Kesi tance . . . .

Grid-No.1 Voltage: Negitive peak value. Negative bias vilue. Positive bias value. Positive peak value. Peak Heater-Cithode Voltige: Heiter negative with respect to cathode:	. 15° max. . 0 max.	volts volts
During equipment warm-up period not exceeding 15 seconds	. 200 mak.	volts
Typical Operating Conditions: With anode voltage of and grid-No.2 voltage of	16000 100	volts
Grid-No.1 Voltage for visual extinction of focused raster	4 to −7.2	vilts

For  $\lambda$ -radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY THBES at front of this section



1.5 mix. megohms

# Color Picture Tube

	Permo-Chrome Bonded-Type 90° Rectongulor New Rore-Eorth (Red) Phosphor			HI-LI	ITE	tection Screen Rotios
	ELECTRICAL					
	Electron Guns, Three with Axes Tilted Toward Tube Axis		R	ed, B	lue.	Green
	Heater, of Each Gun Series Connected Each of the Other Two Heaters:	wi	thin	Tube		
	Current at 6.3 Va			900		mA
	Focusing Method				ectro	static
<b>\</b>	Focus Lens					
	Convergence Method				-	gnetic
	Deflection Method					gnetic
	Deflection Angles (Approx.):			•	17100	5
	Diagonal			89 78 63		deg. deg. deg.
	Direct Interelectrode Capacitances (Ap. Grid No.1 of any gun to all other electrodes		x.);	6		pF
	Grid No.3 to all other electrodes			6.5		рF
	All cathodes to all other electrodes.			15		pF
	External conductive coating to anode (Approx.)		{2	2500 2000	max. min.	pF pF
	OPTICAL					
	Faceplate			. F	ilter	rglass
	Light transmission at center (Approx	(.)				42%
	Surface				Pol	lished
	Screen, on Inner Surface of Faceplate:					
	Type Aluminized, 7	Γric	colo	. Pho	sphe	or-Dot
	Phosphor (three separate phosphors, collectively) b P22- Sulfide	Nev	w Ra	re-Ea	arth (	Red),
	Fluorescence and phosphorescence of separate phosphors, respectively.	of 	. R	ed, B	lue,	Green
	Persistence of group phosphorescene	ce		Me	dium	Short
	Dot Arrangement Triangul red dot, b	lar olue	grou e dot	p coi	nsist I gree	ing of en dot
	Spacing between centers of adjacent dot trios (Approx.)		0.0	29 in	(0.7	4 mm)

# 25AJP22

MECHANICAL Minimum Screen Area (Projected): 295 sq. in (1905 sq. cm)
Bulb Funnel Designation JEDEC No.J195-1/2 A1
Bulb Panel Designation JEDEC No.FP196-1/2
Base Small-Button Diheptar 12-pin
Basing Designation <sup>c</sup> JEDEC No.14BE
Pin Position Alignment Pin No.12 Aligns Approx. with Anode Bulb Contact
Operating Position Anode Bulb Contact on Top
Weight (Approx.)
Unless otherwise specified, values are for each gun and voltage values are positive with respect to cathode
Anode Voltage
Total Anode Current, Long-Term Average
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
Positive peak value 2 max. V
Heater Voltage (ac or dc):
Under operating conditions <sup>a</sup> 16.9 max. V
Under standby conditions <sup>d</sup> 5.5 max. V
Peak 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;
Combined AC and DC value 200 max. V
DC component value 200 max. V
Heater positive with respect to cathode:
Ac component varue
De component variation in the component variation variation in the component variation variati
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 V
Grid-No.3 (Focusing Electrode) Voltage 16.8% to 20% of Anode voltage

	Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused
)	Spot See CUTOFF DESIGN CHART Maximum Ratio of Grid-No.2 Voltages,
	Highest Gun to Lowest Gun in Any Tube (At grid-No.1 spot cutoff
	voltage of -100 V)
	Under operating conditions <sup>a</sup>
1	Under standby conditions <sup>c</sup> 5.0 V
'	Grid-No.3 Current (Total)
	Grid-No.2 Current
	To Produce White of 9300° K + 27 M.P.C.D. (CIE Coordinates x=0.281, y=0.311):
	Percentage of total anode
)	current supplied by Red Blue Green each gun (average)
	Ratio of cathode currents: Min. Typ. Max.
	Red/blue       0.75       1.10       1.50         Red/green       0.65       1.00       1.50
	Red/green       0.65       1.00       1.50         Blue/green       0.60       0.91       1.30
	Displacements, Measured at Center of Screen:
	Raster centering displacement:
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
	Lateral distance between the blue beam and the converged red and green beams ±0.25 in (±6.4 mm)
	Radial convergence displacement excluding effects of dynamic convergence (each beam) ±0.37 in (±9.4 mm)
	Maximum Required Correction for Register® (Including Effect of Earth's Magnetic Field when Using Recommended Components) as Measured at the Center of the Screen in any Direction 0.005 in (0.13 mm) max.
	LIMITING CIRCUIT VALUES
	High-Voltage Circuits:
	Grid-No.3 circuit resistance 7.5 max. MΩ
	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, in which the short-circuit current does not exceed 20 milliamperes.
	Low-Voltage Circuits: Effective grid-No.1-to-cathode- circuit resistance (each gun) 0.75 max. MΩ
_	

### 25AJP22

The low-voltage circuits, including all heater circuits, should be analyzed by assuming the color picture tube heater is connected directly to the receiver chassis ground. Under these conditions the circuits to the elements of all tubes, including the color picture tube, operating from the same heater winding 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 in the assumed picture tube heater ground connection. The leads from all other circuits must be separated from the picture tube leads by a minimum distance of 0.25 inch (6.4 mm) to prevent energy transferto the picture tube circuits. Such current limitation will help prevent picture tube damage in case of momentary cascade arcing.

- <sup>o</sup> Formaximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts. The series impedance to any chassis connection in the DC hiasing circuit for the heater should be between 100,000 ohms and 1 megohin.
- b For curve, see Group Phosphor-P22-New Rare-Earth (Red), Sulfide (Blue & Green) at front of this section.
- <sup>c</sup> The mating socket, including its associated, physicallyattached hardware and circuitry, must not weigh more than one pound.
- d For "instanton" applications, a maximum heater voltage of 5.5 volts (design-maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. 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.

#### X-RADIATION WARNING

Because the 25AJP22 is designed to be operated at anode voltages as high as 27.5 kilovolts (design-maximum value), shielding of the 25AJP22 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

#### BASE SPECIFICATION - JEDEC No. 14BE

Pin 1: Heater Pin 11: Cathode of Blue Gun

Pin 2: Cathode of Red Gun Pin 12: Grid No.1 of Blue Gun

Pin 3; Grid No.1 of Red Gun
Pin 13; Grid No.2 of Blue Gun
Pin 4; Grid No.2 of Red Gun
Pin 14; Heater

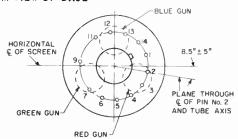
Pin 5: Grid No.2 of Green Gun Cap: Anode (Grid No.4,

Pin 6: Cathode of Green Gun Screen, Collector)

Pin 7; Grid No.1 of Green Gun C: External Conductive

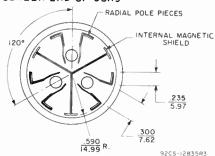
Pin 9: Grid No.3 Coating

#### BOTTOM VIEW OF BASE



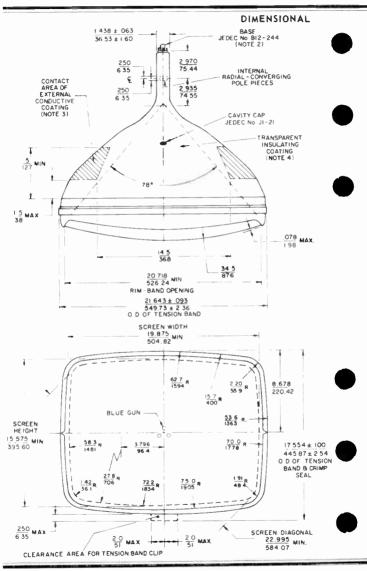
9205-12816

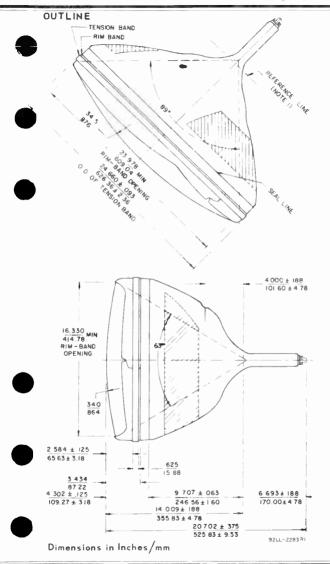
# LOCATION OF RADIAL-CONVERGING POLE PIECES VIEWED FROM SCREEN END OF GUNS



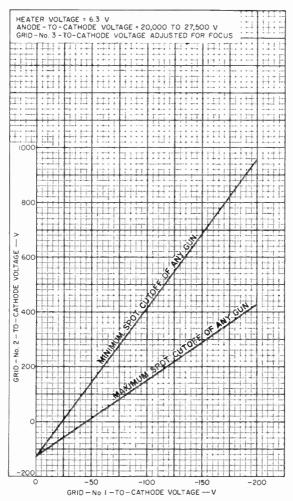
#### NOTES FOR DIMENSIONAL OUTLINE

- Note 1: With tube neck inserted through flared end of reference-line and neck-funnel-contour gauge JEDEC No. G162 and with tube seated in guage, the reference line is determined by the intersection on the plane C-C<sup>1</sup> 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 2-inch (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 grounded with multiple contacts.
- Note 4: To clean this area, wipe only with soft, dry, lintless cloth.





#### **CUTOFF DESIGN CHART**



92CM-12803RI

# **Color Picture Tube**

Mi-Lite Motrix Screen	Permo-Chrom
90° Rectongulor	High-Resolution Gu
New Green Phosphor	Unity Current Rotio
Antiglore Integral Prote	
ELECTRICAL Electron Guns, Three with Axes Tilted Toward Tube Axis	
Heater, of Each Gun Series Connected within Tube with Each of the Other two Heaters:	
Current at 6.3 Va	900 mA
Focusing Method	
Focus Lens	Bipotential
Convergence Method	Magnetic
Deflection Method	
Deflection Angles:	
Diagonal	89 deg.
Horizontal	
Vertical	
Grid No.1 of any gun to all other electrodes	7.5 pF
Grid No.3 to all other electrodes .	6.5 pF
All cathodes to all other electrodes	
External conductive coating to anode	\begin{cases} 2500 \text{ max. pF} \\ 2000 \text{ min. pF} \end{cases}
PATICAL Faceplate and Protective Window	
Light transmission at center (Appro	
Surface of Protective Window	specular reflection
Screen	Aluminized
Matrix!	Black opaque material
Phosphor, rare-earth (red), sulfide (blue & green)	P22
Persistence	Medium-Short
Агтау	422,550 Dot trios
Spacing between centers of adjacent dot trios (approx.)	. 0.029 in (0.74 mm)

MECHANICAL Minimum Screen Area (Projected) 295 sq. in (1905 sq. cm)	
Bulb Funnel Designation JEDEC No.J195-1/2	_
Bulb Panel Designation JEDEC No.FP196-1/2	
Protective Window Designation JEDEC No.SP196-1/2	
Base b Small-Button Diheptar 12-pin Pin Position Alignment Pin No.12 Aligns Approx.	
with Anode Bulb Contact	
Operating Position Anode Bulb Contact on Top	
Weight (Approx.)	
MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES Unless otherwise specified, values are for each gun and voltage values are positive with respect to cathode	
Anode Voltage	
( 20,000 min. V	
Total Anode Current, Long-Term Average1000 max. μΑ	
Grid-No.3 (Focusing Electrode) Voltage	
Peak-Grid-No.2 Voltage, Including Video Signal Voltage 1000 max. V	
Grid-No.1 Voltage: Negative bias value	
Negative operating cutoff value 200 max. V	
Positive bias value 0 max. V	
Positive peak value 2 max. V	
Heater Voltage (ac or dc):	
Under operating conditions 5.7 min 6.9 max. V	
Under standby conditions 5.5 max. V	
Peak Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period	9
not exceeding 15 seconds 450 max. V	
After equipment warm-up period:	
Combined AC and DC value 200 max. V	
DC component value 200 max. V	
Heater positive with respect to cathode: AC component value 200 max. V	
DC component value 0 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 between 20,000 and 27,500 V	
Grid-No.3 (Focusing Electrode) Voltage 16.8% to 20% of Anode voltage	

Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused
Spot See CUTOFF DESIGN CHART Maximum Ratio of Grid-No.2 Voltages, Highest Gun to Lowest Gun in Any Tube (At grid-No.1 spot cutoff voltage of -100 V) 1.86
Heater Voltage:
Under operating conditions:
When standby operation is not
utilized
When 5.0-V standby operation is utilized
Under standby conditions delications delications delications delications delications delications delications delications delication delications delications delication delicatio
Grid-No.3 Current (Total)45 to +15 μA
Grid-No.2 Current5 to +5 μA
To Produce White of $9300^{\circ}$ K + 27 M.P.C.D. (CIE Coordinates x = 0.281, y = 0.311):
Percentage of total anode current supplied by each gun (average)
Ratio of cathode currents: Min. Typ. Max.
Red/blue 0.75 1.10 1.50
Red/green 0.65 1.00 1.50
Blue/green 0.60 0.91 1.30
Displacements, Measured at Center of Screen:
Raster centering displacement:
Horizontal ± 0.45 in (± 11.4 mm)
Vertical ± 0.45 in (± 11.4 mm)
Lateral distance between the blue beam and the converged red and green beams ± 0.25 in (± 6.4 mm)
Radial convergence displacement excluding effects of dynamic convergence (each beam) ± 0.37 in (± 9.4 mm)
Maximum Required Correction for Register* (Including Effect of Earth's Magnetic Field when Using Recommended Components) as Measured at the Center of the Screen in any Direction 0.005 in (0.13 mm) max.
LIMITING CIRCUIT VALUES
High-Voltage Circuits:
Grid-No.3 circuit resistance 7.5 max, MΩ



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, in which the short-circuit current does not exceed 20 milliamperes.

Low-Voltage Circuits:

Effective grid-No.1-to-cathode-..... 0.75 max. MΩ circuit resistance (each gun) The low-voltage circuits, including all heater circuits, should be analyzed by assuming the color picture tube heater is connected directly to the receiver chassis ground. Under these conditions the circuits to the elements of all tubes, including the color picture tube, operating from the same heater winding 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 in the assumed picture tube heater ground connection. The leads from all other circuits must be separated from the picture tube leads by a minimum distance of 0.25 inch (6.4 mm) to prevent energy transfer to the picture tube circuits. Such current limitation will help prevent picture tube damage in case of momentary cascade arcing.

- 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 100,000 ohms and 1 megohm.
- b The mating socket, including its associated, physicallyattached hardware and circuitry, must not weigh more than one pound.
- d The use of a 5-volt standby condition in conjunction with 6-volt operating condition is recommended to improve the reliability of the color picture tube by extending the emission wear-out life and reducing other gun-related defects. A maximum heater voltage of 5.5 volts (Design-Maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. All other voltages normally applied to the tube must be removed during standby operation.
- e Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios.

X-RADIATION WARNING: Because the 25BCP22 is designed to be operated at anode voltages as high as 27.5 kilovolts (Design-Maximum value), shielding of the 25BCP22 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

#### BASE SPECIFICATION - JEDEC No. 14BE

Pin 1: Heater Pin 11: Cathode of Blue Gun Pin 2: Cathode of Red Gun Pin 12: Grid No. 1 of Blue Gun

Pin 2: Cathode of Red Gun Pin 12: Grid No.1 of Blue Gun Pin 13: Grid No.2 of Blue Gun

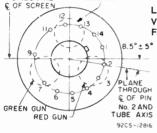
Pin 4: Grid No.2 of Red Gun Pin 14: Heater

Pin 5: Grid No.2 of Green Gun Cap: Anode (Grid No.4, Pin 6: Cathode of Green Gun Screen, Collector)

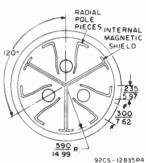
Pin 7: Grid No.1 of Green Gun C: External Conductive

Pin 9: Grid No.3 Coating

# BOTTOM VIEW OF BASE HORIZONTAL BLUE GUN



#### LOCATION OF RADIAL-CON-VERGING 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 (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 glave funnel.

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 2-inch (51-mm)

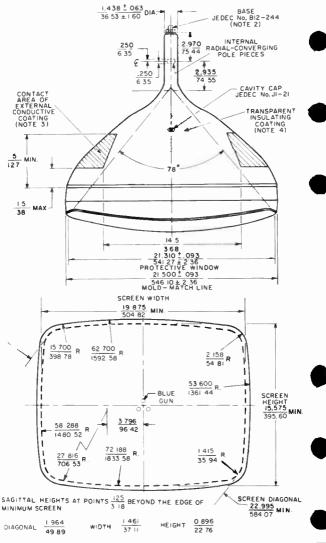
circle concentric with bulb axis.

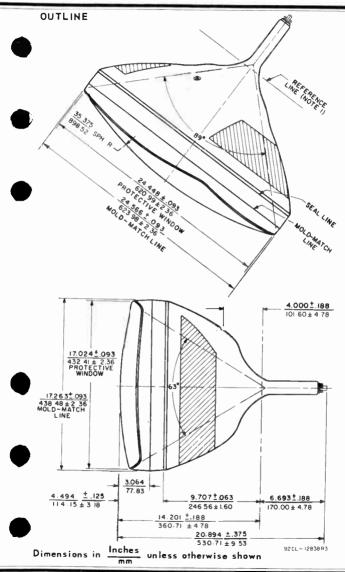
Note 3: The drawing shows the size and location of the contact area of the external conductive coating. The actual area of this coating will be greater than that of the contact area so as to provide the required capacitance. External conduc-

tive coating must be grounded with multiple contacts.

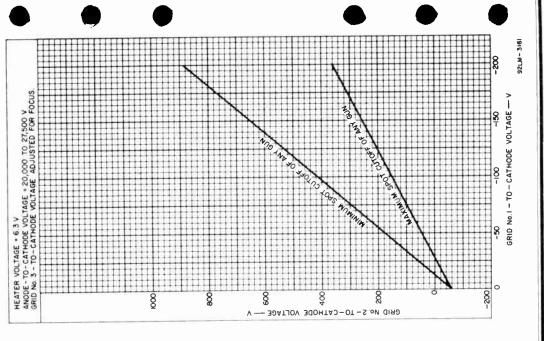
Note 4: To clean this area, wipe only with soft, dry, lint-less cloth.







# CUTOFF DESIGN CHART



# 25BDP22

# Color Picture Tube

Hi-Lite Matrix Screen 90° Rectangular New Green Phosphor Perma-Chrome High-Resolution Gun Unity Current Ratios

Integral Implosion Protection — Banded Type

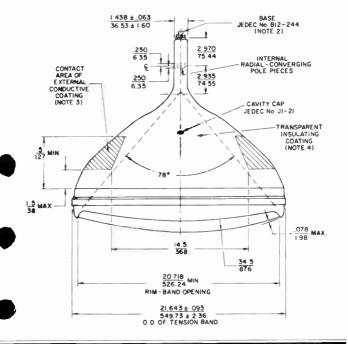
The 25BDP22 is the same as the 25BCP22 except for:

	0	TI	~	AI	
- 0	г	T١	_	AI	_

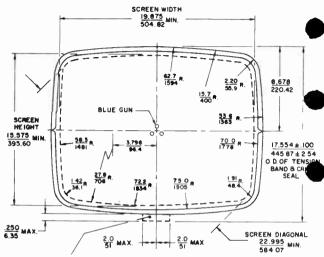
Faceplat	е														•	٠		Filte	erglass
Light	trar	nem	195	10	n ai	t	c	ėn	tei	. (	A	pμ	ro	х.	)				69%
Surfac																		P	lished

#### MECHANICAL

#### DIMENSIONAL OUTLINE (Top View)



#### DIMENSIONAL OUTLINE (Front View)



#### CLEARANCE AREA FOR TENSION BAND CLIP

HEIGHT

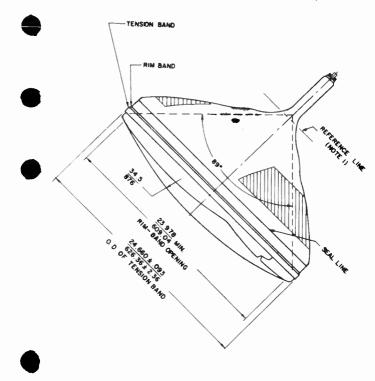
SAGITTAL HEIGHTS AT POINTS  $\frac{125}{3.18}$  BEYOND

24.13

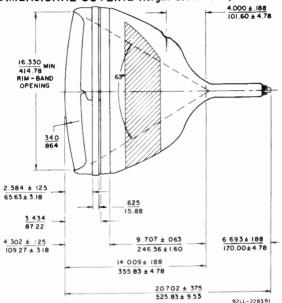
THE EDGE OF MINIMUM SCREEN

2.063 52 40 DIAGONAL 1.524 WIDTH 38.7 0.950

# DIMENSIONAL OUTLINE (Right Oblique View)



#### DIMENSIONAL OUTLINE (Right Side View)



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 2-inch (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 grounded with multiple contacts.

Note 4: To clean this area, wipe only with soft, dry, lint-less cloth.

Dimensions in Inches unless otherwise shown

# Color Picture Tube

#### PERMA-CHROME

**HI-LITE Screen** 

Antiglare Integral Protective Window

This data sheet is to be used in conjunction

with data for RCA-25XP22.

Rare-Earth (Red) Phosphor

For general data, terminal diagram, maximum and minimum ratings, equipment design ranges, limiting circuit values, x-radiation warning, and general considerations of the 25BGP22, refer to the 25XP22 except as noted below.

#### MECHANICAL

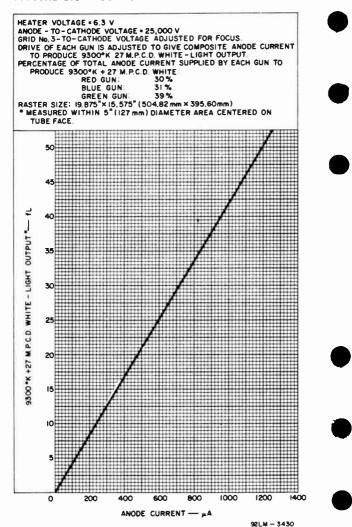
Bulb Panel Designation	JEDEC No.FP196-1/2A3
OPTICAL	

#### **EQUIPMENT DESIGN RANGES**

To Product White of 9300° 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 30	Blue 31	Gree	n %
Ratio of cathode currents:		Min	Тур	Max
Red/blue		0.75	0.95	1.25
Red/green		0.60	0.75	1.10
Blue/green		0.60	0.80	1.10

#### TYPICAL LIGHT-OUTPUT CHARACTERISTIC



# Color Picture Tube

#### PERMA-CHROME

HI-LITE Screen

Rare-Earth (Red) Phosphor
Integral Implosion Protection — Banded Type

This data sheet is to be used in conjunction with data for RCA-25AJP22.

For general data, maximum and minimum ratings, equipment design ranges, limiting circuit values, x-radiation warning and base specification of the 25BHP22, refer to the 25AJP22 except as noted below.

#### MECHANICAL

Bulb Panel Designation ......... JEDEC No.FP196-1/2HI

#### OPTICAL

#### Faceplate:

Light transmission at center (Approx.) ..... 52%

#### **EQUIPMENT DESIGN RANGES**

Blue/green . . . . . .

To Product White of  $9300^{\circ}$  K + 27 M.P.C.D. (CIE Coordinates x = 0.281, y = 0.311):

current supplied by each gun (average)		Green 39	n %
Ratio of cathode currents:	Min	Тур	Max
Red/blue	 0.75	0.95	125
Red/green	 0.60	0.75	1.10

. . 0.60 0.80 1.10

#### TYPICAL LIGHT-OUTPUT CHARACTERISTIC

HEATER VOLTAGE = 6.3 V ANODE - TO - CATHODE VOLTAGE = 25,000 V GRID No. 3-TO - CATHODE VOLTAGE ADJUSTED FOR FOCUS DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ANOOE CURRENT TO PRODUCE 9300°K 27M.P.C.O. WHITE - LIGHT OUTPUT. PERCENTAGE OF TOTAL ANODE CURRENT SUPPLIED BY EACH GUN TO PRODUCE 9300°K + 27 M.P.C.D. WHITE RED GUN: BLUE GUN 31 % GREEN GUN. 39% RASTER SIZE: 19.875"×15.575" (504.82 mm × 395.60 mm) MEASURED WITHIN 5"(127 mm) DIAMETER AREA CENTERED ON TUBE FACE: 9300 "K +27 M.P.C.D. WHITE - LIGHT OUTPUT "- 1 40 35 30 25 20 10 200 600 800 1200 ANODE CURRENT --- "A

92LM - 3430

# **Color Picture Tube**

Ultra-Rectangular	Hi-Lite Matrix Screen
4 x 3 Aspect Ratio	Light-Neutral Screen Appearance
Electrical:	
Heater, of Each Gun Series Co Tube with Each of the Other	
	900 mA
	Bipotential
Convergence Method	•
Deflection Method	Magnetic
Deflection Angles (Approx.): Diagonal	
Grid No.1 of any gun to a Grid No.3 to all other elect All cathodes to all other e	II other electrodes 7.5 pF trodes 6.5 pF lectrodes 15 pF
Capacitance Between Anode a Conductive Coating	nd External 2500 max. pF 2000 min. pF
Optical:	•
Faceplate and Safety Panel	r (Approx.)
Surface of Safety Panel	Treated to minimize specular reflection
Matrix. Phosphor, rare-earth (red) Persistence Array Spacing between centers o	
Mechanical:	0.020 m (0.00 mm)
Minimum Screen Area (Project Bulb Funnel Designation	ed) 315 sq. in (2032 sq. cm) JEDEC No.J208-3/4 B1/D1
Bulb Panel Designation	JEDEC No.FP209-3/4 W2
Base Designation <sup>a</sup>	Small-Button Diheptar 12-Pin (JEDEC No.B12-244)
Basing Designation	JEDEC No.14BE
Pin Position Alignment	Pin No.12 Aligns Approx. with



Anode Bulb Contact

Operating Position, preferred Anode Bulb	Contact on	Тор
Gun Configuration		
Weight (Approx.)		
Implosion Protection:		
Integral Safety Panel JEDEC	No.SP209-1/	4A1
Maximum and Minimum Ratings, Design-Maximum	n Values:	
Unless otherwise specified, values are for each values are positive with respect to cathode.	gun and vo	tage
Anode Voltage	27,5 max. 20 min.	kV kV
Anode Current, Long-Term Average <sup>b</sup>	1000 max.	μΑ
Grid-No.3 (Focusing Electrode) Voltage	6000 max.	V
Peak-Grid-No.2 Voltage, Including Video Signal Voltage	1000 max.	٧
Grid-No.1 Voltage:	400 max.	V
Negative bias value	200 max.	v
Positive bias value	0 max.	V
Positive peak value	2 max.	V
Heater Voltage (ac or dc):C	(	
Under operating conditions	6.9 max.	V
Under standby conditions <sup>d</sup>	5.5 max.	v
Heater-Cathode Voltage: Heater negative with respect to cathode: During equipment warm-up period		
not exceeding 15 seconds	450 max.	V
After equipment warm-up period:  DC component value	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
Equipment Design Ranges:		
Unless otherwise specified, values are for each values are positive with respect to cathode	gun and vo	ltage
For anode voltages between 20 and 27.5 kV		
Grid-No.3 (Focusing Electrode) Voltage	16.8% to 20 Anode vo	



	Grid-No.2 Voltage for Visual Extinction	n CUTOEE DE	CICN CH	A DT
	of Undeflected Focused Spot See	COTOFF DE	in Fig	ure 3
•	At Grid No.1 voltage of -75 V At Grid No.1 voltage of -125 V At Grid No.1 voltage of -175 V		95 to 2 205 to 5	95 V 35 V
	Maximum Ratio of Grid-No.2 Voltages Lowest Gun in Any Tube (At grid-No. voltage of -100 V)	1 spot cutoff		1.B6
	Heater Voltage: C Under operating conditions: When standby operation is not When 5.0-V standby operation is Under standby conditions C	s utilized <sup>a</sup> 	6.	0 V
	Grid-No.3 Current (Total)		±1	5 μΑ
	Grid-No.2 Current		±	5 µA
	Grid-No.1 Current		±	5 μA
		Illum.D	Color	
	To Produce White Light of	6550°K +	9300°K 27 M.P.	
	CIE Coordinates:	7 M.P.C.D.		U.D.
	X	0.313 0.329	0.2B1 0.311	
	Y	0.323	0.511	
	supplied by each gun (average):			
	Red	41	30	%
	Blue	24	31 39	% %
	Green	35	39	76
	Ratio of cathode currents:			
	Red/blue: Minimum ,	1,35	0.75	
	Typical	1.70	0.95	
	Maximum	2.20	1.25	
	Red/green:			
	Minimum	0.95	0.60	
•	Typical	1.15	0.75	
	Maximum	1.70	1.10	
	Blue/green:		0.60	
	Minimum	0.50	0.60	
	Typical	0.70	0.B0 1.10	
	Maximum	0.95	1.10	
	Displacements, Measured at Center of	Screen:		
	Raster centering displacement:	+ 0.45	in (± 11.4	mml
	Horizontal	+ 0.45	in (± 11.4 in (± 11.4	
	Vertical		(= 11.4	
	the converged red and green beams	6 ± 0.25	in (± 6.4	mm)

Radial convergence displacement excluding effects of dynamic convergence (each beam)
Maximum Required Correction for Registere (Including Effect of Earth's Magnetic Field when Using Recommended Components) as Measured at the Center of the Screen in any Direction 0.005 in (0.13 mm) max.
Typical Operation:
Heater Voltage 6.3 V
Anode Voltage
Grid No.3 Voltage Adjusted for focus
Color Temperature 9300° K + 27 M.P.C.D.
Raster Size
Typical White-Light Output Measured within 5 in (127 mm) diameter area centered on tube face:
At anode current of 1000 $\mu$ A
Limiting Circuit Values:
$\begin{array}{llllllllllllllllllllllllllllllllllll$
Low-Voltage Circuits: Effective grid-No.1-to-cathode-circuit resistance (each gun) 0.75 max. M $\Omega$
X-Radiation Characteristic:
Maximum Anode Voltage at which the X-radiation emitted will not exceed 0.5 mR/h at an anode current of 300 $\mu$ A
The X-radiation emitted from this picture tube, as measured in accordance with the procedure of JEDEC Publication No.64A will not exceed 0.5 mR/h throughout the useful life of the tube when operated within the Design-Maximum ratings: 27.5 kV anode voltage and $1000~\mu\text{A}$ anode current. The tube should not be operated beyond its Design-Maximum ratings stated above (such operation may

A-radiation emitted from this picture tube, as measured in accordance with the procedure of JEDEC Publication No.64A will not exceed 0.5 mR/h throughout the useful life of the tube when operated within the Design-Maximum ratings: 27.5 kV anode voltage and 1000 μA anode current. The tube should not be operated beyond its Design-Maximum ratings stated above (such operation may shorten tube life or have other permanent adverse affects on its performance), but its X-radiation will not exceed 0.5 mR/h for anode voltage and current combinations given by the isodose-rate limit characteristics as shown in Figure 1. Operation above the values shown by the curve may result in failure of the television receiver to comply with the Federal Performance Standard for Television Receivers, Sub-Part C of Part 78 of Title 42, Code of Federal Regulations (PL90-602) as published in the Federal Register Vol.34, No. 247, Thursday, December 25, 1969. Maximum X-radiation as a function of anode voltage at 300 μA anode current is shown by the curve in Figure 2. X-radiation at a constant anode voltage varies linearly with anode current.



- a The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one pound (one-half kilogram).
- b The short-term average anode current should be limited by circuitry to 1500 microamperes.
- c For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis connection in the dc biasing cirucit 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.
- d The use of a 5-volt standby condition in conjunction with 6-volt operating conditions is recommended to improve the reliability of the color picture tube by extending the emission wear-out life and reducing other gun-related defects. A maximum heater voltage of 5.5 volts (Design-Maximum value) may be maintained on the color picture tube when the receiver is in the "off" (standby) position. All other voltages normally applied to the tube must be removed during standby operation.
- e Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios.

#### Notes for Dimensional Outline

Note 1: With tube neck inserted through flared end of referenceline 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.

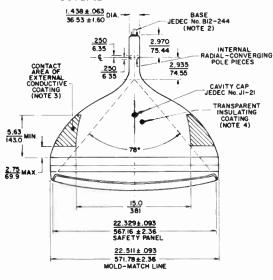
Note 2: Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. Bottom circumference of base will fall within a 2-inch (51-mm) circle concentric with bulb axis.

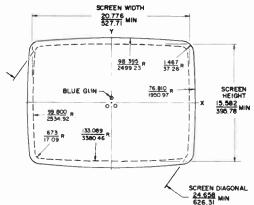
Note 3: The drawing shows the size and location of the contact area of the external conductive coating. The actual area of this coating will be greater than that of the contact area so as to provide the required capacitance. External conductive coating must be grounded with multiple contacts.

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

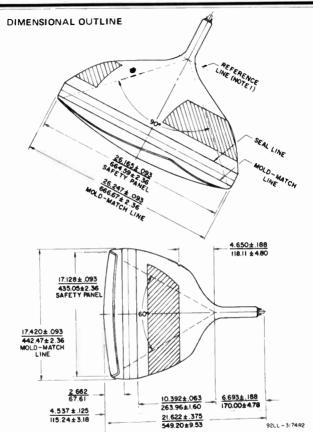


#### **DIMENSIONAL OUTLINE**





Dimensions in inches/mm unless otherwise noted



# Sagittal Heights with Reference to Centerface at Points (3.18 mm) Beyond Edge of Minimum Screen.

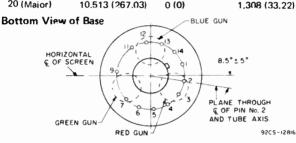
Station No.	Coording	Segittal	
	X	Y	Height
	in (mm)	in (mm)	in (mm)
1 (Minor)	0 (0)	7.916 (201.07)	.680 (17.27)
2	1.000 (25.40)	7.912 (200.96)	.692 (17.58)
3	2,000 (50.80)	7,901 (200.69)	.730 (18.54)
4	3,000 (76.20)	7,882 (220,20)	,791 (20.09)
5	4.000 (101.60)	7.856 (199.54)	.877 (22.28)
6	5.000 (127.00)	7.822 (198.68)	.987 (25.07)

(continued on next page.)



20 (Major)

Sagittal Heights (Cont'd)			
7	6.000 (152.40)	7.781 (197.64)	1.121 (28.47)
8	7.000 (177.80)	7.732 (196.39)	1.279 (32.49)
9	8.000 (203.20)	7.676 (194.97)	1.461 (37.11)
10	9.000 (228.60)	7.612 (193.34)	1.668 (42.37)
11	9.540 (242.32)	7.574 (192.38)	1.790 (45.47)
12 (Diagonal)	10.132 (257,35)	7.242 (183.95)	1.878 (47,70)
13	10.279 (261.09)	6.832 (173.53)	1.841 (46.76)
14	10.333 (262.46)	6.000 (152.40)	1.720 (43.69)
15	10.388 (263.86)	5.000 (127.00)	1.595 (40.51)
16	10.433 (265.00)	4.000 (101.60)	1.492 (37.90)
17	10.468 (265.89)	3.000 (76.20)	1.412 (35.86)
18	10.493 (266.52)	2.000 (50.80)	1.355 (34.42)
19	10.508 (266.90)	1.000 (25.40)	1.320 (33.53)



0 (0)

#### Base Specification - JEDEC No.14BE

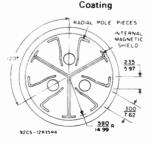
10 513 (267 03)

Pin 1: Heater Pin 11: Cathode of Blue Gun Cathode of Red Gun Pin 2: Pin 12: Grid No.1 of Blue Gun Pin 3. Grid No.1 of Red Gun Pin 13: Grid No.2 of Blue Gun Pin 4: Grid No.2 of Red Gun Pin 14: Heater Pin Grid No.2 of Green Gun Can: Anode (Grid No.4, Pin 6. Cathode of Green Gun Screen, Collector) Pin 7: Grid No.1 of Green Gun

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

Grid No.3

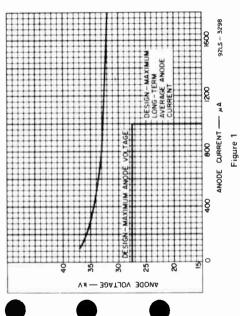
Pin 9:



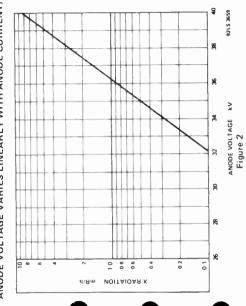
External Conductive

C:

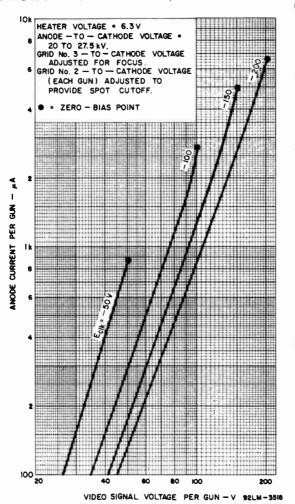




CURRENT) ANODE 300 µA (X-RADIATION AT A CONSTANT AGE VARIES LINEARLY WITH ANODE C CONSTANT ΑT CURVE X-RADIATION LIMIT CURRENT OF 300 µA VOLT/ ANODE

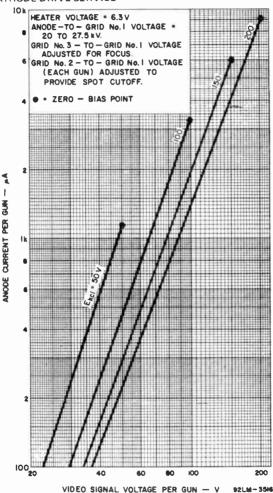


## TYPICAL DRIVE CHARACTERISTICS, GRID-DRIVE SERVICE



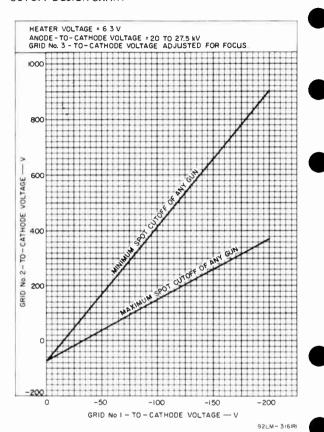
## TYPICAL DRIVE CHARACTERISTICS,

## CATHODE-DRIVE SERVICE





#### CUTOFF DESIGN CHART.



IMPORTANT: Refer to sheet Safety Precautions for Color Picture Tubes at front of this section.

Figure 3

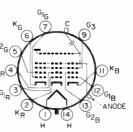
# **Color Picture Tube**

"PERMA-CHROME" ASSEMBLY FOR OPTIMUM UNIFORMITY DURING WARM	
• • • • • • • • • • • • • • • • • • • •	-ur P MAGNETIC DEFLECTION
ALUMINIZED TRICOLOR PHOSPHOR-DOT	
(Utilizing a New Improved Rare-Earth Red	
INTEGRAL FILTERGLASS PROTECTI	VE WINDOW
MAGNETIC CONVERGENCE 3 ELEC	CTROSTATIC-FOCUS GUNS
For live in Color-TV Rece	tvers
ELFCTRICAL	
	Red, Blue, Green
Axe tilt ditoximitable dic Heater, of Each Gun	
rie or	
of the other two tester	
Current stressolt a	900 mA
Focusing Method	
Convergence Method	
Deflection Method	
Deflection Angles (Approx.)	
[rigonal	
/ r i al	
Direct Interelectrode Capacitances (Appro	ox.)
Gris of or any gan to all other lend	
Ill athor to ill other lectrode Grid No.s to all other lectrode	
External conductive coating to anode.	Camaa
THE CONTUCTIVE COLUMN TO MOST.	2000 min pF
OPTICAL	
Faceplate and Protective Window	Filterglass
Light transmission - control (Approx.).	41%
Surface of Protective Window	specular reflection
Screen, on Inner Surface of Faceplate	
Tyre	ricolor, Phosphor-Dot
Pho phor (Three separate pho phor . colle "Tel.)	low Dono Conth (Dad)
Sulfide	e (Blue & Green) Type
Fluorescence and phosphorescence of	
separate pho phoro. restroctively	Red, Blue, Green
Persistence of arous shorstonessince  Not arrangement Each triangular	Medium Short
	group consists of a green, and blue dot
Spining between conters of	•
adjinent dot trion (Approx.)	.0.029 in (0.74 mm)

#### MECHANICAL

## TERMINAL DIAGRAM (Bottom View)

Pir 1 - rester	
Pin L-Cithodi of Fra Gr	
Pin C. i : No. 1 o . F. : G.n	
Pin 4-Grid No. 2 of Fittin	K <sub>G</sub>
Pir b-Gria tr., or Green (un-	
Pin t-Citos of Cont air	G2c
P'r 7-Gris Moni of Green Car	00
Pir 9-Grid No. >	a 01
P'r 11-Citriode of Blue Gun	SZR(4)
P'r 11 - Gr'a 1 .1 o' =1 (.n	- 4
Pir 14-Cria V or Rive sur	G <sub>IR</sub> 3
Pir 14 - Heater	- 13
Cir - Anode (Gri: No.4.	ĸ
uris ∿c., Screen.	
(o''-ctor)	
C - External Continti	



14BE

## MAXIMUM AND MINIMUM RATINGS, DESIGN-MAXIMUM VALUES

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

Anode Voltage	27,500	max \	٧
Total Anode Current, Long-Term Average Grid-No.3 (Focusing Electrode) Voltage	. 1000	max	A
Peak Grid-No.2 Voltage, Including Video Signal Voltage	. 1000	max \	٧

qe
yalue
ating cutoff value 200 max V
value 0 max V
v3lue 2 max V
(AC or DC)
ng conditions <sup>a</sup> $\{6.9 \text{ max}  V\}$
conditions <sup>b</sup> 5.5 max V
node Voltage
/P with respect to cathodo:
oment warm-up period ding 15 seconds
ment warm-up period:
AC and DC value 200 max V
ent value 200 max V
ve with respect to cathodr:
value 200 max V
t value O max V
EQUIPMENT DESIGN RANGES
rise specified, values are for each gun and
ues are positive with respect to cathode
le voltages between 20,000 and 27,500 V
ing Electrode Voltage 16.8% to 20%
of anode volts id-No.1 Voltages See accompanying
of anode volts
of anode volts id-No.1 Voltages See accompanying inction of Catoff Design Chart Grid-No.2 Voltages
of anode volts  id-No.! Voltages
of anode volts id-No.! Voltages
of anode volts  id-No.1 Voltages
of anode volts id-No.1 Voltages. See accompanying inction of Cutoff Design Chart  Grid-No.2 Voltages Isomorphism lovest gun in any No.1 spot cutoff O volts) t (Total) -45 to +15 A
of anode volts id-No.1 Voltages
of anode volts  id-No.1 Voltages
of anode volts  id-No.1 Voltages
of anode volts . See accompanying inction of
of anode volts  id-No.1 Voltages
of anode volts  id-No.1 Voltages
of anode volts . See accompanying cutoff Design Chart  Grid-No.2 Voltages . Las6 . Lowest gun in ary . No.1 spot cutoff (0 volts) .tt (Total)
of anode volts  id-No.1 Voltages
of anode volts  See accompanying  Cutoff Design Chart  Grid-No.2 Voltages  Dowest gun in ary No.1 spot cutoff  O volts)  tt (Total)  to 5 x = 0.281, y = 0.311)  total anode current  Sich gun (Averige)  de current:  Min Typ Max  Min Typ Max  0.75 1.10 1.50  0.65 1.00 2.50  0.60 0.91 1.30  asured at Center of Screen  ng displacement:
of anode volts  id-No.1 Voltages
of anode volts id-No.1 Voltages
of anode volts  See accompanying  Cutoff Design Chart  Grid-No.2 Voltages  Dowest gun in ary No.1 spot cutoff  O volts)  tt (Total)  t (Total)  s x = 0.281, y = 0.311)  total anode current  sich gun (Averige)  de current:  Min Typ Max  0.75 1.10 1.50  0.65 1.00 2.50  0.60 0.91 1.30  assured at Center of Screen  ng displacement:  to between the blue bear
of anode volts id-No.1 Voltages
of anode volts  id-No.1 Voltages See accompanying inction of
of anode volts id-No.1 Voltages

Maximum Required Correction for Register<sup>c</sup> (Including Effect of Earth's Magnetic Field when Using Recommended Components)

screen in my fir ction. . . . . 0.005 in (0.13 mm) max

## EXAMPLES OF USE OF DESIGN RANGES

Inless otherwise specified, voltagevalues are for each gun and are positive with respect to cathode

Anode Voltage	٧
Grid-No.3 (Focusing Electrode) Voltage 4200 to 5000	٧
Grid-No.2 Voltage when circuit	
design utilizes grid-No.1 voltage	
of -150 volts for visual extinction	
Of focused spot:	٧
Grid-No.1 Voltage for visual extinction	
of focused spot when circuit design	
utilizes grid-No.2 voltage of 400 volts95 to -190	٧
Heater Voltage	
the ser op ration rothing 6.3	٧
inger tings, consists, 5.0	٧

## LIMITING CIRCUIT VALUES

High-Voltage Circuits

Grid-No.3 Circuit Resistance. . . . . . . . . . . . 7.5 max M

In order to minimize the possibility of damage to the tube caused by a momentary internal arc, it is recommended that the high-rollage power supply and the grid-Vo.3 power supply be of the limited-energy type, in which the short-circuit current does not exceed 20 mA.

Low-Voltage Circuits

Effective grid-No.1-to-cathodecircuit resistance (Each gun). . . . . . . . 0.75 max M.

The low-voltage circuits, including all heater circuits, should be analyzed by assuming the color picture tube heater is connected directly to the receiver chassis ground. Under these conditions the circuits to the elements of all tubes, including the color picture tube, operating from the same heater winding 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 mA total in the assumed picture tube heater ground connection. The leads from all other circuits must be separated from the picture tube leads by a minimum distance of 0.25 inch (6.4 mm) to present energy transfer to the picture tube circuits. Such current limitation will help prevent picture tube damage in case of momentary cascade arcing.



- a for maximum earliede life, it is recommended that the heater supply be regulated at a Soults. The settle impodance to any chassis connection in the DK brasing circuit for the heater should be between 100,000 ohrs and I megob.
- b for curve, or through Propher Prophe
- For instart regularding, in symmetheater seltage of "Sychis to immersion in value, east be maintained of the other product when the receiver resulted for the third position. All other seltages are ally applied to the tule must be removed during standly operation.
- Beginter is defined is the relative position of the lead trios will be peet to the a solited phosphor-dot trios.

## GENERAL CONSIDERATIONS

X-Radiation Warning. Because the 25MP22 is designed to be operated at anode voltages as high as 27.5 kilovolts (design-maximum value), shrelding of the 25MP22 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

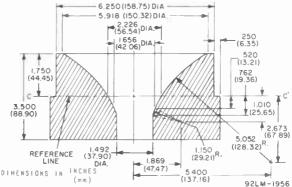
Orientation. The 25VP22 must be operated with tube axis in a horizontal position and with the blue gun uppermost (i.e., the anode contact button on top).

The Deflecting Yoke and tube axes must coincide and the xoke must be free to move along the neck for a distance of approximately 0, linch (13 mm) from its most loward position for adjustment purposes. The xoke mount should also provide for a small amount of rotational adjustment.

Contact to the external conductive coating should be made by multiple fingers to prevent possible damage to the tube from localized overhearing due to poor contact.

Misregister Compensation. Proper operation of the 25MP22 requires compensation for the effects of extraneous magnetic fields, the earth's magnetic field, and other causes which may produce misregister. Compensation for these effects may be accomplished by the use of a purifying magnet.

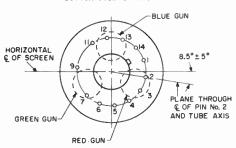
## REFERENCE-LINE AND NECK-FUNNEL-CONTOUR GAUGE JEDEC No.GI62



Beterence Line is determined by plane (-( when gauge is scated,

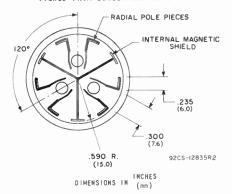


## BOTTOM VIEW OF BASE

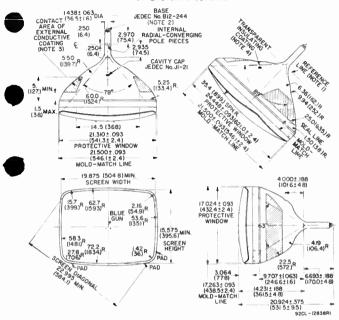


92CS-128I6

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



#### DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

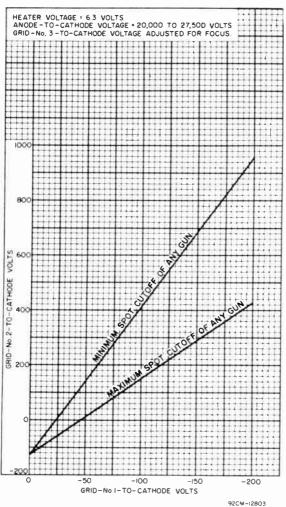
Note 1: With tube neck inserted through flared end of reference-line and neck-funnel-contour gauge and with tube scated in gauge, the reference line is determined by the intersection on the plane C-C' of the gauge with the glass funnel.

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 2-inch (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 grounded with multiple contacts.

Note 4: To clean this area, wipe only with soft, dry, limitless cloth.

# Cutoff Design Chort



# Typical Light-Output Characteristic

HEATER VOLTAGE • 6.3 VOLTS
ANODE-TO-CATHODE VOLTAGE • 25000 YOLTS
GRID-NO. 3-TO-CATHODE VOLTAGE ADJUSTED FOR FOCUS.
DRIVE OF EACH GUN IS ADJUSTED TO GIVE COMPOSITE ANODE

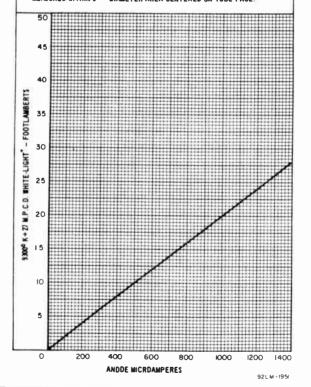
CURRENT TO PRODUCE 9300° K 27 M.P.C.D. WHITE-LIGHT DUTPUT. PERCENTAGE OF TOTAL ANDDE CURRENT SUPPLIED BY EACH GUN

TO PRODUCE 9300° K+27 M.P.C.D. WHITE:

RED GUN: 34% BLUE GUN: 32%

GREEN GUN: 34%

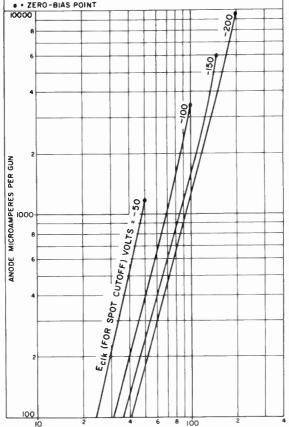
RASTER SIZE: 19.875" X 15.575" (504.8 mm X 395.6 mm)
"MEASURED WITHIN 5" - DIAMETER AREA CENTERED ON TUBE FACE.



## Typical Drive Characteristics

Grid-Drive Service



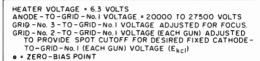


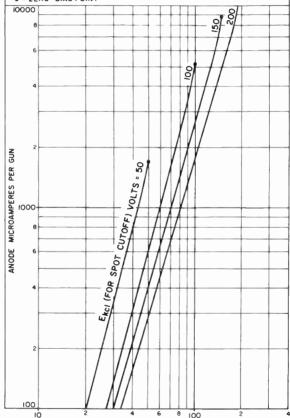
VIDEO SIGNAL VOLTS FROM SPOT CUTOFF PER GUN
92CM-12807

RCA

## Typical Drive Characteristics

Cathode-Drive Service





VIDEO SIGNAL VOLTS FROM SPOT CUTOFF PER GUN

92CM-12806





## Color Picture Tube

"PERMA-CHROME" ASSEMBLY FOR OPTIMUM FIELD PURITY AND UNIFORMITY DURING WARM-UP

RECTANGULAR TUBE MAGNETIC CONVERGENCE

90° MAGNETIC DEFLECTION 3 ELECTROSTATIC-FOCUS GUNS

ALUMINIZED TRICOLOR PHOSPHOR-DOT Hi-Lite SCREEN (Utilizing a New, Improved Rare-Earth Red-Emitting Phosphor)

For Ise in Color-TV Receivers

The 251P22 is the same as the 25AP22 except for the following items:

#### OPTICAL

Faceplate. . . 

#### MECHANICAL

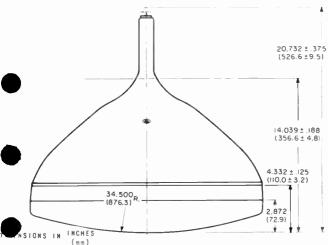
## Tube Dimensions

Gv. +: 11 lingth . 20.732 ± .375 in (526.6 ± 9.5 mm) 37 lb (16.8 kg.)

a It is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 25MP22 to protect it from being struck arridentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide x-radiation protection when required.

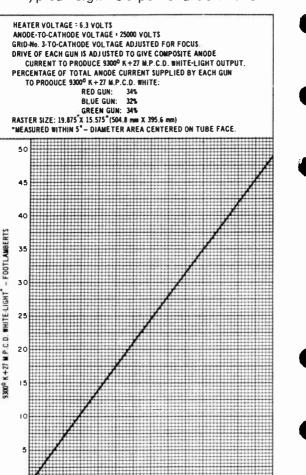
#### DIMENSIONAL OUTLINE

Dimensions shown are only those which are different from the corresponding dimensions for the 25XP22



Note: In side view, spherical radius = 31,000 in (863.6 mm)

# Typical Light-Output Characteristic



92LM-1955



ANODE MICROAMPERES



# 27MP4 PICTURE TUBE

RECTANGULAR METAL-SHELL TYPE MAGNETIC FOCUS

ALUMINIZED SCREEN MAGNETIC DEFLECTION

PINA

General: Heater, for Unicotential Cat Voltage. Current. Faceplate, Compound Scherica	6.3 ac or dc volts
Heater, for Unicotential Cat Voltage	6.3 ac or dc volts
Voltage	6.3 ac or dc volts
Phosphor (For Curves, see front	0.6 ± 10% am  1 Frosted Filterglas  of this Section). P4—Sulfide Typ  Aluminize
Vertical	
Greatest width at lip Greatest height at lip Diagonal at lip Neck length	22-3/16 25-1/4" ± 3/16 19-15/16" ± 3/16 26-7/8" ± 1/4 21/2" ± 3/16 21/2" ± 3/16
Greatest width	
Pin 1 - Heater Pin 2 - Grid No.1 Pin 10 - Grid No.2 Pin 11 - Cathode Pin 12 - Heater	Metal-Shell Lip - Ultor (Grid No.3, Collector)
Maximum Rátings, Design-Cent ULTOR VOLTAGE	18000 max. volt
Negative-bias value Positive-bias value Positive-peak value	0 max. volt

See next page.

- Indicates a change.

2TMPA



PEAK HEATER-CATHODE VOLTAGE:

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

Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . 1.5 max. megohms

♦ Within major area, the radius of curvature is ±0°. The curvature of the surface at the boundary of this area blends into the rim and has a perimetrical shape conforming to the surface of a sphere having a 50° radius.

For X-ray shielding considerations, see sheet X-RAY PRECAUTIONS FOR CATHODE-RAY TUBES at front of this Section

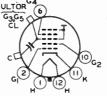
# Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS

ALUMINIZED SCREEN 900 MAGNETIC DEFLECTION

	GENERAL DATA
ΕÌ	ectrical:
Ρi	mater Current at 6.3 volts
El	[2000 min. μμπ ectron Gun Type Requiring No Ion-Tran Magnet
0р	tical:
PH	ceplate Filterglass Light transmission (Approx.)
Мe	chanical:
Ne Pr	erating Position.       Anv         right (Arprox.).       44 lbs         erall length.       21-1/16" ± 3/8"         ck Length       5-1/2" ± 3/16"         ovected Area of Screen.       425 sq. in.         trnal Conductive Coating:
	Tyre
	· licture lube Dimensional-Outlines and Bulb 1214 1 2 A
	Recessed Small Cavity (UEDEC No. 11 21)

Gris No.1 Grid No.4 10 - Grid No. 2 Cathode Fin 12 - Heater



Car - Illter (Crid No. 3. Grio No.5. Collectori Cc at ing

. . . . . . Small-Shell Duodecar b Fin, Arrangement 1 (JFDEC Group 4, No.FE-t-)

## Maximum Ratings, Design-Maximum Values:

TETCR VILIAGE GRID-No.4 (FOCUSI					٠		**** * *	volts
Frs * ve v · ue.						1111	m., x.	, ^ +,
Vegat ve vilue.						5°C	max.	/nl*s

# 27 VP4

GRID-No.1 VOLTAGE:  Negative peak value  Negative bias value  Positive bias value  Positive peak value  PEAK HEATER-CATHODE VOLTAGE:  Heater negative with respect to cathode:	220 max. 155 max. 0 max. 2 max.	volts
During equipment warm-up period not exceeding 15 seconds After equipment warm-up period Heater positive with respect to cathode.	450 max. 200 max. 200 max.	volts
Typical Operating Conditions:		
With ultor voltage of	16000	volts
and grid-No.2 voltage of	300	volts
Grid-No.4 Voltage for focus	-72 to +396	volts
Grid-No.1 Voltage for visual extinction of focused raster	-28 to <b>-</b> 72	volts
Maximum Circuit Values:		
Grid-No.1 Circuit Resistance:	1.5 max.	megohms

For X-radiation shielding considerations, see sheet X-RADIATION PRECAUTIONS FOR CATHODE-RAY TUBES at front of this section



# Picture Tube

RECTANGULAR GLASS TYPE LOW-VOLTAGE ELECTROSTATIC FOCUS ALUMINIZED SCREEN MAGNETIC DEFLECTION

With Heater Having Controlled Warm-Up Time

## GENERAL DATA

ect	

	000.	
He Fo De	ater Current at 6.3 volts	ic
	Diagonal	350
	Grid No.1 to all other electrodes 6  Cathode to all other electrodes 5  Futureal conductive costing to with 12500 max.	urf urf urf urf
E	ectron Gun Type Requiring No Ion-Trap Magr	iet
01	tical:	
Fa	ceplate, Spherical	72% /ne
	Fluorescence	te
Me	chanical:	
Tu	be Dimensions:  Overall length	/8" /8" /8"
	Center	10"
We	reen Dimensions (Minimum):  Greatest width	/4" /8" /4" in. ibs
	lh 1214-1/2	

# 27XP4

Base	(.	JEDEC	Colle C - Extern	No.3, No.5, ector)	
GRI	D-DRIVEª SER	VICE			
Unless otherw ues are posit	ise specified ive with resp	ect to	cathode		
Maximum and Minimum Rati	ngs, Design-	4ax ı mui	n Values:		_
ULTOR VOLTAGE			23000 max.	volts	
	T105	(	11000 min.	volts	
GRID-No.4 (FOCUSING) VOL Positive value Negative value GRID-No.2 VOLTAGE		 	1100 max. 550 max. ∫550 max.	volts volts volts	
GRID-No.1 VOLTAGE:			(200 min.	volts	
Negative-peak value .			220 max.	volts	
Negative-bias value . Positive-bias value .			154 max.	volts	
Positive-peak value .			0 max. 2 max.	volts volts	
			(6.9 max.	volts	
HEATER VOLTAGE  PEAK HEATER-CATHODE VOLT Heater negative with	AGE:		(5.7 min.	volts	
respect to cathode:					
During equipment war			450	1.4	
not exceeding 15 s After equipment warm			450 max. 200 max.	volts volts	
Heater positive with	rup beriou.		ZOU max.	VOICS	ø
respect to cathode.			200 max.	volts	J
Typical Operating Condit	ions:				
With ultor voltage (Ec	sk) of		18000	volts	
and grid-No.2 voltage (			400	volts	
Grid-No.4 Voltage for fo	cuŝ <b>b</b> .		0 to 400	volts	_
Grid-No.1 Voltage for vi	sual				



volts

gausses

megohms

1.5 max.

extinction of focused raster<sup>c</sup> . . . . -36 to -94

Centering Magnet d...... 0 to 11

Field Strength of Adjustable

Grid-No.1-Circuit Resistance. . . .

Maximum Circuit Values:

## CATHODE-DRIVE® SERVICE

Unless otherwise specified, voltage values are positive with respect to grid-No.1	
Maximum and Minimum Ratings, Design-Maximum Values:	
ULTOR-TO-GRID-No.1 VOLTAGE	volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE: Positive value	volts
Negative value	volts
GRID-No.2-10-CAIHODE VOLIAGE: CATHODE-TO-GRID-No.1 VOLIAGE: Positive-peak value 220 max. Negative-bias value 0 max. Negative-bias value 0 max.	volts volts volts volts
Negitive-peak value 2 max. HEATER VOLTAGE	volts volts
PEAK HEATER-CATHODE VOLTAGE:  Heater negative with respect to cathode: During equipment warm-up period not exceeding 15 seconds	volts volts
Typical Operating Conditions:	
With ultor-to-grid-No.1 voltage $(E_{C,5}g_1)$ of 18000 and grid-No.2-to-grid-No.1 voltage $(E_{C,2}g_1)$ of 400	volts
Grid-No.4-to-Grid-No.1 Voltage for focus	volts
focused raster	volts gausses
Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max.	meqohms
Grid drive is the operating condition in which the video signa the grid-No.1 potential with respect to cathode.	1 varies

The grid-No.4 (or grid-No.2-to-grid-No.1) voltage required for optimum focus of any individual tube will have a value anywhere between 0 and 400 volts, is independent of ultor current and will remain essentially constant for values of ultor (or ultor-to-grid-No.1) voltage or grid-No.2 (or grid-No.2-to-grid-No.1) voltage within design-maximum ratings shown for these items.

C See Raster-Cutoff-Range Chart for Grid-Drive Service.

Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/4". The specified centering magnet compensates only for the effect which mechanical tupe tolerances may have on the

# 27XP4

location of the undeflected focused spot with respect to the center of the tube face. Maximum field strength of adjustable centering magnet equals:

$$\sqrt{\frac{\varepsilon_{c_5k} \text{ or } \varepsilon_{c_5g_1} \text{ (volts)}}{16000 \text{ (volts)}}} \times 11 \text{ gausses}$$

The equipment manufacturer must determine and supply additional compensation for the effects of the earth's magnetic field and extraneous fields due to choice of circuitry and components. The additional compensation should preferably be applied as part of the magnetic field of the deflecting yoke.

- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.
- f See Raster-Cutoff-Range Chart for Cathode-Drive Service.

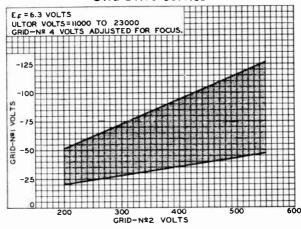
## OPERATING CONSIDERATIONS

X-Ray Warning. When operated at ultor voltages up to I do kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 23 kilovolts (Design-maximum value), shielding of this picture tube for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

Shatter-Proof Cover Over the Tube Face. Following conventional picture tube practice, it is recommended that the cabinet be provided with a shatterproof, glass cover over the face of this 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.

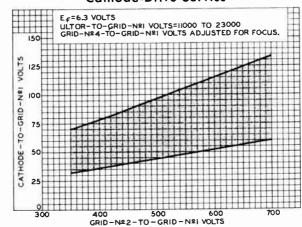


## RASTER-CUTOFF-RANGE CHARTS Grid-Drive Service

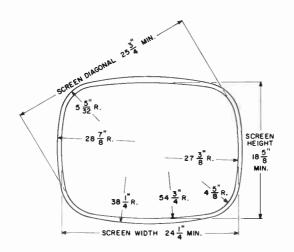


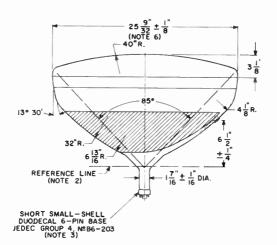
92CS-10912

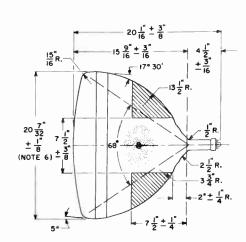
## Cathode-Drive Service

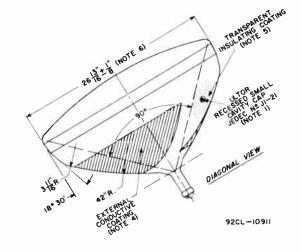


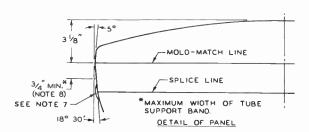
92CS-10904











NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN 6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm~30^{\circ}$ . ULTOR TERMINAL IS ON SAME SIDE AS PIN 6.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE—LINE GAUGE JEDEC No.G—116 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFFRENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC'OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: 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 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE IN-DICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/B", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMEN-SIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

NOTE 8: AREA BETWEEN MOLD-MATCH LINE AND SEAL BULGE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF ASPHALT-IMPREGNATED FELT, OR EQUIVALENT.





## HIGH-VACUUM CATHODE-RAY TUBE

Supersedes Type gaz_
General:
Heater, for Unipotential Cathode:  Voltage 6.3 ± 10%
$D\!J_1$ and $D\!J_2$ are nearer the screen $D\!J_3$ and $D\!J_4$ are neurer the base
With $\mathrm{DJ}_1$ positive with respect to $\mathrm{DJ}_2$ , the spot is deflected toward pin 3. With $\mathrm{DJ}_3$ positive with respect to $\mathrm{DJ}_4$ , the spot is deflected toward pin 1. The angle between the trace produced by $\mathrm{DJ}_3$ and $\mathrm{DJ}_4$ and its intersection with the plane through the tube axis and pin 1 does not exceed $\mathrm{IO}^0$ . The angle between the trace produced by $\mathrm{DJ}_3$ and $\mathrm{DJ}_4$ and the trace produced by $\mathrm{DJ}_1$ and $\mathrm{DJ}_2$ is $900 \pm 40$ .
Maximum Ratings, Absolute Values:
ANODE-No.2 & GRID No.2 VOLTAGE





## HIGH-VACUUM CATHODE-RAY TURE

(continued from preceding page)

## Typical Operation:

Anode No. 2 & Grid No. 2	Voltage <sup>★</sup>		400	600			volts
Anode No.1 Voltage for	Focus						
at 75% of Grid-No.1	Volt-						

age for Cutoff . . 100 150 . .

voits -60 Grid-No.1 Volt. for Visual Cutoff#. -40 volts Max. Anode-No.1 Current Between -50 and +10 namp.

Range\*

Deflection Sensitivity: DJ1 and DJ2 . . . . . . . . 0.273 0.183 . . . mm/v dc DJ3 and DJ4 . . . . . 0.326 0.217 . Deflection Factor:\*\* mm/v dc DJ1 and DJ2 . . . . . . v dc/in. 78 DJ3 and DJ4 .

- ★ Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 400 volts.
- Individual tubes may require between +20\$ and -35\$ of the values shown with grid~No.1 voltages between Zero and cutoff.
- f visual extinction of stationary focused spot. Supply should be adjustable to  $\pm~50\,\mathrm{s}$  of these values.
- See curve for average values.
- Individual tupes may vary from these values by ± 20%.

#### Spot Position:

The undeflected focused spot will fall within a 10-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ and DJ2. Suitable test conditions are: anode-No.2 voltage, 600 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, I megohm each for DJ1 and DJ4, connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No. I voltage should be near cutoff before application of anode voltages.

#### Maximum Circuit Values:

Grid-No.1-Circuit Resistance . . . . . . . 1.5 max. megohms Impedance of Any Deflecting-Electrode

1.0 max. megohm Circuit at Heater-Supply Frequency Resistance in Any Deflecting-

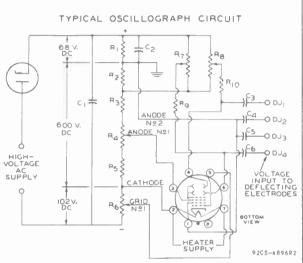
Electrode Circuit 5.0 max. megohms

It is recommended that both deflecting-electrode-circuit resistances be approximately equal.



# 302.A

## HIGH-VACUUM CATHODE-RAY TURE



C1: 0.1 µf

C2: 1.0 µf C3 C# C5 C6: 0.05-µf Blocking Capacitors\* R1 R2: 1.0 Megonm

R3: 1.3 Megohms

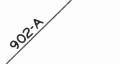
RW: 1-Megohm Potentiometer

R5: 0.3 Megohm R6: 0.5-Megohm Potentiometer R7 RB: Dual 2-Megohm Potentiometer

R9 R10: 2 Megohms

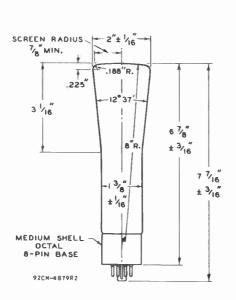
When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

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## HIGH-VACUUM CATHODE-RAY TUBE



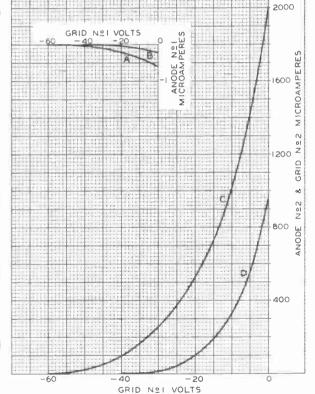


302.A

## AVERAGE CHARACTERISTICS

ij	$E_{f} = 6.3$	VOF	TS	-				1	-
3	ANODE	Nº1	VOL	TS	ADJUSTED	TO	GIVE	FOCUS	4.0

ANODE	Nº! VOLT	IS ADJUSTED T	O GIVE FOCUS	
	CURVE	ELECTRODE CURRENT	ANODE Nº2 & GRID Nº2 VOLTS	
	Δ	ANODE Nº I	600	
	В	ANODE Nº1	400	
	С	ANODE Nº 2 & GRID Nº 2	600	
	D	ANODE Nº 2	400	



APR. 13, 1945 RCA VICTOR DIVISION FADIO COPPORATION OF AMERICA HARRISON NEW JESSEY

92CM - 4895RI



# 205.A

## HIGH-VACUUM CATHODE-RAY TUBE

١,	Supersedes Type 905
	General:
	Heater, for Unipotential Cathode:  Voltage. 2.5 ± 10% ac or dc volts Current. 2.1 amp.  Direct Interelectrode Capacitances (Approx.): Grid No.1 to All Other Electrodes 9.0 μμf DJ1 to DJ2 2.0 μμf DJ3 to DJ4 1.0 μμf Phosphor (For Curves. see front of this Section) No.1 Fluorescence Green Persistence Wedium Focusing Method Electrostatic
	Deflection Method Electrostatic Overall Length
	Greatest Diameter of Bulb
	Minimum Useful Screen Diameter
	$DJ_1$ and $DJ_2$ are nearer the screen $DJ_3$ and $DJ_4$ are nearer the base
	With $\mathrm{DJ}_1$ positive with respect to $\mathrm{DJ}_2$ , the spot is deflected toward pin 3. With $\mathrm{DJ}_3$ positive with respect to $\mathrm{DJ}_4$ , the spot is deflected toward pin 2.
	The angle between the trace produced by DJ <sub>1</sub> and DJ <sub>2</sub> and its intersection with the plane through the tube axis and pin 3 does not exceed 10°.  The angle between the trace produced by DJ <sub>3</sub> and DJ <sub>4</sub> and
	the trace produced by DJ $_{ m I}$ and DJ $_{ m 2}$ is $90^{\circ}$ $\pm$ $6^{\circ}$ .
	Maximum Ratings, Absolute Values:
	ANODE-No.2 & GRID-No.2 VOLTAGE
	Positive Value 0 max. volts PEAK VOLTAGE BETWEEN ANODE No.2 AND  ANY DEFLECTING ELECTRODE 1100 max. volts
	JULY 1, 1945 DATA 1





(continued from preceding page)

#### Typical Operation:

-		/			
	Anode-No. 2	Grid-No.2 Voltage* 1500 2000	) .		volts
		/olt. for Focus at 75%			

of Grid-No.1 Volt. for Cutoff. 338 450 . . . volts Grid-No.1 Volt. for Visual Cutoff. -26 -35 . . . volts Max. Anode-No.1 Current

Range\* . . Between -50 and +10 µamp. Deflection Sensitivity:

Deflection Sensitivity:

DJ1 and DJ2 . . . . . . 0.295 0.221 . mm/v dc

DJ3 and DJ4 . . . . . . 0.348 0.262 . mm/v dc

Deflection Factor:\*\*

- Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1500 volts.
- Individual tubes may require between -30s and +25s of the values shown with grid-No.1 voltages between zero and cutoff.
- # Visual extinction of stationary focused spot. Supply should be adjust—able to  $\pm~50\%$  of these values.
- See curve for average values.
- Individual tubes may vary from these values by ± 20%.

#### Spot Position:

The undeflected focused spot will fall within a 12-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ<sub>1</sub> and EJ<sub>2</sub>. Suitable test conditions are: anode-No.2 voltage, 1500 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, I megohm each, connected to anode-No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

#### Maximum Circuit Values:

Grid-No.1-Circuit	Resistance.				1.5	max.	megohms	
Resistance in Any	Deflecting-							

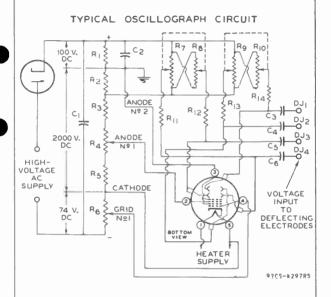
Electrode Circuit⁴ 5.0 max. megohms

It is recommended that all deflecting-electrode-circuit resistances be approximately equal.



# 905.A

## HIGH-VACUUM CATHODE-RAY TUBE



C1: 0.1 µf C2: 1.0 µf C3 C4 C5 C6: 0.05-µf Blocking Capacitors \* R1 R2: 2 Megohms R3: 6 Megohms

R4: 2-Megohm Potentiometer R5; 1.0 Megohm R6: 0.35-Megohm Potentiometer

R6: 0.35-Megohm Potentiometer R7 R8: Qual 5-Megohm Potentiometer R9 R10: Qual 5-Megohm Potentiometer R11 R12 R13 R14: 2 Megohms

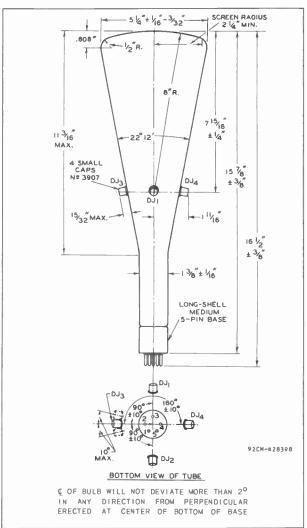
When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

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## 905-A

## HIGH-VACUUM CATHODE-RAY TUBE



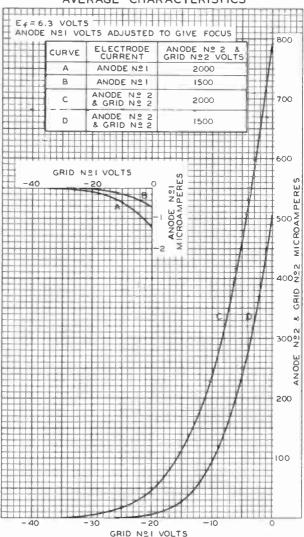
JULY 1, 1945

905.A



# 905.A

#### AVERAGE CHARACTERISTICS







# 908.A

### OSCILLOGRAPH TUBE

Supersedes Type 908

Supersedes Type 900
General:
Heater, for Unipotential Cathode:  Voltage. 2.5 ± 10% ac or dc volts Current. 2.1 amp.  Direct Interelectrode Capacitances lApprox.): Grid No.1 to All Other Electrodes. 9.0 µµf DJ1 to All Other Electrodes. 8.5 µµf Phosphor (For Curves, see front of this Section) No.5 Pluorescence Blue Persistence. Very Short Focusing Method. Electrostatic Deflection Method. Electrostatic Overall Length 11-1/2" ± 3/8" Greatest Diameter of Bulb. 3" ±1/16" Minimum Useful Screen Diameter 2-3/4" Mounting Position. Any Base. Medium 7-Pin Basing Designation for BOTTOM VIEW 7CE Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Deflecting Electrode DJ3 Pin 4 - Anode No.1 Pin 5 - Deflecting Electrode DJ1 Pin 7 - Heater, Cathode
$DJ_1$ and $DJ_2$ are nearer the screen $DJ_3$ and $DJ_4$ are nearer the base
with DJ <sub>2</sub> positive with respect to D <sub>2</sub> , the spot is deflected toward pin 1. With DJ <sub>4</sub> positive with respect to DJ <sub>3</sub> , the spot is deflected toward pin 6.  The angle between the trace produced by DJ <sub>3</sub> and DJ <sub>4</sub> and its intersection with the plane through the tube axis and pin 6 does not exceed 10°.
The angle between the trace produced by DJ $_3$ and DJ $_4$ and the trace produced by DJ $_1$ and DJ $_2$ is 90 $^{\circ}$ $\pm$ 3 $^{\circ}$ .
Maximum Ratings, Design-Center Values:
ANODE-No.2 & GRID No.2 VOLTAGE 1500 max. volts ANODE-No.1 VOLTAGE 1000 max. volts GRID-No.1 (CONTROL ELECTRODE) VOLTAGE: Negative Value





### OSCILLOGRAPH TUBE

(continued from preceding page)

#### Typical Operation:

ı	Anode No. 2 & Grid No. 2 Voltage 1000 1500 volts	
ı	Anode No.1 Voltage for Focus	
ı	at 75% of Grid-No.1 Volt-	
ı	age for Cutoff® 287 430 volts	
ı	Grid-No.1 Volt. for Visual Cutoff#33 -50 volts	
ı	Max. Anode-No.1 Current Range*. Between -50 and +10 μamp.	
ł	Deflection Sensitivity:	

Derre	LIOI	361	121	L.	V I	L									- 1	
DJ1	and	$DJ_2$								0.334	0.223		П	m/v	dc	
DJ3	and	DJ4								0.348	0.233		n	m/v	dc	ı
Defle	ction	1 Fac	to	or:	9.1	F										
DJ1	and	DJ2									114					
DJ3											109	6	٧	dc/i	n.	

- \* Brilliance and definition decrease with decreasing anode-No.2 voltage. In general, anode-No.2 voltage should not be less than 1000 volts.
- Individual tubes may require between +29% and -44% of the values shown with grid-No.1 voltages between zero and cutoff.
- # visual extinction of stationary focused spot. Supply should be adjustable to ± 50% of these values.
- See curve for average values.
- Individual tubes may vary from these values by ± 20%.

#### Spot Position:

The undeflected focused spot will fall within a 15-mm square centered at the geometric center of the tube face and having one side parallel to the trace produced by DJ $_{\rm I}$  and DJ $_{\rm 2}$ . Suitable test conditions are: anode-No.2 voltage, 15D0 volts; anode-No.1 voltage, adjusted for focus; deflecting-electrode resistors, I megohm each for DJ $_{\rm I}$  and DJ $_{\rm 3}$ , connected to anode No.2; the tube shielded from all extraneous fields. To avoid damage to the tube, grid-No.1 voltage should be near cutoff before application of anode voltages.

#### Maximum Circuit Values:

Grid-No.1 Circuit Resistance . . . . . 1.5 max. megohms Impedance of Any Deflecting-Electrode

Circuit at Heater-Supply Frequency 1.0 max. megohm Resistance in Any Deflecting-

Electrode Circuit<sup>\*\*</sup> 5.0 max.

At it is recommended that both deflecting-electrode-circuit resistances be approximately equal.

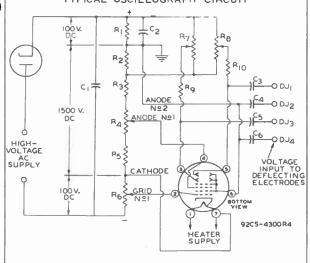
meaohms



# 908:A

### OSCILLOGRAPH TUBE

#### TYPICAL OSCILLOGRAPH CIRCUIT



- C1: 0.1 µf C2: 1.0 µf C3 C8 C5 C6: 0.05-µf Blocking
  - Capacitors\*
- R1 R2: 1.5 Megohms R3: 4 Megohms

- R4: 2-Megohm Potentiometer
- 95: 1.0 Megohm
- R6: 0.5-Megohm Potentiometer R7 R8: Dual 3-Megohm Potentiometer
- R9 R10: 2-Megohms

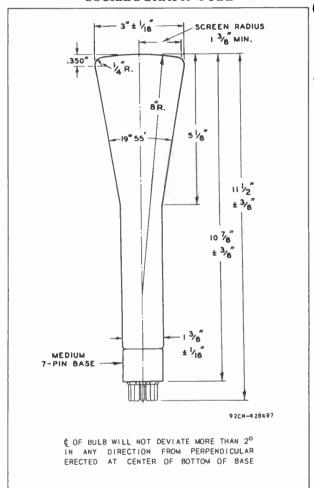
When cathode is grounded, capacitors should have high voltage rating; when anode No.2 is grounded, they may have low voltage rating. For dc amplifier service, deflecting electrodes should be connected direct to amplifier output. In this service, it is preferable usually to remove deflecting-electrode resistors to minimize loading effect on amplifier. In order to minimize spot defocusing, it is essential that anode No.2 be returned to a point in the amplifier system which will give the lowest possible potential difference between anode No.2 and the deflecting electrodes.

The license extended to the purchaser of tubes appears in the License Motice accompanying them. Information contained herein is furnished without assuming any obligations.

908-A



## OSCILLOGRAPH TUBE



JUNE 20, 1946



# 908,A

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		ANODE N								
	С	& GRID	Vº 2		15	00		1		1
	D	ANODE I	Vº 2		10	000		1		
		& GRID	Nº 2							
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		CRID		VOLT						





# 19/2

## HIGH-VACUUM CATHODE-RAY TUBE

HIGH-INTENSITY ELECTROSTATIC-DEFLECTION TYPE
WITH 5" MEDIUM-PERSISTENCE SCREEN FOR OSCILLOGRAPHIC USE

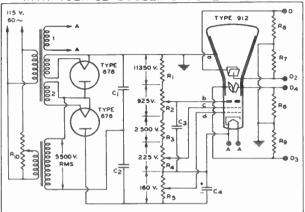
1			GRAPHIC	USE
Heater Coated	Unipotential Ca			
Voltage	2.5	a-c	or d-c	volts
Current	2.1			amp.
Fluorescent Screen:			n L .	
Pattern Color			Gre	enish
Direct Interelectrode C	apacitances:			
- · · · · · · · · · · · · · · · · · ·		14	max.	μμf
	Ç (1 0000			μμf
				μμf
		E 4 (4 !! .	) 1/2 :	2/22"
		3-1/4 T		
				J-42
	(Four)			
Base		Med i um	5-Pin M	icanol
	BOTTOM VIEW			
Pin 1 - Heater		Cap	(Dofler	+100
Pin 2-Grid No. 2				
	P2 (3) DJ			
mr - 0 1 1 1 1		- 1	W 2	
	1 TAP.		Deflec	tina
	2	.,		
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	_			
		F1H 4)	( 004	
Pin 3) { W1				
MAXIMUM RATINGS a	nd TYPICAL OPER	RATING CON	HT I ONS	
Maximum Ratings Are Based of	on a Line-Voltage	Design Cente	r of 117	Volts
· ·	-	_		
				volts
				volts
		-125	appi ox.	AOILS
		70.00		volts
,	ectrode	7000	max.	VOILS
Heater Voltage		2.5 2.5		volts
Anode #2 Voltage	5000 10	000 15000		volts
	1 000 2	000 3000	approx.	volts
Anode #1 Voltage				
Grid #2 Voltage	250	250 250		volts
Grid #2 Voltage Grid #1 Voltage Ad	liusted to give	250 250		volts
Grid #2 Voltage Grid #1 Voltage Ad	liusted to give	250 250		volts
Grid #2 Voltage Grid #1 Voltage Ad Deflection Sensitivit	ljusted to give	250 250 suitable	luminous	volts
Grid #2 Voltage Grid #1 Voltage Ad Deflection Sensitivit DU <sub>1</sub> to DU <sub>2</sub>	justed to give by: 0.083 0.	250 250 suitable 041 0.028	luminous mm/volt	volts spot d.c.
Grid #2 Voltage Grid #1 Voltage Ad Deflection Sensitivit	justed to give by: 0.083 0.	250 250 suitable 041 0.028	luminous	volts spot d.c.
Grid #2 Voltage Grid #1 Voltage Ad Deflection Sensitivit DU <sub>1</sub> to DU <sub>2</sub>	0.083 0.0.102 0.0	250 250 suitable 041 0.028 051 0.034	luminous mm/volt	volts spot d.c.
	Material Pattern Color Direct Interelectrode C Grid to all other eig DJ1 to DJ2 DJ3 to DJ4 Overall Length Maximum Diameter Bulb Caps: Anode No.2 Deflecting Electrodes Base  Pin 1 - Heater Pin 2 - Grid No.2 Pin 3 - Anode No.1 Pin 4 - Grid No.1 Pin 4 - Grid No.1 Pin 5 - Heater, Cathode Single Medium Cap Anode No.2 Cap Over Pin 3  Maximum Ratings Are Based of High-Voltage Electrode Focusing Electrode (Ano Accelerating Electrode Control Electrode (Grid Grid Voltage for Curren Peak Voltage Between Ar	Material Pattern Color  Direct Interelectrode Capacitances: Grid to all other electrodes  DJ1 to DJ2 DJ3 to DJ4  Overall Length Maximum Diameter Bulb Caps: Anode No.2 Deflecting Electrodes (Four) Base  Pin 1 - Heater Pin 2 - Grid No.1 Pin 5 - Heater, Cathode Single Medium Cap Anode No.2 Cap Over Pin 3 - Anode No.1 Pin 5 - Heater, Cathode Single Medium Cap Anode No.2 Cap Over Electrode Pin 3 - DJ2  MAXIMUM RATINGS and TYPICAL OPEI Maximum Ratings Are Based on a Line-Voltage High-Voltage Electrode (Anode #1) Voltage Accelerating Electrode (Grid #2) Volt Control Electrode (Grid #1) Voltage Grid Voltage Between Anode #2 and any deflecting electrode	Material Pattern Color  Direct Interelectrode Capacitances: Grid to all other electrodes  Grid to all other electrodes  Grid to all other electrodes  Grid to all other electrodes  Grid to all other electrodes  14  DJ1 to DJ2  DJ3 to DJ4  1.5  Overall Length  Maximum Diameter  Bulb  Caps:  Anode No.2  Deflecting Electrodes (Four)  Base  BOTTOM VIEW  Pin 1 - Heater Pin 2 - Grid No.1 Pin 3 - Anode No.1 Pin 4 - Grid No.1 Pin 5 - Heater, Cathode Single Medium Cap Anode No.2  Cap Over Single Medium Cap Anode No.2  Cap Over Pin 3  MAXIMUM RATINGS and TYPICAL OPERATING COND  Maximum Ratings Are Based on a Line-Voltage Design Cente High-Voltage Electrode (Anode #1) Voltage Focusing Electrode (Anode #1) Voltage Control Electrode (Grid #1) Voltage Grid Voltage Between Anode #2 and any deflecting electrode 7000	Material Pattern Color  Direct Interelectrode Capacitances: Grid to all other electrodes  DJ1 to DJ2 DJ3 to DJ4  Overall Length  Maximum Diameter  Base  Pottom VIEW  Pin 1 - Heater Pin 2 - Grid No. 2 Pin 3 - Anode No. 1 Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater, Cathode Single Medium Cap Anode No. 2 Cap Over Pin 5 - Heater Over Pin 6 - Heater Pin 7 - Wedium Small Medium 5 - Pin M Medium 5 - Pi

JUNE 20, 1947





# TYPICAL OSCILLOGRAPH CIRCUIT USING THE 912 WITH VOLTAGE-DOUBLING POWER SUPPLY



C<sub>1</sub>, C<sub>2</sub> = 0.5 µf, 10000 V. C<sub>3</sub> = 1.0 µf, 5000 V. C<sub>4</sub> = 16 µf, 200 V. R<sub>3</sub>=0.55 MEGOHM, 20-WATT R<sub>4</sub>=50000 OHMS, 2-WATT R<sub>5</sub>=35000 OHMS, 2-WATT a = ANODE Nº 2 b = ANODE Nº 1 C = GRID Nº 2

R<sub>1</sub> = 2.5 MEGOHMS, 75-WATT R<sub>2</sub> = 0.2 MEGOHM, ID-WATT R<sub>6</sub>, R<sub>7</sub>, R<sub>6</sub>, R<sub>9</sub> = 2 TO 5 MEGOHMS d = GRID Nº I

AS THE TOTAL VOLTAGE ACROSS THE BLEEDER IS REDUCED BY MEARS OF R<sub>18</sub>. THE ELECTRODE VOLTAGES ARE REDUCED IN COMPRET PROFORTION, EXCEPT FOR GRID NO.2 VOLTAGE. THIS WAT HAVE TO BE REQUISTED BY THE USE OF DIFFERENT VALUES FOR R<sub>8</sub> AND P<sub>6</sub>. THEIR TOTAL RESISTANCE BEING REPT THE SAME. COMDENSERS C<sub>6</sub> AND C<sub>6</sub> CAN BE OMITTED IF GRID-VOLTAGE SBITCHING FROM NICH-SPEED PROFOGRAPHIT IS NOT CONTEMPLATED. FILAMENT WINDINGS NCS. 1 and 2 SMOULD BE INSULATED FOR 2000D VOLTS.

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92C-4621R1

## FLUORESCENT-SCREEN CHARACTERISTICS

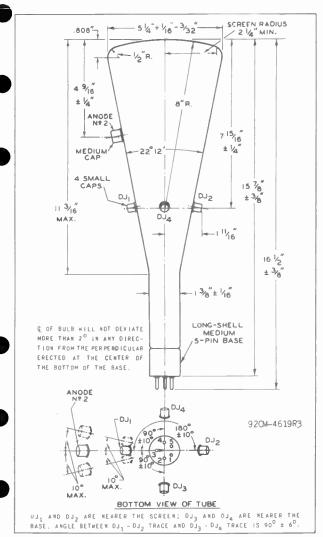
CURVES SHOWING THE AVERAGE CHARACTERISTICS, SPECTRAL EMERGY CHARACTERISTIC, AND PERSIST-ENCE CHARACTERISTIC OF PHOSPHOR NO. I ARE SHOWN AT THE BEGINNING OF THIS SECTION.

-Indicates a change.

AUG. 15, 1946

DATA
TUBE DEPARTMENT

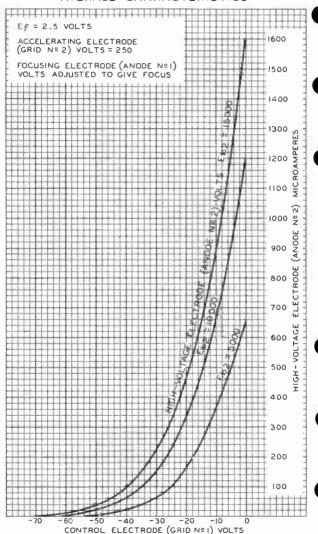








## AVERAGE CHARACTERISTICS







HIGH-VACUUM C.	ATHODE-RAY	TOBE
Heater Coated Unipo	ential Cathode	
Voltage		or d-c volts
Current	0.6	amp.
Focus		Electrostatic
Deflection		Electrostatic
Electrodes $\mathbb{W}_1$ and $\mathbb{W}_2$ (upp Electrodes $\mathbb{W}_3$ and $\mathbb{W}_4$ (low	er): nearest to s	creen
Electrodes Dig and Dig (low	er): nearest to b	ase
$  W_1  $ is on the same side of	tube as pins No. 2	and No.4
Dua is on the same side of	tube as pins No.2	and No.8
Phosphor		No.1
Fluorescence		Green
Persistence		Medium
Direct Interelectrode Capacit	ances:	
Control Electrode (Grid) to All	Other Electrodes	8 µµ۴
Deflecting Electrode DJ; to Defl	ecting Electrode DJ <sub>2</sub>	2.5 µµf
Deflecting Electrode DJ3 to Defl	ecting Electrode Da	2.5 µµf
Maximum Overall Length		4-3/4"
Maximum Diameter		1-5/8"
Bulb	Metal	Shell, MT-10
Base	Small Wafe	r Octal 8-Pin
MAXIMUM RATINGS and TYP	ICAL OPERATING CON	DITIONS
Maximum Ratings Are Based on a Lin		
High-Voltage Electrode (Anode		
Focusing Electrode (Anode No.		
Control Electrode (Grid) Volt		r positive
Peak Voltage Between Anode No		1 00311110
Any Deflecting Electrode	250 m	ax. volts
Grid Circuit Resistance	1.5 m	
Impedance of Any Deflecting-E		
Circuit at Heater-Supply Fr		ax. megohm
Typical Operation:		
Anode No. 2 Voltage	250 500	volts
Anode No.1 Voltage	50 100 at	prox. volts
	ed to give suitable	
Deflection Sensitivity:		
Electrodes DJ & DJ2	0.15 0.07	mm/volt d.c.
Electrodes D3 & D4		mm/volt d.c.
NOTE I: Brilliance and defin		
anode voltages. In g		No.2 voltage
should not be less than		
NOTE 2: The d-c potential of		
maintained essentially	equivalent to that	of anode No. 2
by connecting resistors		
10 megohms between each		
No. 2. This arrangement	by suitable choic	e of resistor
values minimizes patter		
resulting from unbalanc		
electrodes. The smalle		ues, the less
the distortion for a gi	ven beam current.	
C. O: See next page.		
- fndicates a change.		
a change.		



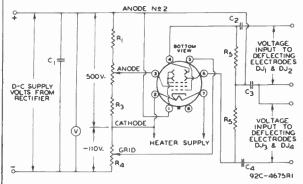


(continued from preceding page)

 $^{\rm Cl}$  Supply should be adjustable to  $\pm$  30% of the value shown.  $^{\rm O}$  Approximately 80% of Anode No.1 voltage is required for current cutoff when, in some applications, it is necessary to use the maximum permissible grid-circuit resistance.

Characteristic Curves of phosphor No.1 are shown at the beginning of this section.

#### TYPICAL OSCILLOGRAPH CIRCUIT



NOTE 3: When the cathode or the negative end of the cathode-ray high-voltage supply is grounded, blocking condensers  $C_2$ ,  $C_3$ , and  $C_4$  should have a high voltage rating. When anode No.2 is grounded,  $C_3$  may be omitted and  $C_2$  and  $C_4$  may be low-voltage condensers.

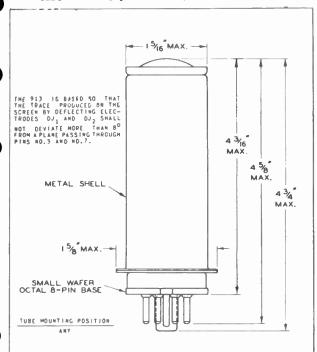
For d-c amplifier service, the deflecting electrodes should be coupled direct to the output of the amplifier by omitting the blocking condensers. In addition, it will usually be preferably to remove the associated deflecting electrode resistor in order to minimize the loading effect of the resistor on the d-c amplifier. With the resistor removed, it is essential, in order to minimize spot defocusing, that anode No.2 be returned to some point in the d-c amplifier circuit such that the potential difference between anode No.2 and the average voltage across the deflecting electrodes will be as low as possible.

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- Indicates a change.







#### BOTTOM VIEW OF SOCKET CONNECTIONS

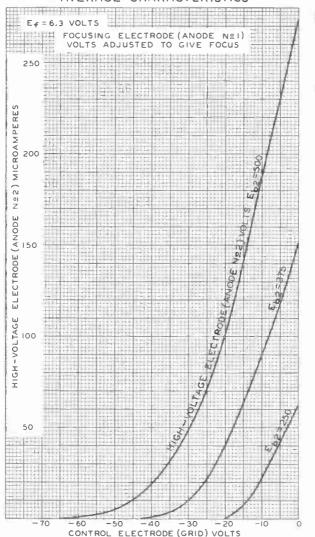
 $\begin{array}{lll} {\rm DJ_1} \ {\rm to} \ {\rm DJ_4} = {\rm Deflecting} \ {\rm Electrodes} \\ {\rm P_2} = {\rm Anode} \ {\rm No.2} \\ {\rm P_1} = {\rm Anode} \ {\rm No.1} \\ {\rm G_2} = {\rm Grid} \ {\rm No.2} \\ {\rm G_2} = {\rm Control}^* \left( {\rm Grid} \ {\rm No.1} \right) \ {\rm Electrodes} \\ {\rm M} = {\rm Meater} \\ {\rm K} = {\rm Cathode} \\ {\rm S} = {\rm Shell} \\ {\rm MC} = {\rm No} \ {\rm Connection} \\ \end{array}$ 







### AVERAGE CHARACTERISTICS



OCT. 20-1936

RCA VICTOR DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92C-4680



## 914-A

OF A

OSCILLOGRAPH TUBE
ELECTROSTATIC FOCUS ELECTROSTATIC DEFLECTION

General:	DATA
Current. Direct Interelectrode Capaci Grid No.1 to All Other Ele D1 to D2 D3 to D4 Phosphor (For Curves, see for Fluorescence. Persistence.	hode:  2.5 ac or dc volts  2.1 amp tances (Approx.): ctrodes 10.5
Deflection Method	Electrostatic 20-1/16" ± 3/8"
Pin 1 - Heater Pin 2 - Anode No.1 Pin 3 - Grid No.2 Pin 4 - Grid No.1 Pin 5 - Cathode Pin 6 - Heater Single Medium Cap- Anode No.2 Cap Over Pin 2 Electrode DJ1	TOM VIEW  Cap over Pin 5  Cap Over Pin 5  DJ2 Pins 1 & 6 Cap Over Pins 1 & 6 Cap Over Pins 3 & 4  DJ3 Deflecting Electrode DJ3  Deflecting Electrode DJ3  Deflecting Electrode DJ3  Deflecting Electrode DJ4  DJ4
$\begin{array}{c} DJ_1 \text{ and } DJ_2 \text{ are} \\ DJ_3^2 \text{ and } DJ_4^2 \text{ are} \end{array}$	nearer the screen nearer the base
toward pin 2. With DJ3 pos spot is deflected toward p	
intersection with the plane does not exceed 10°.	produced by $\mathrm{DJ}_1$ and $\mathrm{DJ}_2$ and its through the tube axis and pin 2
The angle between the trace trace produced by DJ and I	e produced by DJ <sub>3</sub> and DJ <sub>4</sub> and the DJ <sub>2</sub> is $90^{\circ} \pm 6^{\circ}$
Maximum Ratings, Design-Cente ANODE-No.2 VOLTAGE OANODE-No.1 VOLTAGE.	7000 max. volts
L	e and average anode-No.2 current should





### OSCILLOGRAPH TUBE

	For any anode-No.2 voltage (Eb <sub>2</sub> ) between 1500 and 7000 volts  Anode-No.1 Voltage 15% to 26% of Eb <sub>2</sub> volts  Grid-No.2 Voltage		GRID No. 2 VOLTAGE. GRID No. 1 VOLTAGE: Negative bias value. Positive bias value. Positive peak value. PEAK VOLTAGE BETWEEN ANODE No. AND ANY DEFLECTING ELE HEATER-CATHODE VOLTAGE: Heater negative with respect	2 CTRODE .		o max. volts o max. volts o max. volts o max. volts	
Anode—No.1 Voltage	Anode—No.1 Voltage	<b>→</b>	Equipment Design Ranges:				
Anode—No.1 Voltage	Anode—No.1 Voltage		For any anode-No. 2 voltage (Eb	) between	n 1500 and	1 7000 volts	
Grid-No.2 Voltage	Grid-No.? Voltage		_	-			1
for Visual Cutoff. 30% of E <sub>b2</sub> volts Max. Anode—No.1  Current Range. −15 to + 10 μamp Deflection Factors:  DJ₁ to DJ2 38 to 54 v dc/in./kv of Eb₂ DJ3 to DJ4 30 to 44 v dc/in./kv of Eb₂  Examples of Use of Design Ranges:  For Anode—No.2 Volt. of 1500 2500 5000 7000 volts Anode—No.1 Voltage 250 250 250 volts Max. Grid—No.1 Volt.  for Visual Cutoff −75 −75 −75 volts Deflection Factors:  DJ₁ to DJ₂ 57-81 93-135 190-270 266-378 v dc/in DJ3 to DJ4 45-66 75-110 150-220 210-308 v dc/in Maximum Circuit Values:  Grid—No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting—Electrode	for Visual Cutoff. 30% of E <sub>b2</sub> volts Max. Anode—No.1		Grid-No.? Voltage			voits	•
Max. Anode—No.1	Max. Anode—No.1			OW of E.		volte	
Deflection Factors:     DJ <sub>1</sub> to DJ <sub>2</sub> 38 to 54 v dc/in./kv of Eb <sub>2</sub> DJ <sub>3</sub> to DJ <sub>4</sub> 30 to 44 v dc/in./kv of Eb <sub>2</sub> DJ <sub>3</sub> to DJ <sub>4</sub> 30 to 44 v dc/in./kv of Eb <sub>2</sub> Examples of Use of Design Ranges:  For Anode-No. 2 Volt. of 1500 2500 5000 7000 volts  Anode-No. 1 Voltage . 225-390 375-650 750-1300 1050-1800 volts  Grid-No. 2 Voltage . 250 250 250 volts  Max. Grid-No. 1 Volt. for Visual Cutoff -75 -75 -75 -75 volts  Deflection Factors:     DJ <sub>1</sub> to DJ <sub>2</sub> 57-81 93-135 190-270 266-378 v dc/in     DJ <sub>3</sub> to DJ <sub>4</sub> 45-66 75-110 150-220 210-308 v dc/in  Maximum Circuit Values:  Grid-No. 1-Circuit Resistance 1.5 max. megohms  Resistance in Any Deflecting-Electrode	Deflection Factors:			0.6 01 262	•		
DJ₁ to DJ₂	D1 to D2			5 to + 10		μamp	
DJ3 to DJ4	Examples of Use of Design Ranges:  For Anode-No.2 Volt. of 1500 2500 5000 7000 volts  Anode-No.1 Voltage. 225-390 375-650 750-1300 1050-1800 volts  Grid-No.2 Voltage. 250 250 250 250 volts  Max. Grid-No.1 Volt.  for Visual Cutoff -75 -75 -75 -75 volts  Deflection Factors:  Di to Di2 57-81 93-135 190-270 266-378 vdc/in  Di3 to Di4 45-66 75-110 150-220 210-308 vdc/in  Maximum Circuit Values:  Grid-No.1-Circuit Resistance 1.5 max. megohms  Resistance in Any Deflecting-Electrode  Circuit . 5 max. megohms			20 + 2 54	v deli	n /by of Et	
Examples of Use of Design Ranges:  For Anode-No.2 Volt. of 1500 2500 5000 7000 volts  Anode-No.1 Voltage. 225-390 375-650 750-1300 1050-1800 volts  Grid-No.2 Voltage. 250 250 250 250 volts  Max. Grid-No.1 Volt. for Visual Cutoff -75 -75 -75 volts  Deflection Factors:  D1 to D2 57-81 93-135 190-270 266-378 vdc/in  DJ 3 to DJ4 45-66 75-110 150-220 210-308 vdc/in  Maximum Circuit Values:  Grid-No.1-Circuit Resistance 1.5 max. megohms  Resistance in Any Deflecting-Electrode	Examples of Use of Design Ranges:  For Amode-No.2 Volt. of 1500 2500 5000 7000 volts  Anode-No.1 Voltage. 225-390 375-650 750-1300 1050-1800 volts  Grid-No.2 Voltage . 250 250 250 250 volts  Max. Grid-No.1 Volt.  for Visual Cutoff -75 -75 -75 -75 volts  Deflection Factors:  D1 to D2 57-81 93-135 190-270 266-378 vdc/in  D3 to D4 45-66 75-110 150-220 210-308 vdc/in  Maximum Circuit Values:  Grid-No.1-Circuit Resistance 1.5 max. megohms  Resistance in Any Deflecting-Electrode  Circuit . 5 max. megohms				v dc/i	n./kv of Eb2	
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Anode—No.1 Voltage	Anode—No.1 Voltage 225-390 375-650 750-1300 1050-1800 volts Grid—No.2 Voltage		1		5000	moo volts	
Grid-No.2 Voltage	Grid-No.2 Voltage			_	-		
for Visual Cutoff $-75$ $-75$ $-75$ $-75$ volts Deflection Factors: $D_1$ to $D_2$ $57$ -81 $93$ -135 $190$ -270 $266$ -378 v dc/in $D_3$ to $D_4$ $45$ -66 $75$ -110 $150$ -220 $210$ -308 v dc/in Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting-Electrode	for Visual Cutoff $-75$ $-75$ $-75$ volts Deflection Factors: $O_1$ to $O_2$ $57$ -81 $93$ -135 $190$ -270 $266$ -378 $v$ dc/in $O_3$ to $O_4$ $45$ -66 $75$ -110 $150$ -220 $210$ -308 $v$ dc/in Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting-Electrode Circuit 5 max. megohms		Grid-No.2 Voltage 250				
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$\mathbb{D}_1$ to $\mathbb{D}_2$ 57-81 93-135 190-270 266-378 v dc/in $\mathbb{D}_3$ to $\mathbb{D}_4$ 45-66 75-110 150-220 210-308 v dc/in Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting-Electrode	$\begin{array}{c} \mathbb{D}_1 \text{ to } \mathbb{D}_2. \ \dots \ 57\text{-81} \ 93\text{-135} \ 190\text{-}270 \ 266\text{-}378 \ vdc/in} \\ \mathbb{D}_3 \text{ to } \mathbb{D}_4. \ \dots \ 45\text{-}66 \ 75\text{-}110 \ 150\text{-}220 \ 210\text{-}302 \ vdc/in} \\ \mathbf{Maximum Circuit Values:} \\ \text{Grid-No.1-Circuit Resistance} \ \dots \ \dots \ 1.5 \ \text{max.} \ \text{megohms} \\ \text{Resistance in Any Deflecting-Electrode} \\ \text{Circuit}^0 \ \dots \ 5 \ \text{max.} \ \text{megohms} \\ \end{array}$			~ 15	- 15	-75 VOICS	
Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting-Electrode	Maximum Circuit Values: Grid-No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting-Electrode Circuit 5 max. megohms			93-135	190-270 2	66-378 v dc/in	
Grin-No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting-Electrode	Grid-No.1-Circuit Resistance 1.5 max. megohms Resistance in Any Deflecting-Electrode Circuit 5 max. megohms		DJ3 to DJ4 45-66	75-110	150-220 2	10-308 v dc/in	4
Resistance in Any Deflecting-Electrode	Resistance in Any Deflecting-Electrode Circuit <sup>o</sup> 5 max. megohms		Maximum Circuit Values:				
	Circuit <sup>o</sup> 5 max. megohms				. 1.5 m	ax. megohms	
					5	av mannhme	
	→ Minimum Circuit Values:			CITCUIT.		ax. megorins	
→ Minimum Circuit Values:	T		_				

The power supply should be of the limited-energy type with inherent regulation to limit the continuous short-circuit current to 5 milliamperes. If the supply permits the instantaneous short-circuit current to exceed 1 ampere, or is capable of storing more than 250 microcoulombs, the effective resistance in circuit between indicated electrode and the output

-> Indicates a change.

Brilliance and definition decrease with decreasing anode—No. 2 voltage. in general, anode—No. 2 voltage should not be less than 1500 volts.

 $<sup>\</sup>ensuremath{\text{O}}$  It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



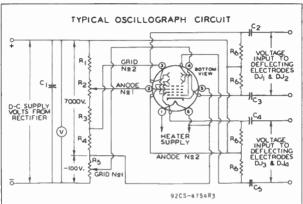


OSCILLOGRAPH TUBE
capacitor should be as follows:  Grid-No.1 - Circuit Resistance
The resistors should be capable of withstanding the applied voltages.





#### OSCILLOGRAPH TUBE



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C _1 = Filter Capacitor 0.5 to 2.0 \mu^{\rm f} _2 , C _3 , C _4 , C _5 = SEE NOTE _3 + R _4 + R _5 = Bleeder Potentiometer _6 = 2.5 MeGohm _6 = 2.5 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = 0.12 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = 0.12 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = 0.12 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE 0.0 MeGohm _6 = SEE
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NOTE: When the cathode or the negative end of the cathode-ray highvoltage supply is grounded, blocking capacitors C2, C3, C4, and C5 should have a high voltage rating, when anode No.2 is grounded, C2, C3, C4, and C5 may be low-voltage capacitors.

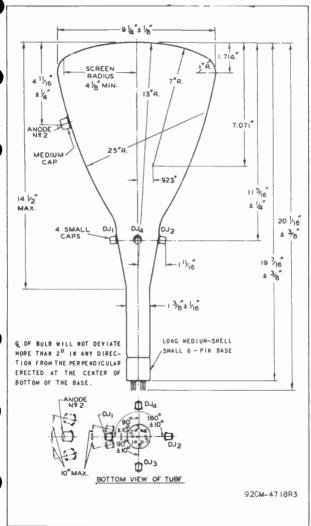
C<sub>2</sub>, C<sub>3</sub>, C<sub>8</sub>, and C<sub>5</sub> may be low-voltage capacitors.
For dc amplifier service, the deflecting electrodes should be coupled direct to the output of the amplifier by omitting the blocking capacitors. In addition, it will usually be preferable to remove the associated deflecting-electrode resistor in order to minimize the loading effect of the resistor on the dc amplifier. With the resistor removed, it is essential, in order to minimize spot defocusing, that anode No.2 be returned to some point in the dc amplifier circuit such that the potential difference between anode No.2 and the average voltage across the deflecting electrodes will be as low as possible.

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.



## 914-A OSCILLOGRAPH TUBE



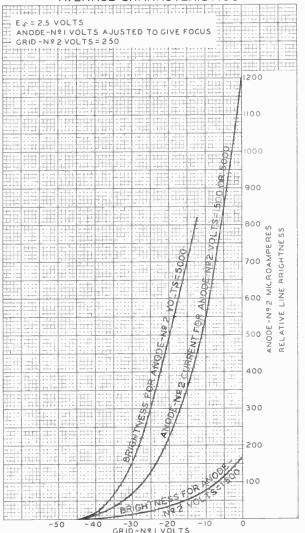


MAY 1, 1950





#### AVERAGE CHARACTERISTICS



## Projection Kinescope

FORCED-AIR COOLED ELECTROSTATIC FOCUS

MAGNETIC DEFLECTION 20 FT. x 15 FT. PROJECTED PICTURES

For Black-and-White Projection Systems in Theater and Glosed-Circuit Television Applications

The 4486 is the same as the 7MP4 except that it is supplied with a fitted high-ioltage anode cable. (See Accompanying Dimension Outline).

#### MECHANICAL

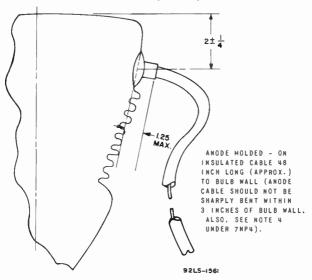
Cap stone for type "F4 does not upt for the "THE

#### TERMINAL DIAGRAM (Bottom View)

Mote: Socket contacts for Pins No.5, 6, 7, 8, 10, 11, 12, and 13 should be removed so that maximum insulation is provided for Pin No.9.

#### DIMENSIONAL OUTLINE

(Other dimensions are the same as those shown for Type 7NP4)



DIMENSIONS IN INCHES

## Oscillograph-Type Cathode-Ray Tubes

#### Post-deflection Accelerator

#### **Electrostatic Deflection**

### **Electrostatic Focus**

For General Oscillographic Applications in which Lou-Speed or Medium-Speed Recurrent-Have Phenomena are to be Observed

#### **ELECTRICAL**

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DJ2 to a															•	•	:	:	:		9	ρF
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ABSOLUTE-MAXIMUM AND MINIMUM RATINGS	
Post-Deflection Accelerator Voltage 8000 max	٧
Anode Voltage 4000 max	V
Grid-No.3 (Focusing-Electrode) Voltage 2000 max	٧
Grid-No.   Voltage	
Negative bias value 200 max	٧
Positive bias value O max	٧
Positive peak value 2 max	٧
I C O may	٧
Heater Voltage	٧
Peak Heater-Cathode Voltage	
Heater negative with respect to distincte 125 max	٧
Heater positive with respect to cathode 125 max	٧
TYPICAL OPERATING VALUES	

Unless otherwise specified all values are positive with respect to cathode

Post-Deflection Accelerator Voltage 6000	٧
Anode Voltage	٧
Grid-No.3 (Focusing-Electrode) Voltage 750 to 1200	V
Grid-No.1 Voltage58 to -93	٧
m : 1 : () - ( for a for a discussion of the contract of the c	

For visual cutoff of focused spot Deflection Factors

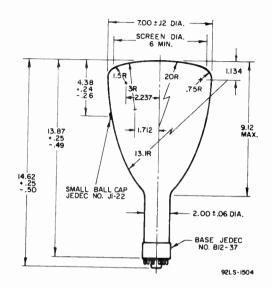
			4490	4491	W / 1 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
DJ1 and DJ2.			133 to 153	-	V (dc)/in
DJ3 and DJ4.			99 to 115	85 to 101	V (dc)/in
_			UM CIRCUIT		

MO. Grid-No. I-Circuit Resistance . . . . . . . Resistance in any Deflection Electrode Circuit<sup>a</sup>.

X-RADIATION WARNING: Shielding of these cathode-ray tubes for x-radiation may be needed to protect against possible danger of personal injury from prolonged exposure at close range.

It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

#### **DIMENSIONAL OUTLINE (4490)**



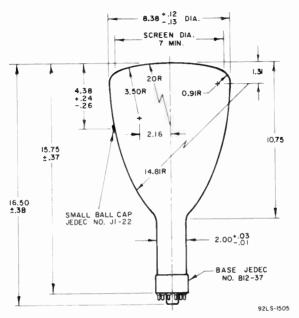
**DIMENSIONS IN INCHES** 

© of bulb will not deviate more than 2° in any direction from the perpendicular erected at the center of bottom of the base.

The plane through the tube axis and pin 5 may vary from the trace produced by DJ1 and DJ2 by an angular tolerance (measured about the tube axis) of ±10°. Angle between DJ1 - DJ2 trace and DJ3 - DJ4 trace is 90°+3°.

DJ1 and DJ2 are nearer the screen; DJ3 and DJ4 are nearer the base. With DJ1 positive with respect to DJ2, the spot will be deflected toward pin 5; likewise, with DJ3 positive with respect to DJ4, the spot will be deflected toward pin 2.

#### **DIMENSIONAL OUTLINE (4491)**



DIMENSIONS IN INCHES

 $\mathbb{C}$  of bulb will not deviate more than  $2^0$  in any direction from the perpendicular erected at the center of bottom of the base.

The plane through the tube axis and pin 5 may vary from the trace produced by DJ1 and DJ2 by an angular tolerance (measured about the tube axis) of  $\pm 10^{\circ}$ . Angle between DJ1 - DJ2 trace and DJ3 - DJ4 trace is  $90^{\circ}\pm 3^{\circ}$ .

DJ1 and DJ2 are nearer the screen; DJ3 and DJ4 are nearer the base. With DJ1 positive with respect to DJ2, the spot will be deflected toward pin5; likewise, with DJ3 positive with respect to DJ4, the spot will be deflected toward pin 2.

## Oscillograph-Type Cathode-Ray Tube

	Oscillograph-Typ	e Carno	ae-kay	lube
	ELECTROSTATIC DEFLECTION 5-	-in DIAMETER	ELECTROSTAT	IC FOCUS
	For General Oscillogro Recurrent-Wave Phen ELE			
	Heater Current at 6.3 V			0.6 A
•	Dil to ill other electrode Di2 to ill other electrode Di3 to ill other electrode Di4 to ill other electrode Focusing Method	C'ro; c'		
	Fluor concours (tostrore			
	Faceplate		Cle	ar Glass
	Minimum Useful Screen Diamet			
		er Chanical		4.30 111
	Operating Position			Anv
	Weight			0.125 in ± 0.06 in ± 2 Dev.66
_		GRAM (Bottom		, IO-pin
	Pir 1-Heater		DJ3 DJ4	
	Pir 2-Gris Mr.1 Fir a-Cathosa		(6) (7)	P,G <sub>2</sub>
	Pin La Cuita (1.2)  Fin A wall that the Electron of the Cuita Charles (1.5)  Fin A wall that the Electron of the Cuita Charles (1.5)  Fin A wall that the Charles (1.5)	⊬ ~: <b>k</b> €	1 === '	10 D11
	Pir 1 = 0 - 1 = 1 ing -1 - 1 + 0	ar Di.	G <sub>1</sub> (1) <sup>C</sup> (12)	
	AB30LUTE-MAXIMU	MAND MINIMUM	RATINGS	
	Anode Voltage			) max V
	Grid-No.3 (Focusing-Electrod Grid-No.1 Voltage	e) Voltage	1100	) max V
	Legative pir value Politive pir value		. (	) max V ) max V

0 max 2 max

Heater Voltage			. 6.9	max min	٧	
Peak Heater-Cathode Voltage					•	
Heater negative with respect to	cathode .		. 125	max	٧	
Heater positive with respect to			. 125	max	٧	

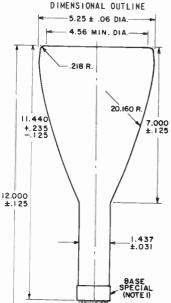
Unless otherwise specified all values are positive with respect to cathode

Anode Vol Grid-No.3	(F	ocusir	ng.	۰E	l٤	ect	ro	de	)	Vo	١t	aa	е.	750 to 1000
For v's	VO	Itage		•		. •	٠	٠		٠	•	٠	•	-60 to -140

Deflection Factors

#### MAXIMUM CIRCUIT VALUES

a It is recommended that the deflecting-electrode-circuit resistances be approximately equal.



DIMENSIONS IN

The plane through the tube axis and pin 4 may vary from the trace produced by DJI and DJ2 by an angular tolerance (measured about the tube axis) of  $10^{\circ}$ . Angle between DJI - DJ2 trace and DJ3 - DJ4 trace is  $90^{\circ} + 3^{\circ}$ .

101 and 102 are nearer the screen; 10.3 and 10.14 are nearer the base. With 101 positive with respect to 10.12, the spot will be deflected-toward pin 4: likewise, with 10.3 positive with respect to 10.14, the spot will be deflected toward Pin 1.

Note I: Base is identical to short small-shell duodecal JEDECNo.Bl2-207 except pin No.5 and pin No.11 are omitted.

9215-1167

INCHES

## Cathode-Ray Tube

## 7"-DIAMETER CRT WITH MAGNETIC FOCUSING AND DEFLECTION

- Ground Optically-Flat Faceplate
- Ultra-High Resolution
- Extra-Fine Grain Phosphor
  - For Photographic Reproduction
  - Useful Screen Diameter 6-1/4"

#### General Data

	ica	

Heater Voltage, DC	.3 V
Heater Current at 6.3 V	).6 A
Focusing Method	gnetic
Deflection Method Ma	ignetic
Deflection Angle (approx.)	42 <sup>0</sup>
Direct Interelectrode Capacitances (approx.):	
Cathode to all other electrodes	0.0 pF
Grid No.1 to all other electrodes	0.0 pF

Optical:
Faceplate, flat Clear, Browning-Resistant Glass
Transmission Factor
Reflection Factor <sup>a</sup>
Index of Refraction
Minimum Useful Screen Diameter 6.25 in
Phosphor, Aluminized Sulfide Type

#### Mechanical:

Tube Dimensions:

Maximum Overall Length	 22-1/8 in
Maximum Bulb Diameter	 7-1/16 in

C.I.E. coordinates (x,y) . . . . . . . . . . . . . . . . 0.150, 0.059

. . . . . . . . . . . Purplish Blue

Base

-	ase, budgetai, ,	
Α	node Lead (flying)b	4 in
0	perating Attitude	Any
V	/eight (approx.)	3 lb
R	atings, Absolute-Maximum Values:	
Α	node Voltage, DC	V
G	rid-No.2 Voltage, DC 1,500	V
G	rid-No.1 Voltage:	
	Negative bias DC 200	V
	Positive bias DC 0	V
Н	eater-to-Cathode Voltage:	
	Cathode positive 60	V
	Cathode negative	V
T	ypical Operation:	
Α	node Voltage, DC	V
G	rid-No.2 Voltage, DC	V
G	rid-No.1 Cut-Off Voltage, DC55 to -95	V
Pe	erformance Data:	
	Maximum Line Widthd 0.0009	in
	Maximum Persistence <sup>e</sup> 5.0	µsec
С	ircuit Requirements	
M	aximum Grid-No.1 Circuit Resistance 1.0	мΩ
Н	eater Voltage Regulation See No	ote f
а	The external surface of the faceplate is treated with a multi- layer, optical coating to suppress reflections of light in the to 800 nm range.	
b	The anode is terminated with the assembly, AMP B37740 wl mates with the AMP Connector 830050-1 or equivalent.	hŧch
d	Line width is defined as the width at the half-amplitude poin	t of

. Small-Shell, Duodecal, 7-Pin

Persistence is defined as the time following cessation of excitation for the light output to decay to 10% of the value observed during excitation. The persistence is measured using a stationary, focused spot. Cathode current during excitation is 1.0 µA.

the light energy distribution of the line. The line width is measured with a slit analyzer at a cathode current of 1.0  $\mu$ A.

f Heater voltage must be regulated to within 1.0% to assure optimum tube performance.



### SAFETY PRECAUTIONS

### X-Radiation Warning

Although X-radiation is generated primarily at the face of the tube when it is operated, the X-rays are emitted in all directions

These rays can constitute a health hazard unless the tube is adequately shielded. Make sure that the shielding provides the required protection against personal injury.

On the neck of the tube itself the following warning appears and should be strictly adhered to:

### X-RAY WARNING

This tube in operation produces X-Rays which can constitute a health hazard unless the tube is adequately shielded for radiation.

### High Voltage

The high voltages at which tube type is 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 enclosing 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.

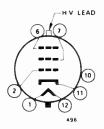
In the use of the tube it should always be remembered that high voltages may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections, and that the tube surface maintains a static charge for some time after the power has been turned off. Therefore, before any part of the circuit or the tube is touched, the power-supply switch should be turned off, both terminals of high-voltage capacitors should be grounded, and the terminals of the high-voltage power supply should be grounded.

After these steps have been taken and before touching the tube, discharge the anode terminals, the surface of the faceplate, and the coated surface of the cone by use of a suitable wand which is connected to ground. It is to be noted that the entire surface of the cone and of the faceplate will not be discharged by touching the wand to a single point on either surface, because the surfaces have high resistance. Therefore, to discharge each surface, it will be necessary to sweep over the entire surface with the wand.

### Tube Handling

Wear "Safety" Goggles with side shields, when handling tube, to prevent possible injury from flying glass in case of tube breakage. Do not strike or scratch tube. Never subject it to more than moderate pressure when installing in or removing from equipment. Always Handle Tube with Extreme Care. Ground anode contact before touching after power is off.

### TERMINAL DIAGRAM



Heater Grid No.1

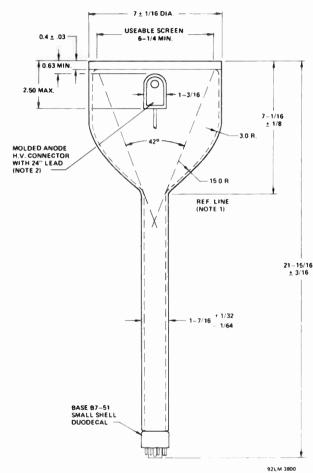
Grid No.2

Pin 11-Cathode

Pin 12-Heater

Accelerator

### **DIMENSIONAL OUTLINE**



Note 1— Ref. line determined by position of 1.5 inch dia, ring at rest.

Note 2— The anode is terminated with the assembly AMP B37740 which mates with the AMP Connector 830050-1 or equiv.



# Oscillograph-Type Cathode-Ray Tube

5-Inch Diameter **Electrostatic Deflection**  Post-Deflection Accelerator **Electrostatic Focus** 

For General Oscillographic Applications in which Extremely Low-Speed or Medium-Speed Recurrent - or Non-Recurrent-Wave Phenomena are to be Observed

### ELECTRICAL

Α	0.6													١.	3 V	6.3	at	rren	CL	Heater	,
_				)	(.)	(0)	ppi	(Aı	s (	ces	ane	ita	ac	ap	e C	rode	lecti	tere	. In	Direct	
рF	10								es	ode	tr	ec.	el	er.	the	1 01	n al	. 1 t	i No	Grie	
рF	5.5									es	od.	tro	ec	e1	er	otho	all o	to	node	Cath	
pF	2.5																				
pF	3.0											Ċ			•			DIA.	to	D 13	
pF	10.5						Ī	Ť	Ī	Ť	Ť	65	- 00		10	- 0	nt ha	211	+0	D 11	
ρF	8.5																				•
ρF	8.5																				,
ρF	9.0																				
	0.0	١.		•	•	•	•	•	•	•	•	162	: 00		11 00	r e	otne	all	to	_ 5574	
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ITIC	ctrosta	l e	E	٠	٠	•	•	٠									thod	in Me	ctio	Defle	

### OPTICAL

Minimum	Us	efu	ıl	Sc	re	en	D	i a	me	tei	r.							4.56 ir
Shape										٠	٠			•	٠	٠	•	.Flat, Circular
Faceplat	е									•				٠	٠	٠	•	Clear Glass
Persi	ster	nce						•		•	•	٠	٠	•	•	•	٠	Long
Phosph	ore	350	en	се				•		•	٠	٠	•	٠	•	٠	٠	Yellowish-Green
Fluore	SCE	-nc	е.							٠	٠	٠	•	٠	٠	٠	٠	. Purplish-Blue
Phosphor			٠		٠	٠	٠	٠	•	٠	•	٠	٠	٠	٠	•	٠	

### MECHANICAL

	Base		S	pe	Сİ	a١	,	Şm	a i	1-	\$h	e i	ı	Duodecal,	IU-PIN	•
	Bulb				٠.	٠.	٠		٠.		•	٠.	٠		Jev. 67	
•	Greatest Diameter .						•	٠	٠	•	•	٠	٠	5	.31 IN	,
ı	Overall Length	•	٠	•	٠	٠	•	•	٠	•	•	•	٠	12.00 1 0	21 :-	
	Weight (Approx.).	٠	•	•	•	•	•	•	•	•	•	-	•	12.00 + 0	.13 in	
	Weight (Approx.)	•	•			Ī	Ċ	Ċ							2 lb	

	TERMINAL DIAGRAM (Bot	tom View)
_	Pin 1-Heater	DJ3 DJ4
	Pin 2-Grid No.1	G3 _ (6) (7) _PG2
	Pin 3 - Cathode	
	Pin 5-Grid No.3	- T
	Pin 6 - Deflecting Electrode DJ3 co	P POST PATTY X [NO DUZ
	Pin 7-DeflectingElectrode DJ4 Acc	ELERATOR -
	Pin 8 - Anode, Grid No.2	κ(3) D <sub>D</sub>
	Pin 9 - Deflecting Electrode DJ2	
	Pin 10 - Deflecting Electrode DJ1	2
	Pin 12 - Heater	G <sub>1</sub> (1) (12)
	Can - Post-Accelerator	ы ы

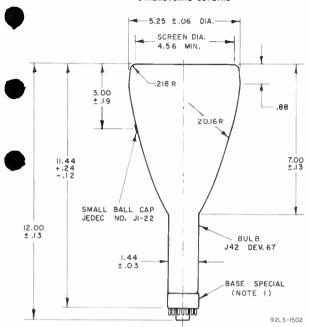
(Grid No.5 & collector)

ABSOLUTE-MAXIMUM AND MINIMUM RATINGS							
Post-Deflection Accelerator Voltage 6000 max V Anode Voltage							
Grid-No.1 Voltage  Negative bias value							
neater voltage							
Peak Heater-Cathode Voltage Heater negative with respect to cathode 125 max V Heater positive with respect to cathode 125 max V							
TYPICAL OPERATING VALUES Unless otherwise specified all values							
are positive with respect to cathode							
Post-Deflection Accelerator Voltage							
DJ1 and DJ2 69 to 91 V (dc)/in DJ3 and DJ4							
MAXIMUM CIRCUIT VALUES							
Grid-No.1-Circuit Resistance							
It is recommended that the deflecting-electrode-circuit resistances be approximately equal.							

X-RADIATION WARNING: Shielding of these cathode-ray tubes for x-radiation may be needed to protect against possible danger of personal injury from prolonged exposure at close range.



### DIMENSIONAL OUTLINE



DIMENSIONS IN INCHES

The plane through the tube axis and pin 1 mas vary from the trace produced by DJ3 and DJ3 by an angular tolerance (measured about the tube axis) of  $10^{\circ}$ . Angle between DJ1 - DJ2 trace and DJ3 - DJ4 trace is  $90^{\circ}$  +  $3^{\circ}$ .

DJ1 and DJ2 are nearer the screen; DJ3 and DJ4 are nearer the base. With DJ1 positive with respect to DJ2, the spot will be deflected toward pin 5; likewise, with DJ3 positive with respect to DJ4, the spot will be deflected toward pin 1.

Note 1: Base is identical to short small-shell duodecal JEDEC No.B12-207 except pin No.4 and pin No.11 are omitted.



# 5" Radar Display CRT

- Electrostatic focus
- Magnetic deflection
- Less than ten inches overall length
- Offset neck facilitates positioning of display origin at screen edge
- For display of airhorne weather radar data in airplane cockpits

_			
Ð	a	t	а

### Electrical:

Heater for Unipotential Cathode:

Encusing Method	Fine	trostatic
Current at 6.3 V	0.3	Α
Voltage® (AC of DC)	6.3	V

Grid No.1 to all other electrodes	10	max.	рF
Cathode to all other electrodes	6	max.	ρF

### Optical:

Faceplate:

Material	Clear Glass
Shape	Spherical
Minimum useful diameter	4.5 in

### Phosphor:

Type Aluminized, P7
Fluorescence White
Phosphorescence Yellowish Green
Persistence Long (100 ms to 1 sec.)

### Mechanical:

### Tube Dimensions:

Maximum bulb diameter		5 in
Neck diameter	7	/8 in
Base (9 Pin)	JEDEC N	o.E9-37

Maximum overall length . . . . . . . . . . . . . 9-13/16 in

Anode Connector	 Button J1-22
Operating Assistud	Any



Maximum Ratings, Absolute Maximum Valuesb					
Anode Voltage	12000	max.	V		
Grid No.4 Voltage	450	max.	V		
Grid No.2 Voltage	450	max.	V		
Grid No 1 Voltage:					
Negative bias value	100	max.	V		
Positive bias value	0	max.	V		
Positive peak value	2	max.	V		

125

max.

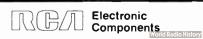
### Typical Operating Values

All values are specified with respect to cathode

Peak Heater Cathode Voltage . . . . . .

All values are specified with respect to carnode.	
Anode Voltage	V
Grid No.4 Voltage <sup>c</sup>	V
Grid No.2 Voltage	V
Grid No.1 Voltaged	V
Anode Current	μΑ
Grid No.3 Current	μΑ
Grid No 2 Current	μΑ
Grid No.1 Drive Voltage	V
Resolution <sup>e</sup> 0.014	ın

- For optimum life the heater voltage should be regulated at 6.3 volts.
- A description of the Absolute-Maximum Rating is given in the General Section, titled Rating Systems for Electron Tubes.
- Adjust for best focus
- Adjust for visual cutoff of undeflected spot.
- At center of tube face, Shrinking raster measurement.



X-Ray Warning

Shielding of this cathode-ray tube for X-ray radiation may be needed to protect against possible danger of personal injury from prolonged exposure at close range.

### High Voltage

The high voltages at which tube type is 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 enclosing 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.

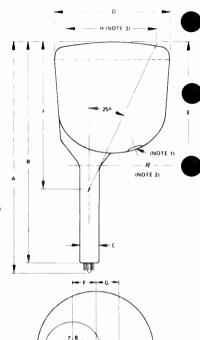
In the use of the - tube it should always be remembered that high voltages may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections, and that the tube surface maintains a static charge for some time after the power has been turned off. Therefore, before any part of the circuit or the tube is touched, the power-supply switch should be turned off, both terminals of high-voltage capacitors should be grounded, and the terminals of the high-voltage power supply should be grounded.

After these steps have been taken and before touching the tube, discharge the anode terminals, the surface of the face-plate, and the coated surface of the cone by use of a suitable wand which is connected to ground. It is to be noted that the entire surface of the cone and of the faceplate will not be discharged by touching the wand to a single point on either surface, because the surfaces have high resistance. Therefore, to discharge each surface, it will be necessary to sweep over the entire surface with the wand.

### **Dimensional Outline**

Note 1: Anode button J1-22. Note 2: Reference line; ring gauge {1,000" +,003" .000" diameter x 1.500" long) will stop at this reference line.

Note 3: Quality circle.



How F and and
6, 8, 9
32
92LM 4252

Pin No.1 — G1
Pin No.2 – H
Pin No.3 — H
Pin No.4 - G1
Pin No.5 - NC
Pin No.6 - G4
Pin No.7 - G2
Pin No.8 - G1
Pin No.9 - K
Button - Anode, G3

Tabula	ated Dimensions
Α	9.812 Max.
В	9.060 ± .060
С	0.870 ± .030
D	4.950 ± .062
Ε	5.218 ± .125
F	1.000 Ref.
G	1.000 Ref.
н	4.500 Min.
_ J	6.250 Ref.

# Display-Storage Tube

Single Writing Gun Single Viewing Gun High Display Uniformity High Luminance **High Resolution** TV Capability

ELECTRICAL			
	Writing Section	Viewing Section	Units
Heater: For Unipotential Cathode			
Voltage (AC or DC)	6.3 ± 10%	6.3 ± 10%	V
Current at 6.3 V	0.6	0.6	Α
Warmup Time <sup>a</sup>		60	S
Direct Interelectrode Capacitano	es:		
Grid No.1 to all other electrodes	7.0		рF
Cathode to all other electrodes	5.0		pF
Backplate to all other electrodes		150	рF
Focusing Method	Electrostatic		
Deflection Method	Magnetic		
Phosphor		P20 (Alum	inized)
MECHANICAL			
Minimum Useful Viewing Diamet	er	4.0	in
Maximum Overall Length (Excluding Ring)b		11.59	ın
Maximum Seated Length (Excluding Ring)b		11.25	in
Maximum Diameter (Silastic Padding Ring)b		5.396 ± 0.01	5 in
Bases:			
Writing gun		JEDEC No.	E8-49
Viewing gun		JEDEC No	o.E7-1
Bulb terminals (two)		JEDEC No	.J1-21
Screen connector		AMP Type No.832692 or	
Operating Position			Any
Weight (Approx.)		20	lb

# 4547

### MAXIMUM RATINGS

Absolute-Maximum Ratings - All voltages are shown with respect to the cathode of the viewing gun unless otherwise specified.

	Min.	Max.	Units
Screen Voltage			
Peak	0	10,000	V
DC	0	9,000	V
Backplate Voltage			
Peak	0	15	V
DC	-30	10	V
Viewing Section Voltages			
Collector (Grid No.5)	180	300	V
Collimator (Grid No.4)	40	150	V
Grid No.3 <sup>e</sup>	10	150	V
Grid No.2		150	V
Grid No.1	-100	0	V
Heater	-125	125	V
Writing Section			
Grid No.4 <sup>e</sup>	10	150	V
Grid No.3 <sup>f</sup>	0	1200	V
Grid No.2 <sup>e</sup>	10	150	V
Grid No.1 <sup>f</sup>	-200	Note g	V
Cathode	-2750	145	V
Heater <sup>f</sup>	-125	125	V
Screen Resistorh	1.0		$\Omega$ M
Collector Resistorh	5,000		Ω

### RECOMMENDED OPERATING VALUES

All voltages are shown with respect to the cathode of the viewing

gun.		
Screen Voltage	8500	V
Backplate Voltage	0	V
Viewing Section Voltages		
Collector (Grid No.5)	200	V
Collimator (Grid No.4)	60 to 110	V
Grid No.3 <sup>j</sup>	10 to 60	V
Grid No.2 <sup>j</sup>	110	V
Grid No.1j	-40 to 0	V



### RECOMMENDED OPERATING VALUES (Cont'd)

Writing	Section	Voltages
---------	---------	----------

Grid No.3 <sup>k</sup>	-2075 to 1575 V	,
Grid No.1	Notes g,m	
Cathode	-2500 V	,
Screen Resistor	1.0 MΩ	2
Collector Resistor	10,000 Ω	2

### PERFORMANCE DATA AND CHARACTERISTICS

Min.	Typical	Max.	Units
4.0	1 , p. 1001	, viux,	in
700	1300		fL
10			s
		Note s	
	300	750	μΑ
	1.0	2.4	mA
	2.5	4.0	mA
	2.5	5.0	mA
400			lines
1.5	2.5	3.5	ms
	700 10	4.0 700 1300 10 300 1.0 2.5 2.5 400	4.0 700 1300 10  Note s 300 750 1.0 2.4 2.5 4.0 2.5 5.0

- a Viewing-gun Heater Warm-up Time must be completed before any other voltages are applied.
- b The silastic-padding ring is permanently attached to the bulb and is used to facilitate shock mounting.
- Mates with AMP No.833589 or equiv. from AMP Inc., 155 Park Street, Elizabethtown, PA 17022.
- e Grids No.4 and No.2 of Writing Gun and grid No.3 of Viewing Gun are connected within the tube.
- f Voltages are shown with respect to cathode of Writing Gun.
- 9 The writing-gun grid No.1 should never be more positive than necessary to write the display to saturated brightness for a given scanning and drive condition. In no case should the writing-gun No.1 voltage have a value greater than zero with respect to the writing-gun cathode.
- h Unbypassed, current-limiting resistor.
- j Adjust for brightest, most uniform, full-size pattern.
- k Adjust for the smallest, most circular spot.



- The maximum bias-voltage value for writing-beam cutoff is -130 volts with respect to writing-gun cathode.
- P Luminance (Brightness) and screen current are measured after the entire display is written to saturated brightness, the writing gun has been turned off, and with no erasing pulse applied.
- The time required for any 1.5-inch diameter area of the useful 4-inch diameter viewing area to spontaneously rise (with no writing or erasing) from zero brightness (viewing-beam cutoff) to 10% of saturated brightness.
- 5 The undeflected spot position must fall within a circle having a 5/16-inch radius (maximum), 1-3/4-inches from the geometric center of the tube face, on the radius passing through the center of the neck of the writing gun.
- t With writing gun turned off, with no erasing pulse applied, and display erased to cutoff.
- u Measured with viewing-gun grid No.1 at zero volts and with all other electrodes at voltages shown under Recommended Operating Values.
- V Measured with writing-gun grid No.1 at zero volts while writing an overscanned TV-type raster.
- W Adjust erase pulser to 60 pps, 0.5 milliseconds width, and sufficient amplitude to just erase any written information. Using a standard television raster, without blanking or video, adjust raster to 3.0 inch horizontal by 2-1/4 inch vertical. Adjust writing-gun grid No.1 bias to reduce the raster to just under write threshold. Adjust the video amplitude so that all half-tones, of a television pattern such as that provided by an RCA 2F21 Monoscope, are clearly discernable. Move the raster and adjust the erase-pulse amplitude to eliminate undersirable picture retention. Minor readjustment of the write-gun grid No.1 bias, the erase pulse amplitude and the video drive may be necessary to obtain the best subjective picture.
- Measured from saturated brightness to cutoff with an erase pulse 0.5 volt more positive than that necessary for complete erasure.

#### **ENVIRONMENTAL TESTS**

The 4547 is designed to withstand the following environmental tests:

Test 1. Vibration in each of the three orthogonal axes as shown in Figure 1, to a double amplitude of 0.03 inch, varied at a uniform rate from 10 to 55 Hz and back to 10 Hz over a five minute interval for each axis.

Test 2. Temperature storage for 24 hours each at  $100^{\circ}$  C and at  $-65^{\circ}$  C.

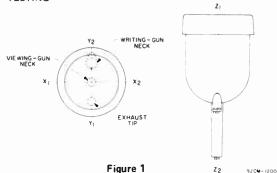
Test 3. Temperature and altitude in three phases as follows:

Phase 1. Storage for one hour at a temperature of -40° C followed by tube operation for five minutes under the conditions shown under Recommended Operating Values.

Phase 2. Temperature is increased from -40 $^{\circ}$  C at a rate of 2 $^{\circ}$  C per minute until a temperature of +86 $^{\circ}$  C is reached. Following one hour storage at +86 $^{\circ}$  C, the tube is operated for five minutes under the conditions shown under Recommended Operating Values.

Phase 3. Barometric pressure is next reduced until a pressure equivalent to an altitude of 20,000 feet is attained. The tube is then operated for five minutes under the conditions shown under Recommended Operating Values. Upon completion of the third phase of this test, pressure is increased and temperature decreased, at a rate of 2°C per minute, until ambient pressure-temperature conditions are reached.

# ORTHOGONAL AXES OF 4547 USED FOR ENVIRONMENTAL TESTING



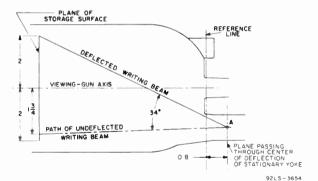
### OPERATING CONSIDERATIONS

The undeflected, focused writing beam lands Deflection nearly normal (perpendicular) to the storage-grid surface at a distance of 1-3/4 inches from its center and in the direction of the wirting gun neck.

The writing beam may be deflected by two stationary pairs of coils. One pair is used for horizontal deflection, and the other pair for vertical deflection. When these coils are used. centering the undeflected writing beam can be accomplished by passing direct current of the required value through each pair of deflecting coils.

To avoid neck shadow, when the stationary coils are used. it is essential that the center of deflection should be located not more than 0.8 inch from the reference line as shown The writing beam must be deflected from its undeflected position, through a typical angle of 340 to sweep fully the storage surface.

### LOCATION OF CENTER OF DEFLECTION



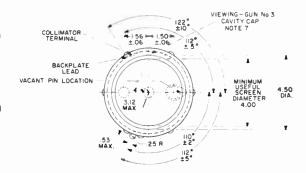
### CAUTION

To prevent possible damage to the tube, allow the viewinggun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing beam on till the writing beam is turned off.

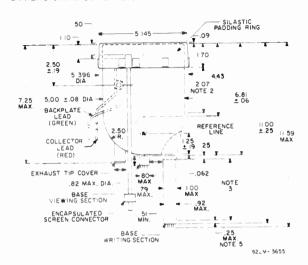
### **PRECAUTIONS**

- The following operating precautions must be followed to protect the 4547 from inadvertent damage
  - 1. Do not exceed maximum ratings.
  - 2. Be sure to include the screen resistor.
  - 3. Be sure to include the collector resistor.
  - 4. Do not apply excessive writing-beam current density.
  - 5. Protect against scanning failure.
  - 6. Protect against loss of bias.
  - 7. Apply voltages to tube in correct order.
  - 8. Never write unless viewing beam is on.
  - 9. Stay within recommended viewing-grid voltage ranges.

### DIMENSIONAL OUTLINE (TOP VIEW)



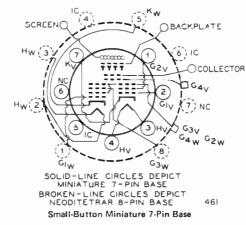
### DIMENSIONAL OUTLINE (FRONT VIEW)



### **DIMENSIONAL OUTLINE NOTES**

- Note 1: The silastic-padding ring is permanently attached to the bulb and fits with a light push into a gauge having an inside diameter of 5.396" ± 0.015".
- Note 2: Within this length, bulb diameter is  $5.00'' \pm 0.08''$ .
- Note 3: Within this length, neck diameter is 0.920" maximum.
- Note 4: Aircraft-Marine Products, Inc., type LGH Part No.832692, or equivalent. This part mates with Aircraft-Marine Products, Inc., Part No. AMP 833589, Ceramic Terminal, or Equivalent.
- Note 5: Within this length, neck diameter is 0.950" maximum.
- Note 6: Do not use these cavity caps for connection. The caps are connected internally and may be at a potential which could constitute a shock hazard. It is recommended that these caps be covered with electrical insulation.
- Note 7: Grids No.4 and No.2 of Writing Gun and grid No.3 of the Viewing Gun are connected within the tube.

### BASING DIAGRAM - BOTTOM VIEW



### VIEWING SECTION

Pin 1: Grid No.2

Pin 2: Grid No.1

Pin 3: Heater

Pin 4: Heater

Pin 5: Internal Connection -Do Not Use

Pin 6: No Connection

Pin 7: Cathode

Flexible Lead (Large): Screen 8.38" ± 0.20" long Flexible Lead (Green): Backplate 10.00" ± 0.50" long

Flexible Lead (Red): Collector 10.0 ± 0.5" long

Recessed Cavity Caps: JEDEC No.J1-21

Collimator (Grid No.4)

### Small-Button Neoditetrar 8-Pin Base

#### WRITING SECTION

Pin 1: Grid No.1

Pin 2: Heater

Pin 3: Heater

Pin 4: Internal Connection - Do Not Use

Pin 5: Cathode

Pin 6: Internal Connection - Do Not Use

Pin 7: No Connection

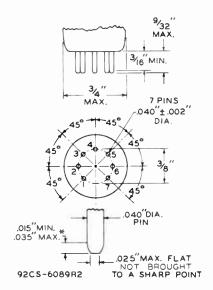
Pin 8: Grid No.3

Note: Grids No.4 & No.2 are connected internally to Grid No.3

of viewing gun.



#### SMALL BUTTON MINIATURE 7-PIN BASE



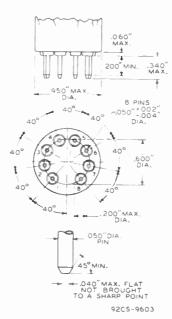
\*This dimension around the periphery of any individual pin may vary within the limits shown.

Base-pin positions are held to tolerances such that entire length of pins will, without undue force, pass into and disengage from flat-plate gauge (part of gauge JEDEC No.GE7-1) having thickness of  $1/4^{\prime\prime}$  and eight holes with diameters of  $0.0520^{\prime\prime}\pm0.0005^{\prime\prime}$  so located on a  $0.3750^{\prime\prime}\pm0.0005^{\prime\prime}$  diameter circle that the distance along the chord between any two adjacent hole centers is  $0.1434^{\prime\prime}\pm0.0005^{\prime\prime}$ .

The design of the socket should be such that circuit wiring can not impress lateral strains through the socket contacts on the base pins. The point of bearing of the contacts on the base pins should not be closer than 1/8" from the bottom of the seated tube.

### SMALL BUTTON NEODITETRAR 8-PIN BASE

Base-pin positions are held to tolerances such that entire length of pins will, without undue force, pass into and disengage from flat-plate gauge having thickness of 1/4" and nine holes with diameter of 0.0700"  $\pm 0.0005$ " so located on a 0.6000"  $\pm 0.0005$ " diameter circle that the distance along the chord between any two adjacent hole centers is 0.2052"  $\pm 0.0005$ ".



X-RADIATION WARNING: Shielding of this cathode-ray tube for x-radiation may be needed to protect against possible danger of personal injury from prolonged exposure at close range.

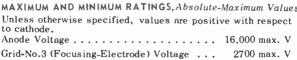
For further information or application assistance on this device, contact your RCA Field Representative or write, Display Tube Marketing, RCA, Lancaster, PA. 17604



# Display Cathode-Ray Tube

12"-Rectangular 70°-Magnetic Deflection Display Cathode-Ray Tube Having Integral Protective Window and P4 Phosphor Screen

ELECTRICAL	
Heater Current at 6.3 volts 0.6	3 A
Focus Method Electrosta	tic
Deflection Method Magne	tic
Direct Interelectrode Capacitances (Typical):	
Grid No.1 to all other electrodes 6	рF
Cathode to all other electrodes 5	рF
External conductive coating to anode	pF pF
OPTICAL	
Faceplate, Spherical Filterglad	88
Light transmission at center (Approx.)	7%
Phosphor P4-Sulfide Type, Aluminize Tube Dimensions:	ed
Overall length 16.60 max.	in
Neck length 7.56 ± 0.25	in
Greatest width	in
Greatest height 8.56 ± 0.12	in
Bulb See Dimensional Outlin	ne
Anode Cap Recessed Small Cavity Co (JEDEC No.J1-2	
Base Small-Shell Duodeca	ı1 <b>,</b>
Arrangement	1,
6-Pin (JEDEC No.B6-6 Operating Position	
Weight (Approx.)	-
MAXIMUM AND MINIMUM RATINGS, Absolute-Maximum Va	
maximum and minimum natings, Absolute-Maximum va	i ue:



Grid-No.1 Voltage:

EL ECTRICAL



Grid-No.2 Voltage . . . . . . . . . .

400 max, V

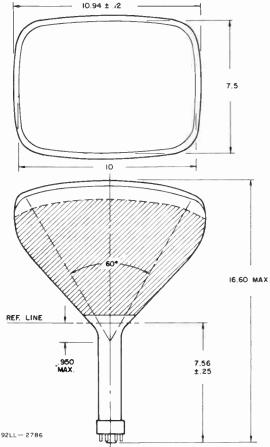
Positive peak value 2 max. V	
Peak Heater-Cathode Voltage:	
Heater negative with respect to cathode 180 max. V	ļ
Heater positive with respect to cathode 180 max. V	
Heater Voltage (ac or dc):	
Under operating conditions b	
RECOMMENDED OPERATING VALUES	ļ
Unless otherwise specified, values are positive with respect to cathode. Raster size 6 inches by 8 inches. Standard TV Scan.	
Anode Voltage	
Anode Current 100 µA	١
Grid-No.3 (Focusing-Electrode) Voltage for an Anode Current of 100 microamperes 1400 to 1800 V	
Grid-No.2 Voltage	
Grid-No.1 Voltage for Visual Extinction of Focused Raster	
TYPICAL PERFORMANCE DATA	
Atrecommended operating values, unless otherwise specified.	
Anode Current 70 to 30% of cathode current	
Grid-No.3 Current 30 to 70% of cathode current	
Typical Trace Luminance Typical Trace Luminance Characteristic	
Typical Center Line Width <sup>d</sup>	•
Spot Position See footnote e	
MAXIMUM CIRCUIT VALUE	
Grid-No.1 Circuit Resistance 1.5 max. $M\Omega$	
b For maximum cathode life, it is recommended that the heater	
supply be regulated at 6.3 volts.  Average luminance (brightness) at the center of a single trace scanned at a given sweep speed and refreshed at a given rate.	
d Measured by shrinking raster technique at an anode cur-	
rent of 100 microamperes.  The center of the undeflected, unfocused spot will fall	



### X-RADIATION WARNING

Because the 4557 is designed to be operated at anode voltages as high as 16,000 volts, shielding of the 4557 for X-radiation may be needed to protect against possible injury from prolonged exposure at close range.

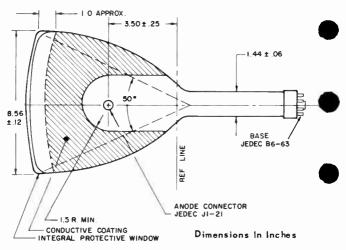
DIMENSIONAL OUTLINE Dimensions In Inches



See accompanying Inch Dimension Equivalents in Millimeters.



### DIMENSIONAL OUTLINE(Top Right Side View)



Inch Dimension Equivalents in Millimeters								
Inch	mm	Inch	mm	Inch	mm_			
.06 .12 .25 .950	1.5 3 6.3 24.1 25.4	1.44 1.5 3.50 7.5 7.56	36.5 38.1 88.9 190.5	8.56 10 10.94 16.60	217.4 254 277.8 421.6			

### TERMINAL DIAGRAM (Bottom View)

Pin 1: Heater

Pin 2: Grid No.1

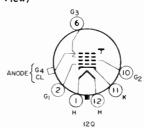
Pin 6: Grid No.3 Pin 10: Grid No.2

Pin 11: Cathode

Pin 12: Heater

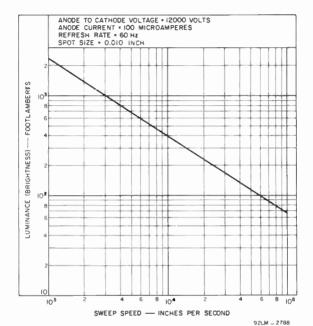
Cap: Anode (Grid No.4

and Collector)

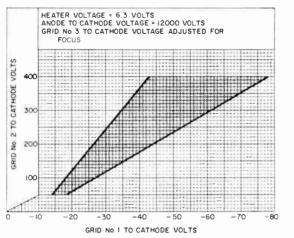


### TYPICAL TRACE LUMINANCE CHARACTERISTIC

(Average brightness at center of single trace scanned at the refreshed at the indicated rate)



### CUTOFF DESIGN CHART



92LS-2787

# **Monoscopes**°

Custom-Built 2"-Diameter, Electrostatic-Focus, Electrostatic-Deflection Monoscope Tubes For Use As Alpha-Numeric Character Generators

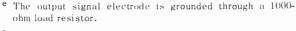
ELECTRICAL	
Heater Current at 6.3 volts 0	.6 A
Focusing Method Electrost	atic
Deflection Method Electros	tatic
Direct Interelectrode Capacitances (Approx.):	
Grid No.1 to all other electrodes	7 pF
Cathode to all other electrodes	5 pF
Output Signal Electrode to all other electrodes	3 pF
DJ1 to all other electrodes 10	pF
DJ2 to all other electrodes 10	) pF
DJ3 to all other electrodes	рF
DJ4 to all other electrodes	pF
DJ1 to DJ2	pF
DJ3 to DJ4	B pF
Deflection Direction:	
A positive voltage on DJ1 deflects the beam toward to stencil.	p of
A positive voltage on DJ3 deflects the beam toward the side of the stencil.	left
MECHANICAL	
Tube Dimensions:	
Maximum Overall Length 11	.5 in
Maximum Diameter Including Bulb Terminals	35 in
Bulb (Glass)	T16
Base Medium-Shell, Diheptal 12 JEDEC No.B1	-Pir 2-37
Socket Cinch Part No.3M14, or equiva	alent
Bulb Terminals (Two) Small Ball JEDEC J	
Bulb Tonnia I Control Cinch Dont No 231 on action	

Stencil Electrode: Useful area
MAXIMUM AND MINIMUM RATINGS, Absolute-Maximum Values
Unless otherwise stated, values are positive with respect to cathode.  Output Signal Electrode Voltage
Heater Voltage (ac or dc); Under Operating Conditions   6.9 max. V  5.7 min. V
RECOMMENDED OPERATING VALUES d
Unless otherwise specified, values are positive with respect to output signal electrode.  Output Signal Electrode Voltage Ground  Stencil-Electrode Voltage15 V  Average Deflecting Electrode Voltage.  Vertical (DJ1 and DJ2) +35 V  Horizontal (DJ3 and DJ4) +35 V  Grid-No.4 & Grid-No.2 Voltage (Astigmatism) 0 to +70 V



.... -1600 to -1500 V

Grid-No.1 Voltage <sup>9</sup>				
Heater Voltage <sup>h</sup>				6.3 V
TYPICAL PERFORMANCE CHA				
	Min.	Typical	Max.	
Output Signal Current <sup>†</sup>	_	5	_	μΑ
Trace Angle:				
Vertical	_	2	5 d	legrees
Horizontal	_	2	5 d	legrees
Between Vertical and Horizontal Traces	89	90	<b>91</b> d	egrees
Deflection Factors: <sup>k</sup>				
Vertical (DJ1 and DJ2)	46	-	60	V/in
Horizontal (DJ3 and DJ4)	46	_	60	V/in
Undeflected Spot Position <sup>m</sup>	-	_	0.15	in
A specific tube designation in signed to each type employing a	the 45 a differ	560 serie: ent stenci	s will Il patte	be as- ern.
b Made by Cinch Manufacturing C Elk Grove Village, IL 60007.	Company	y, 1501 Mo	orse Av	venue,
• For maximum cathode life, it is ersupply be regulated at 6.3 ve		mended t	nat the	e heat-
d The tube must be shielded to p from affecting performance. A flected beam be allowed to re	t no ti	me shoul	d the	unde-



Adjust for minimum astigmatism.

area of the stencil electrode pattern.

Grid-No.3 (Focusing Electrode)

Voltage .....

- 9 Adjust as required.
- h ()ne side of heater terminal (Pin No.1) is connected to -1800 V dc.

- i For cathode current not exceeding 110 microamperes.
- k Useful area of stencil electrode is 1.1"x 1.1".
- <sup>m</sup> The undeflected spot position must fall within a circle having a 0.15 inch diameter (maximum) centered on the stencil electrode pattern.

### TYPICAL STENCIL ELECTRODE PATTERN



### **OPERATING CONSIDERATIONS**

Tubes in the 4560 series are intended for use as character generators in conjunction with display cathoderay tubes in computer data terminal display equipment. In such equipment, the electron beam in the monoscope is first deflected to a desired character location on the stencil and at the same time the display cathode-ray tube electron beam is deflected to a desired position in the display. The monoscope electron beam is then rapidly scanned over the selected character in the stencil

and the display cathode-ray tube electron beam is synchronously deflected on the phosphor screen.

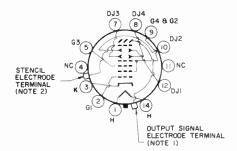
In the monoscope, electrons which pass through the stencil are collected on the output signal electrode and generate a video signal across the output load resistor. This signal is amplified and then applied to the grid of the display cathode-ray tube.

The effect of this operation is that the character stenciled into the monoscope is displayed on the phosphor screen of the display cathode-ray tube. Other characters may be chosen by positioning the monoscope electron beam at different locations on the stencil. A character may be located anywhere in the cathode-ray tube display by appropriate positioning of its electron beam.

### NOTE

Stencil patterns supplied to RCA for incorporation in the 4560 family of monoscopes should be at least 10 times larger than the useful 1.1" x 1.1" area of the stencil electrode. The alpha-numeric characters of the pattern should be white on a dark background. Such patterns or requests for information on RCA fabricated stencil patterns should be directed to Storage Tube Marketing, RCA, Lancaster, PA 17604, or to the nearest Sales Office.

## TERMINAL DIAGRAM (Bottom View)



Pin No.1: Heater Pin No.2: Grid No.1 Pin No.3: Cathode

Pin No.4: No connection

Pin No.5: Grid No.3

Pin No.7: Deflecting Electrode DJ3 Pin No.8: Deflecting Electrode DJ4 Pin No.9: Grid No.4 and Grid No.2 Pin No.10: Deflecting Electrode DJ2

Pin No.11: No connection

Pin No.12: Deflection Electrode DJ1

Pin No.14: Heater

Terminals -

Nearest Base: Stencil Electrode

Furthest from Base: Output Signal Electrode

Note 1: The plane passing through the tube axis and the key of the base does not deviate more than  $\pm~10^{\rm O}$  from the plane passing through the tube axis and the output signal electrode terminal cap.

Note 2: The plane passing through the tube axis and Pin No.4 of the base does not deviate more than  $\pm~10^{0}$  from the plane passing through the tube axis and the stencil electrode cap.

# DIMENSIONAL OUTLINE Ì ĸ М STENCIL ELECTRODE TERMINAL JEDEC No JI-25 (NOTE I) OUTPUT SIGNAL ELECTRODE TERMINAL JEDEC No JI - 25 (NOTE 2) Д BASE JEDEC No BI2-37

Ì

92JV 283

## NOTES FOR DIMENSIONAL OUTLINE

Note 1: Angular orientation of the stencil electrode terminal with respect to pin No.4 of base is ± 10°.

Note 2: Angular orientation of the output signal electrode terminal with respect to key of base is  $\pm~10^{\circ}$ .

## OUTLINE DIMENSIONS

Dimensions	Inches	mm
A	11.312 ± .188	287.32 ± 4.77
С	2.050 ± .050 Dia.	52.07 ± 1.27 Dia
J	.500 ± .062	12.70 ± 1.57
К	1.750 ± .125	44.45 ± 3.17
М	.185 max.	4.69 max.

# 4583, 4584, 4585

## **Projection Kinescopes**

7"-Diameter Electrostatic-Focus, Magnetic-Deflection Types

- Matched Trio of Tubes for Color Projection Systems
- Designed for Use with Schmidt Reflective Optical Systems
- Matched Phosphors
- High Picture Brightness
- Wide Range of Synthesized Colors

Cathode to all other electrodes ...

Balanced Drive Characteristics

## General Data

#### Electrical:

62 A
tatic
netic
35°
2 pF

## Optical:

Faceplate, Sph	erical (	Clear, Brow	ning Resist	ant Glass
Radius of ci	urvature (inner radius)			15.315 in
Minimum Opti	cal-Quality-Rectangle		5	5x3-3/4 in
Refractive Inde	ex of Faceplate .			1.469
Phosphors, Alu	iminized:			
4583			Sulfide (B	tue) Type

C.I.E. coordinates (x,y)	
Luminescence	Blue
Persistence	Medium
4584	Silicate (Green) Type

C.I.E. Coordinat	es (x,y)	 	. 0.2	10, 0.720
Luminescence		 		Green
Persistence				. Medium

. Rare-Earth (Red) Type								4585
0.660, 0.340	 		,y)	(×	es	dinate	I.E. cool	С
Red						nce	iminesce	Li

Luminescence Red
Persistence Medium

6 pF

# 4583, 4584, 4585

Tube Dimensions:	
Overall length	
Base Small-Shell Diheptal 14-Pin, JEDEC No.B14-4	5
Anode Lead Molded-on, Insulated Cabl	
Operating Position	ıy
Weight (Approx.)	os
Maximum and Minimum Ratings,	
Absolute-Maximum Values <sup>b</sup>	
Average Anode Power:c	
With forced-air cooling of faceplate 160 max.	W
Air Flow to Faced	m
Anode-to-Cathode Voltage 80 max. k	V
Grid-No.3-to-Cathode Voltage	V
Grid-No.2-to-Cathode Voltage 1.05 max.	V
Grid-No.1-to-Cathode Voltage:	
Negative bias value	V
Positive bias value 0 max.	V
Peak positive value	V
Anode Current, Long-Term Average (for 5" x 3-3/4"  TV raster)	ıΑ
Peak Heater-Cathode Voltage:	
Heater negative with respect to cathode 150 max.	V
Heater positive with respect to cathode 150 max.	V
(6.93 max.	V
Heater Voltage (AC or DC) <sup>e</sup>	V
Recommended Operating Values <sup>f</sup>	
Raster Size 5" x 3-3/4	""
Anode Voltage 75 k	V
Anode Current, Long-Term Average	A
Grid-No.3 Voltage for Focus at an Anode Current of 1000 $\mu A$ 15 to 17 $$ k	V
Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused Raster See Figure	1
Heater Voltage	V



## Typical Performance Data

• •				
	Blue	Green	Red	
Luminous Output of each Tube at an Anode Current of 1000 $\mu$ A for each tube	88	1400	520	lumens
Luminance of Each Tube at an Anode Current of 1000 $\mu$ A for Each Tube	680	10800	4000	fL
Luminance of Three Tubes Combine at an Anode Current of 1000 µA on Limiting Tube and with Anode Currof Other Two Tubes Adjusted to Produce White of 9300° K + 27 M.P.C.D.			8500	total fL
Percentage of Total Luminance Supplied by Each Tube	8	70	22	%
Percentage of Total Anode Current Supplied by Each Tube (Approx.)	50	27	23	%
Center Resolution9			600	TV Lines
Grid-No.3 Current (Total)h			± 15	μΑ
Grid-No.2 Current			± 15	μΑ

## Circuit Requirements

## High Voltage Circuits

In order to minimize the possibility of damage to the tubes and adjacent circuits 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. An external spark gap must be provided at the grid-No.3 terminal. The following resistor and voltage values are mandatory.

Anode-Circuit Resistance (unbypassed) ..... 0.5 min.  $M\Omega$ 

Grid-No.3 Circuit Resistance (unbypassed)	0.1	$\Omega$ M
Grid-No.3 Spark-Gap Firing Voltage	20	kV
Low-Voltage Circuits		
Grid-No.2 Circuit Resistance (bypassed)	10	kΩ
Grid-No.1 Circuit Resistance (unbypassed)	1	kΩ
Effective Grid-No.1-to-Cathode Circuit Resistance	1.5	max. MΩ

a Sharp corners on the yoke assembly in the vicinity of the tube neck should be avoided. Insulation between the yoke winding and/or the core and the tube neck should be capable of withstanding at least 10 kV and preferably 15 kV.

## 4583, 4584, 4585

- b A description of the Absolute Maximum Rating is given in the General Section, titled Rating Systems for Electron Tubes.
- C. The product of anode-to-cathode voltage and anode current (long term average) should never exceed 160 warts.
- d The specified air flow should be delivered perpendicularly from a nozzle having a diameter of about 2 inches onto the face of the tube while it is in operation. In a typical system with air filter, the total system static pressure is approximately 0.25 inch of water. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the anode power supply to prevent operation of the tube without cooling.

Cooling of the tube by a tangential flow of air across its face is not recommended because the temperature gradient produced across the face may result in immediate or delayed cracking of the face.

- e For maximum cathode life, it is recommended that the heater supply be regulated at 6.6 volts.
- f These tubes may be operated at reduced anode voltage and/or anode current. At reduced anode voltage, center resolution will decrease. At reduced anode voltage and/or anode current, luminance will decrease. The grid No 3 voltage for focus will be reduced in proportion to the reduction in anode voltage. Other performance characteristics may also be affected.
- 9 Determined for a 3 3/4 inch high TV resolution test pattern with tube operating at a screen current of 1000 microamperes.
- h Grid-No.3 current is normally low, as indicated in the data, when the tube is operated under recommended conditions. Lower grid-No.3 voltages (as required for focus if anode voltage is reduced) and/or higher grid-No.2 voltages can lead to a grid-No.3 current level approaching that measured in the anode circuit. Note that the fraction of available current intercepted by the grid-No.3 electrode is not constant, but increases with increasing anode current.

## The Conductive Coating

The conductive coating on the exterior of the tube neck must be grounded. Connection to the coating may be made by using a flexible metal band fastened firmly around the neck at the base end of the coating. The metal band should be fastened only tight enough to insure good contact. If the band is clamped very tight, resultant glass strains may eventually cause the neck to break. This coating must not be scratched and must never be washed with liquids likely to soften or dissolve lacquers.

The external coating on the neck serves to prevent corona between the neck and the yoke. Corona would damage the yoke insulation and cause breakdown in the glass of the neck. It is important that the yoke insulation be adequate for operation of the yoke against the external grounded coating. The resistance of the external conductive coating is sufficiently high so that damping of the yoke deflecting energy is negligible. Because of this high resistance, a contact area of at least 1/4 square inch should be used in making connection to the external coating.

## Safety Precautions

## X-Radiation Warning

Although X-radiation is generated primarily at the face of the tube when it is operated, the X-rays are emitted in all directions.

These rays can constitute a health hazard unless the tube is adequately shielded. Make sure that the shielding provides the required protection against personal injury.

On the neck of the tube itself the following warning appears and should be strictly adhered to:

## X-Ray Warning

This tube in operation produces X-rays which can constitute a health hazard unless the tube is adequately shielded for radiation.

## High Voltage

The high voltages at which these 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 enclosing of

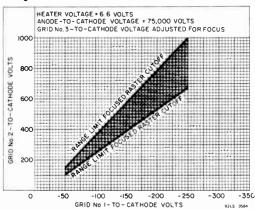
## 4583, 4584, 4585

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.

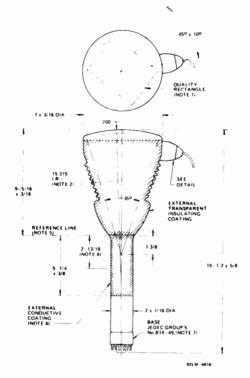
In the use of these tubes it should always be remembered that high voltages may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections, and that the tube surface maintains a static charge for some time after the power has been turned off. Therefore, before any part of the circuit or the tube is touched, the power-supply switch should be turned off, both terminals of high-voltage capacitors should be grounded, and the terminals of the high-voltage power supply should be grounded.

After these steps have been taken and before touching the tube, discharge the anode terminal, the surface of the face-plate, and the coated surface of the cone by use of a suitable wand which is connected to ground. It is to be noted that the entire surface of the cone and of the faceplate will not be discharged by touching the wand to a single point on either surface, because the surfaces have high resistance. Therefore, to discharge each surface, it will be necessary to sweep over the entire surface with the wand.

## **Cutoff Design Chart**



## **Dimensional Outline**



Note 1: When viewed from the face of the tube, the minor axis of the 5" x 3-3/4" quality rectangle is located 45° ± 10° in a counter-clockwise direction from a plane through the anode terminal and the tube axis.

Note 2: Inside surface of faceplate within the quality rectangle may vary ± 0.006" from the sphérical surface having a 15.315" radius.

Note 4: The plane through Base Pin No.9 and the tube axis may vary from the plane through the anode terminal and the tube axis by an angular tolerance (measured about the tube axis) of ± 10°. The anode terminal is on same side as Pin No.9.

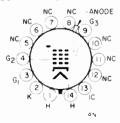
## 4583, 4584, 4585

- Reference line is determined by position where gauge Note 5: 2 100" ± 0 001" LD and 3" long will rest on bulb cone
- External conductive coating must be grounded Note 6:
- Socket for this base should not be rigidly mounted, it Note 7: should have flexible leads and be allowed to move freely Socket contacts for Pins 5, 6, 7, 8, 10, 11, 12, and 13 should be removed in order to provide maximum insulation for Pin No 9
- Effective deflecting field must be within this space Note 8:
- Anode cable should not be sharply bent within 5" of bulb Note 9: wall

#### Dimensional Outline Detail



#### Socket Connections (Bottom View)



Note: Socket contacts for Pins No. 5, 6, 7, 8, 10, 11, 12, and 13 should be removed so that maximum insulation is provided for Pin No. 9.

- Pin 1 Heater
- 2 Cathode Pin
- 3. Grid No.1
- Pin 4 Grid No 2
- 5 No Connection
- Pin 6 No Connection
- No Connection
- Pin 8 No Connection
- Pin 99, Grid No 3
- Pin 10 No Connection
- Pin 11 No Connection
- Pin 12 No Connection
- Pin 13 Internal Connection
- Do Not use
- Pin 14 Heater
- Cable Anode



## Graphechon Tube

Scan-Conversion Storage-Tube Assembly Very High Resolution Capability

Ruggedized Structure Designed to Meet MIL-E-5400 Specification

Integral Shielding and Deflection Coils

Small Size - 15" Max. Length 3.65" Diameter 0.6-Watt Heaters for Writing and Reading Guns

## **ELECTRICAL**

Heater Current at 6.3 Volts, Each Gun
Focusing Method, Each Gun Electrostation
Deflection Method, Each Gun Magnetic
Deflection Coils See footnote a
Total Deflection Angle, Each Gun (Approx.) 50 degrees
Deflection Coil Alignment <sup>b</sup> 0.5 degrees
Undeflected Spot Position, Each Gunc 5% of target diameter
Direct Interelectrode Capacitances:

	Typ.	Max.	
Output-signal-electrode to all other electrodes <sup>d</sup>	17	20	рF
Reading-gun grid No.1 to all other electrodes	_	15	pF
Reading-gun cathode to all other electrodes	_	9	рF
Writing-gun grid No.1 to all other electrodes	_	15	рF
Writing-gun cathode to all other	_	Q	nΕ

#### MECHANICAL

Tube Dimensions	See Dimensional Outline
Connections	See footnote e
Operating Position	Any
Maximum Weight	6.26 lbs

## MAXIMUM AND MINIMUM RATINGS, Absolute-Maximum Values

Voltages are referred to ground unless otherwise specified.

	Min.	Max.		
Writing Gun:				
Heater voltage9 (AC or DC)	5.7	6.9	V	
Cathode voltage	-9000	-	V	
Heater-cathode voltage	-125	10	V	
Grid-No.1 (control grid) voltageh	-300	0	V	
Grid-No.2 voltage <sup>h</sup>		750	V	
Grid-No.3 (beam focus) volta <b>ge<sup>h</sup>.j</b>	-	1500	V	
Grid-No.4 (anode) voltage	Gro	und		
Reading Gun:				
Heater voltagek (AC or DC)	5.7	6.9	V	
Cathode voltage	-1500	_	V	
Heater-cathode voltage	-125	10	V	
Grid-No.1 (control grid) voltagem	-300	0	V	
Grid-No.2 voltage <sup>m</sup>	_	750	V	
Grid-No.4 (beam focus) voltage <sup>j,m</sup>	-	750	V	
Grids No.3 & No.5 (anode) voltage	-30	30	V	
External conductive coating	Gro	ound		
Target Section:				
Output signal electrode voltage	-10	10	V	
Shading electrode voltage	-30	30	V	
Backplate voltage	-20	50	٧	

## TYPICAL OPERATING CONDITIONS

Voltages are referred to ground unless otherwise specified.

## Writing Gun:

Heater voltage9 (AC or DC)	V
Cathode voltage	V
Grid-No.1 (control grid) voltage for beam cutoffh	V
Grid-No.2 voltage <sup>h</sup>	V
Grid-No.3 (beam focus) voltageh.j 600 to 1400	V
Grid-No.4 (anode) voltage Groun	ıd
Reading Gun:	
Heater voltagek (AC or DC)	V
Cathode voltage -1200	V

## TYPICAL OUTPUT CONDITIONS

Reading Gun:

Grid-No.1 (control grid) voltage for beam cutoff <sup>m</sup>	-120 to -70	V
Grid-No.2 voltage <sup>m</sup>	300	V
Grid-No.4 (beam focus) voltagej, m	200 to 440	V
Grids No.3 & No.5 (anode) voltage <sup>n</sup>	-20 to 0	V
External conductive coating	Grou	und
larget Section:		
Output-signal-electrode voltage	0	V
Shading electrode voltage <sup>n</sup>	0 to 20	V
Backplate voltagen	-15 to 0	V

## PERFORMANCE CHARACTERISTICS

The Performance Characteristics shown below are obtained in one mode of tube operation which is representative of many applications. Trade-offs in these characteristics may be made to achieve optimum tube performance in other operating modes.

	Min.	Max.
Output Signal CurrentP	0.5	- μΑ
Storage Time9		See footnote r
Signal-to-Shading Ratios	5:1	
Signal-to-Background-Shading Ratio $^{\mbox{\scriptsize t}}$ .	8:1	-
Center Resolution, At 50% amplitude response	1600	<ul> <li>TV lines/ target diameter</li> </ul>
Edge Resolution, At 50% amplitude response		See footnote v
Writing Speed	200	<ul> <li>μs/ target diameter</li> </ul>
Shades of Gray <sup>W</sup>	7	_
Blemishes <sup>X</sup>		See footnote y

## **ENVIRONMENTAL CONDITIONS**

The 4598 will provide the performance specified under Performance Characteristics when the tube is exposed to the following environmental conditions:

## Requirement

	Temperature-Altitude <sup>2</sup>	MIL-E-5	5400L, Par. 3.2	2.24.3, Table I	ı
				Class 1A	١
	Humidity		MIL-E-5400L	, Par. 3.2.24.4	ļ
1	O1 1				

Shock MIL-E-5400L, Par. 3.2.24.6 . . . . See accompanying Vibration Levels



- The deflection coils are electrically similar to type Y65 manufactured by Syntronic Instruments Inc., Addison, Illinois. A variety of inductances are available, which are suitable for either push-pull or single-ended circuit configurations.
- b The orthogonality of the horizontal and vertical axes of each deflection coil is within 1/2 degree of 90 degrees. The horizontal axis of the writing deflection coil is parallel within 1/2 degree to the horizontal axis of the reading deflection coil.
- The undeflected spots of both guns fall within a circle having a diameter that is 5 per cent of the target diameter, and is centered on the target.
- d The value shown is the capacitance of the assembly supplied with a solderable terminal as the output signal electrode connection; if a coaxial connector or cable is supplied, their capacitance must be added to this value.
- Connection to the output signal electrode can be provided by means of a solderable terminal, coaxial connector, or coaxial cable. Connections to the deflection coils and low voltage electrodes are by flexible leads. Connections to the high voltage electrodes are made by silicone rubber leads; connectors such as type B40706 lead assemblies manufactured by AMP Inc., Capitron Division, Elizabethtown, PA, can also be supplied.
- 9 One side to be externally connected to writing-gun cathode.
- h With respect to writing-gun cathode.
- i Adjust for best focus.
- One side to be externally connected to reading-gun cathode.
- m With respect to reading-gun cathode.
- Adjust for optimum signal and storage performance. n
- This value is the saturated output signal current.
- Storage time is proportional to the area scanned by the readinggun raster. The limits are given for a raster of aspect ratio 1:1, and inscribed within the target area.
- The specified performance characteristics are obtained over a range of storage times from 1.0 second maximum to 3.0 seconds minimum. The specified performance characteristics except shades of gray are obtained over a range of storage times from 0.5 second maximum to 4.0 seconds minimum. Storage time is measured to 10 per cent of signal amplitude.



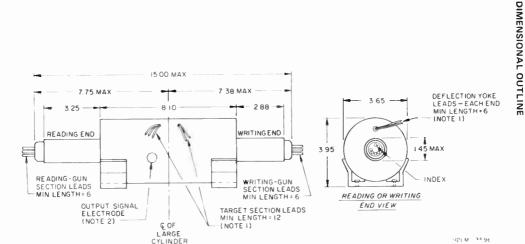
- This limit applies to the central 75 per cent of the target. The measurement is taken along that single line of the output video signal which has the lowest signal-to-shading ratio.
- This limit applies to the central 75 per cent of the target. The measurement is taken along that single line of the output video signal which has the lowest signal-to-background-shading ratio.
- Resolution is measured using a raster written perpendicular to the horizontal scanning lines of the reading gun raster, and with the writing-gun drive voltage adjusted to give a peak output signal 85 per cent of saturated signal amplitude.
- A minimum resolution of 1200 TV lines per target diameter is obtained over 75 per cent of the target diameter. A minimum resolution of 1400 TV lines per target diameter is obtained over 75 per cent of the target diameter using dynamic focusing of the reading gun.
- W A step voltage waveform with seven equally spaced levels is used as input.
- X Blemishes are measured within a circular area centered on the target and with a diameter of 90 per cent of the target diameter. Blemish size is specified as a percentage of the target diameter; blemish amplitude, as a percentage of saturated signal amplitube. Blemishes with an amplitude of less than 10 per cent are not counted. Dark blemishes with a size of less than 1/8 per cent are not counted.
- Y The maximum size of any light blemish is 1/2 per cent. The amplitude and number of light blemishes are limited as shown in the following table:

Amplitude	Maximum Numbe
10% to 50%	10
20% to 50%	3
Greater than 50%	0

The maximum size of any dark blemish is 1/2 per cent. The maximum number of dark blemishes is five.

The backplate voltage of the tube may be changed in a predetermined manner to compensate for the variation in storage time as a function of temperature.





Dimensions in Inches

## DIMENSIONAL OUTLINE (cont'd)

Note 1 - All leads are labeled.

Note 2 — Connection to the output signal electrode can be provided by means of a solderable terminal, coaxial connector, or coaxial cable.

#### TARGET-SECTION LEADS

Lead 1: Writing-Gun Grid No.4

Lead 2: Backplate

Lead 3: Shading Electrode

Lead 4: Reading Gun Grids No. 3 & 5

Lead 5: Reading-Gun External Conductive Coating

#### WRITING-GUN SECTION LEADS

Lead 1: Heater Lead 2: Grid No.1 Lead 3: Grid No.3 Lead 4: Grid No.2 Lead 5: Cathode

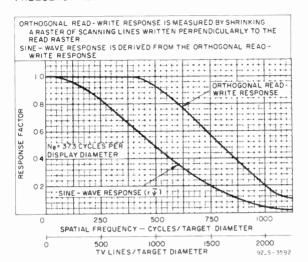
Lead 6: Heater

## READING-GUN SECTION LEADS

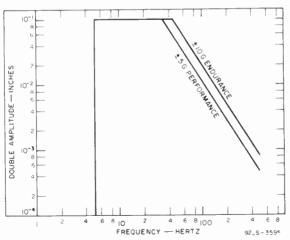
Lead 1: Heater Lead 2: Grid No.1 Lead 3: Grid No.4 Lead 4: Grid No.2 Lead 5: Cathode Lead 6: Heater



## FREQUENCY RESPONSE CHARACTERISTICS



## **VIBRATION LEVELS**



0.6 A

## Projection Kinescope

- 5"-Diameter Electrostatic-Focus, Magnetic-Deflection Type
- For Monochrome Television Projectors
- Designed for Use with Schmidt Reflective Optics
- High Picture Luminance 3000 fL at 300 µA
- High Resolution 600 TV Lines at 300  $\mu$ A
- Forced-Air Cooled
- Rare Earth (White) Phosphor
- Fine Screen Texture

Heater Current at 6.3 Volts

■ Color Temperature — 7800° K + 70 MPCD

## General Data

-	 	cal	١.

Focusing Method Electrostatic
Deflection Method <sup>a</sup> Magnetic
Deflection Angle (Approx.)
Direct Interelectrode Capacitances (Approx.):
Grid No.1 to all other electrodes B pF
Cathode to all other electrodes 5 pF
Optical:
Faceplate, Spherical Clear, Browning-Resistant Glass
Radius of curvature (inner radius) 7.10 $\pm$ 0.20 in
Minimum Useful Screen Diameter 4.50 in
Minimum Optical-Quality-Circle Diameter 4,25 in
Refractive Index of Faceplate
Phosphor, Aluminized
C.1.E. coordinates (x,y) 0.290, 0.361
Luminescence White

#### Mechanical:

## Persistence Tube Dimensions:

Overall length	12.19 + 0.37 - 0.38 in
Greatest diameter of bulb (Excluding cab	le) $5.00 \pm 0.12$ in
ase	III-Shell Duodecal 7-Pin,

Medium

JEDEC No. B7-51

Anode Lead Molded-on, Insulated Cable, 48 in Bulb	long 10H1
Operating Position	Any
Maximum and Minimum Ratings, Absolute-Maximum Valuesb	_
Average Anode Power:	
Without forced-air cooling of faceplate 9 max.	w
With forced-air cooling of faceplate 12 max.	w
Air Flow to Face <sup>C</sup> when Average Anode	cfm
FOWER Exceeds 5 Watts	kV _
Anode-to-Cathode Voltage         42         max.           Grid-No.3-to-Cathode Voltage         9         max.	kV
Grid-No.2-to-Cathode Voltage	v
Grid-No.1-to-Cathode Voltage:	•
Negative bias value	V
Positive bias value 0 max.	V
Peak positive value	V
Anode Current, Long-Term Average (for 4" x 3" TV raster)	μΑ
Heater negative with respect to cathode 175 ma	x. V
Heater positive with respect to cathode 10 ma	x. V
Heater Voltage (ac or dc) <sup>d</sup>	*
Recommended Operating Valuese	
Raster Size	4'' x 3''
Anode Voltage 40	kV
Anode Current, Lorig-Term Average	μΑ
Grid No.3 Voltage for Focus at an Anode Current of 300 μA	) kV
Grid-No.2 and Grid-No.1 Voltages for Visual Extinction of Focused Spot See F	Figure 1
Heater Voltage 6.3	3 V
Typical Performance Data	
At Recommended Operating Values:	
Center Resolution <sup>f</sup> 600 T	V Lines
( 3000	fL
Luminance at 300 µA	nits



1.5 max.  $M\Omega$ 

Luminous Flux	. 29	50 lu	mens
Grid-No.3 Current (Totall9	. ±	10	μΑ
Grid-No.2 Current	. ±1	5	μΑ
Circuit Requirements			
High-Voltage Circuits:			
In order to minimize the possibility of damage to jacent circuits caused by a momentary internal are ed that the high-voltage power supply and the griply be of the limited-energy type. An external spar vided at the grid-No.3 terminal. The following revalues are mandatury.	c, it is i id-No.3 k qap r	ecomn power nust be	sup-
Anode-Circuit Resistance (unbypassed)	0.5	min.	$\Omega M$
Grid-No.3 Circuit Resistance (unbypassed)	0.1		$\Omega M$
Grid-No.3 Spark-Gap Firing Voltage	12		kV
Low-Voltage Circuits:			
Grid-No.2 Circuit Resistance (bypassed)	10		${\bf k}\Omega$
Grid-No.1 Circuit Resistance (unbypassed)	1		kΩ

- a Sharp corners on the yoke assembly in the vicinity of the tube neck should be avoided. Insulation between the yoke winding and/or the core and the tube neck should be capable of withstanding at least 10 kV and preferably 15 kV.
- b A description of the Absolute Maximum Ratings is given in the General Section, titled Rating System for Electron Tubes.
- The specified air flow should be delivered perpendicularly from a nozzle having a diameter of about 2 inches onto the face of the tube while it is in operation. In a typical system with air filter, the total system static pressure is approximately 0.25 inch of water. The cooling air must not contain water, dust, or other foreign matter. The air-cooling system should be electrically interconnected with the anode power supply to prevent operation of the tube without cooling.
  - Cooling of the tube by a tangential flow of air across its face is not recommended because the temperature gradient produced across the face may result in immediate or delayed cracking of the face.
- d For maximum cathode life, it is recommended that the heater supply be regulated at 6.3 volts.
- This tube may be operated at reduced anode voltage and/or anode current. At reduced anode voltage, center resolution will decrease. At reduced anode voltage and/or anode current, lumi-

Effective Grid-No.1-to-Cathode Circuit

- nance will decrease. The grid-No.3 voltage for focus will be reduced in proportion to the reduction in anode voltage. Other performance characteristics may also be affected.
- f Determined for a 3-inch high TV resolution test pattern with tube operating at a screen current of 300 microamperes.
- 9 Grid-No.3 current is normally low, as indicated in the data, when the tube is operated under recommended conditions. Lower grid-No.3 voltage (as required for focus if anode voltage is reduced) and/or higher grid-No.2 voltages can lead to a grid-No.3 current level approaching that measured in the anode circuit. Note that the fraction of available current intercepted by the grid-No.3 electrode is not constant, but increases with increasing anode current.

## Safety Precautions

## X-Radiation Warning

Although X-radiation is generated primarily at the face of the tube when it is operated, the X-rays are emitted in all directions.

These rays can constitute a health hazard unless the tube is adequately shielded. Make sure that the shielding provides the required protection against personal injury.

On the neck of the tube itself the following warning appears and should be strictly adhered to:

## X-RAY WARNING

This tube in operation produces X-Rays which can constitute a health hazard unless the tube is adequately shielded for radiation.

In normal operation, this tube produces more x-radiation than the Tube Type 5AZP4 which it may replace. Make sure that shielding is adequate.

## High Voltage

The high voltages at which this type is 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 enclosing 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.

In the use of this tube it should always be remembered that high voltages may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections, and that the tube surface maintains a static charge for some time after the power has been turned off. Therefore, before any part of the circuit or the tube is touched, the power-supply switch should be turned off, both terminals of high-voltage capacitors should be grounded, and the terminals of the high-voltage power supply should be grounded.

After these steps have been taken and before touching the tube, discharge the anode terminal, the surface of the face-plate, and the coated surface of the cone by use of a suitable wand which is connected to ground. It is to be noted that the entire surface of the cone and of the faceplate will not be discharged by touching the wand to a single point on either surface, because the surfaces have high resistance. Therefore, to discharge each surface, it will be necessary to sweep over the entire surface with the wand.

## **Tube Handling**

Wear "Safety" Goggles with side shields, when handling tube to prevent possible injury from flying glass in case of tube breakage. Do not strike or scratch tube. Never subject it to more than moderate pressure when installing in or removing from equipment. Always Handle Tube with Extreme Care. Ground anode contact before touching after power is off.

## **Operating Considerations**

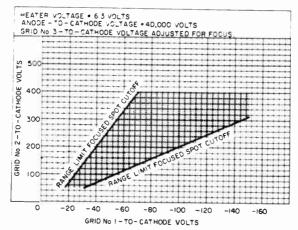
Humidity Considerations. When humidity is high, a continuous film of moisture may form on untreated glass. If a high-voltage gradient is present, this film may permit sparking to take place over the glass surface. In order to minimize the formation of a continuous moisture film, the glass cone is treated with a transparent moisture-repellent insulating coating. This coating must not be scratched, and must be

kept clean and free from contamination such as fingerprints. The coating may be washed with a solution of a mild soapless detergent and water. After the surface is washed, it should be rinsed with clean water and be dried immediately. Any damage to the coating or any contamination on the surface may result in sparking over the cone of the bulb.

Dust Considerations. The high voltage applied to the tube increases the rate at which dust is precipitated on the surface of the tube. The rate of precipitation is further accelerated in the presence of corona. Such dust not only decreases the insulation of the bulb coating but also reduces the amount of radiation transmitted through the bulb face. The dust usually consists of fibrous materials and may contain soluble salts. The fibers absorb and retain moisture; the soluble salts provide electrical leakage paths that increase in conductivity as the humidity increases. Because a film of dust can nullify the protection provided by the insulating coating on the bulb, the tube should be protected as much as possible from dust and should be cleaned, when necessary, as described under Humidity Considerations.

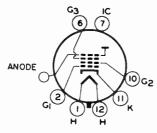
Corona Considerations. A high-voltage system may be subject to corona, especially when the humidity is high, unless suitable precautions are taken. Corona, which is an electrical discharge appearing on the surface of a conductor when the voltage gradient exceeds the breakdown value of air, causes deterioration of organic insulating materials, induces arc-over at points and sharp edges, and forms ozone, a gas which is deleterious to many insulating materials. Sharp points or other irregularities on any part of the high-voltage system may increase the possibility of corona and should be avoided. Instead, rounded contours and surfaces should be used.

## **Cutoff Design Chart**



92LS-2953

## Basing Diagram, Bottom View



Pin 1: Heater

Pin 2: Grid No.1

Pin 6: Grid No.3

Pin 7: Internal Connection - Do not use

Pin 10: Grid No.2

Pin 11: Cathode Heater Pin 12:

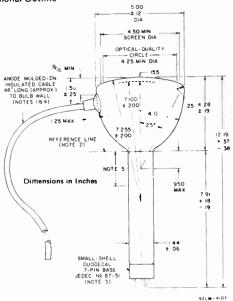
Flexible Cable: Anode

Note: Socket contacts for vacant pin positions No.3, 4, 5, 8, and 9 should be removed so that maximum insulation is provided

for pins No.6 and 7.



#### Dimensional Outline



- Note 1 The plane through the tube axis and vacant pin position No.3 may vary from the plane through the tube axis and anode-cable connection at bulb wall by angular tolerance (measured about the tube axis) of ±20°. Anode-cable connection is on same side as vacant pin position No.3.
- Note 2 Reference line is determined by position where gauge 1.500" +0.003" -0.000" I.D. and 2" long will rest on bulb cone.
- Note 3 Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely.

  Socket contacts corresponding to vacant pin positions
  No.3, 4, 5, 8 and 9 should be removed in order to provide maximum insulation for pins No.6 and 7.
- Note 4 Anode cable should not be sharply bent within 3" of bulb wall.
- Note 5 To avoid excessive interaction between the deflecting and focusing fields, the windings of the deflecting yoke should not extend more than 2 inches from the reference line toward the base.



# 5826

## **IMAGE ORTHICON**

MAGNETIC FOCUS

MAGNETIC DEFLECTION

1	DATA
	General:
	Heater, for Unipotential Cathode:
	Voltage 6.3 ± 10% ac or dc volts Current
1	Anode to All Other Flectrodes 20 μμf Photocathode, Semi-Transparent:
	Recponse See Curve Useful Size of Rectangular Image
	(4 x 3 aspect ratio) 1.6" max. diagonal Orientation of Rectangular Image— Proper orientation
)	is obtained when the vertical scan is essentially par- aliel to the plane passing through center of face plate and pin No.7 of the shoulder base.
	Focusing Method.         Magnetic           Deflection Method.         "agnetic           Overall Length         15-3/16" ± 1/4"           Greatest Diameter of Bulb.         3" ± 1/16"
	Minimum Deflecting-Coil Inside Diameter
	Alignment-Coil Length
	End Base Small-Shell Diheptal 14-Pin (JETEC No.B14-45)
	Pin 1 - Heater POTTOM VIEW Pin 2 - Grid No.4 DIRECTION OF LIGHT:
	Pin 3-Grid No.3 Pin 4-Internal Connec-
	tion—Do Not Use Pin 5-Dynode No.2 Pin 6-Dynode No.4
	Pin 7 - Anode Pin 8 - Dynode No.5
	Pin 9 – Dynoae No.3 Pin 10 – Dynode No.1, Gri J No.2
1	Pin 11 - Internal Connection—Do Not Use
	Pin 12 - Grid No.1 Pin 13 - Cathode Pin 14 - Heater  Pin 14 - Heater  WHITE INDEX LINE
	ON FACE Shoulder Base Keyed Jumbo Annular 7–Pin
	Pin 1-Grid No.6 Pin 5-Griu No.5 Pin 2-Photocathode Pin 6-Target
	Pin 3 - Internal Connec- tionDo Not Use  Pin 7 - Internal Connec- tionDo Not Use
	Pin 4- Internal Connection—Do Not Use  andrates a harge.





## **IMAGE ORTHICON**

_																	
Ma	x i mum	Rat	ings	. Ab	sol	ute	Va	lue	s:								
PH	OTOCA	THOD	E VO	I TAG	iF.									-550	max.	VO	lts
PH	OTOCA	THOD	F II	LUMI	NAT	LÓN					•				max.	_	t-c
OP	ERATI	NG T	EMPE	RATI	IRF (	OF A	ΔNY	PΔ	RT.	ΩĒ	R	HI P	}		max.		00
I OP	ERATI	NG T	FMPF	RATI	IRF I	nF i	RHII	R A	T	0.		0		0.0	max.		0
	LARGE									n 1				35	min.		00
	MPERA											•		) -			
	SECTI																
			RGET								П				max.		00
CD	I D-NO										•	•		-	max.		
	RGET					•	• •	•			•	•	•	-550	max.	VO	lts
	Posit													E 0			1 4 -
	Nogot	ive	valu	е.						٠	٠				max.		lts
C D	Negat	IVE	VAIU	e.	٠.						•				max.		ts
CD	ID-No	0 V	ULTA	GE.				•					*		max.		lts
CD	1D-No	. 4 V	OLTA	GE.				٠				•	•		max.		lts
GK	1D-No	· > Y	ULIA	GE.	A		. ÷				•	•			max.		lts
GK	ID-No ID-No	. Z 0	DIN	OUL-	·NO.	T A	JLI	465	٠.	•	•			350	max.	VO	lts
														4.00			
	Negat	ive	Dias	Va I	ue.			•			٠	•	•		$\max$ .		lts
DE	Posit	IVE	DIAS	vai	ue.	+.			* 1		۰			U	max.	VO	lts
	AK HE																
	Heate														max.		lts
	Heate	r po	siti	ve w	/ith	re:	spe	ct	to	ca	th	ode			max.		lts
AN	ODE-S	UPPL	Y V0	LIAG	F.	4		٠							max.		lts
V0	LTAGE	PER	, MOL	TIPL	.IER	ST	4GE							350	max.	VO	lts
Ту	pical	Оре	rati	on:													
Phi	otoca	thod	e Vo	1t.aa	e (	lmad	ae I	- nc	us)				-30	n to	-500	VO.	lts
Gr	id-No	.6 V	olta	ae (	Acce	alei	rato	nr)				•		0 (0	000		
	75% o	f nh	otoc	atho	ide i	/nl	tani	٠.,					-22	5 to	-375	VO	lts
Ta	rget	Volt	ane			, , ,	. ag			•	•	•		0	/ -		lts
Gr	id-No.	5 V	olta	ne l	Dece	اماد	rati	nr)	ė•	•	٠	•			100		lts
Ğr	id-No	4 V	olta	ne l	Rear	n Fr	2011	21		•	•	•		0 to			lts
Gr.	id-No	3 V	olta olta	gc 1	l Dear		JCU.	0		•	•	•		5 to			lts
Gr.	id-No.	うぇ	Dun	ode.	No.	1 V	1+:	•		•	•	•	~ ~	300			lts
Gr.	id-No.	1 V	olta	ne l	For	P;	21.00	ra	Č.	of	έÌ	•	/		-115		lts
	node-l										' /	•		600			lts
	node–l										•	•		800			lts.
Dy Dw	node-l	ر ۱۹۵۰ ۱۱ ما	V 0 1	tage				•		•	٠	•		1000			lts
Dy.	node–l	NO.4	V 0 1	tage				•		٠		•					
Dy I	node-i	YO. 0	101	t age				٠		۰	۰			1200			lts
An	ode Vo	orta	ge.								۰	•		1250			lts
An	ode Ci	urre	nt.											50			μa
ra	rget '	emp	erat	ure	Kan	ge .				۰	۰	٠	3	5 to	60		oC
$\oplus$	Ratio	of d	lvnode	vol	tage	s is	shr	D W.C	und	er	T v	nic:	al 0o	erat.	on.		
•	Adjust																
••																o ni	ina
	most i	unifo	rm re	solu	tion	and	sic	ina l	OU	tpu	t i	ove	r ent	ire p	voltage icture	area	, ng
極岸	Adjust	t to	qive	the :	mosi	uni	form	n1y	sha	ded	D	icti	ure n	ear m	aximum	sign	al.

→ Indicates a change





## IMAGE ORTHICON

	Highlight Illumination on Photocathode for Maximum Signal Output: With 2870°K Tungsten Illumination,	
	White Fluorescent Illumination, or Daylight. 0.04	ft-c
)	Ratio of Peak-to-Peak Highlight Video- Signal Cur. to RMS Noise Current (Approx.) 70 Minimum Peak-to-Peak Blanking Voltage 10	volts
	Field Strength at Center of Focusing Coil. 75 Focusing—Coil Current (Approx. for coil	gausses
	listed below) <sup>n</sup> 75	mái.
	Deflecting-Coil Current (Approx. for assembly listed below): Horizontal (Peak to Peak) 625	ma
)	Vertical (Peak to Peak) 290 Alignment-Coil Current (Approx. for coil	ma
	listed below) 0 to 30	ma
	Components:	
	Deflecting-Coil Assembly (Includes Keyed Jumbo Annular 7-Pin Socket). RCA Type No. Focusing-Coil Assembly RCA Type No. Alignment-Coil Assembly RCA Type No. Hor. Deflection Output Transformer . RCA Type No. Ver. Deflection Output Transformer . RCA Type No.	202D75 204D75 204T1
	Direction of current should be such that a porth-seeking nol	e is at-

## Direction of current should be such that a north-seeking pole is attracted to the image end of focusing coil.

#### **OPERATING NOTES**

After the 5826 has been inserted in its sockets and the voltages applied, allow it to warm up for 1/2 to 1 hour with the camera lens iris closed. Then, proceed with normal operating adjustments.

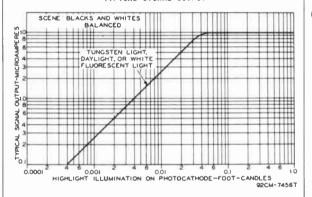
When the equipment design or operating conditions are such that the maximum temperature ratingor maximum temperature difference will be exceeded, provision should be made to direct a blast of cooling air from the diheptal-base end of the tube along the entire length of the bulb surface, i.e., through the space between the bulb surface and the surrounding deflecting coil and its extension. For this purpose, a small blower is satisfactory, but it should run at low speed to prevent vibration of the 5826 and the associated amplifier equipment. Unless vibration is prevented, distortion of the picture may occur. To keep the operating temperature of the large end of the tube from falling below 45°C, some form of controlled heating should be employed. Ordinarily, adequate heat will be supplied by the focusing coil, deflecting coils, and associated amplifier tubes so that the temperature can be controlled by the amount of cooling air directed along the bulb surface. 5826



## IMAGE ORTHICON

Resolution of better than 500 lines at the center of the picture can be produced by the 5826 when the highlight illumination from an RMA Standard Test Chart is above the knee of the typical signal—output curve for this type. To utilize such resolution capability in the horizontal direction with the standard scanning rate of 525 lines, It is necessary to use a video amplifier having a bandwidth of at least 6 megacycles. The maximum resolution obtainable is limited by the mesh—screen portion of the target.

## TYPICAL SIGNAL OUTPUT



SPECTRAL SENSITIVITY CHARACTERISTIC
and
OUTLINE DIMENSIONS

are the same as those shown for Type 5820



GAGG

RADECHON CHARGE STORAGE TUBE

SINGLE-BEAM, BARRIER-GRID TYPE CAPACITANCE-DISCHARGE READING NON-EQUILIBRIUM WRITING

## DATA

	r a	

Heater, for Unipotential Cathode:	.
Voltage 6.3 ac or dc	volts
Current 0.6	атр
Direct Interelectrode Capacitances (Approx.):	1
Grid No.1 to all other electrodes 9	$\mu\mu$ †
Deflecting electrode DJ <sub>1</sub> to all	í
other electrodes	μμt
Deflecting electrode DJ <sub>2</sub> to all	
other electrodes	μμt
Deflecting electrode DJ <sub>3</sub> to all	
other electrodes	μμf
Deflecting electrode DU <sub>4</sub> to all	
other electrodes 11.5	μμf
$D_1$ to $D_2$	щuf

щf DJz to DJA μμf Grid No.5 to backing-electrode Grid No.5 and backing-electrode μμ.f to collector . .

Collector to all other electrodes external cylindrical shield. See Curve .Electrostatic Focusing Method. . . Electrostatic Deflection Method. 11-27/32" ± 3/8" Overall Length . . 3.30" ± 0.05"

Minimum Useful Storage-Surface Diameter. . Any except those positions where Mounting Position. . . the diheptal base is up and the tube axis is at an angle of less

than 60° from the vertical. Weight (Approx.)

Base: On large end of tube . . . Small-Button Twentyninar 8-Pin (JETEC No.E8-19)

VIEW OF TWENTYNINAR-BASE END OF TUBE

Multiple Connec-Pin tions to Backing-Pin 10 Electrode. Only Pin 14 One Need be Used Pin 18

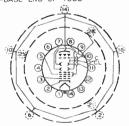
Greatest Diameter of Tube.

Pin 21 - No Connection

Pin 25 - No Connection Pin 28 - Grid No.5

PINS 2.6.10,14.18: GN 1-7/8\*

PINS 21,25,28: ON 7/8" DIA, PIN CIRCLE



SOLID-I, INE CIRCLES DEPICT DIMEPTAL BASE BROKEN-LINE CIRCLES DEPICT TWENTYNINAR BASE

TENTATIVE DATA 1



On small end of tube	Small-Shell Diheptal 14-Pi (JETEC No.B14-45
VIEW OF DIHEPTAL-BA	
VIEW OF DINEFTAL-DA	SE END OF TUBE
Pin 1 - Heater	Pin 10 - Deflecting
Pin 2 - Cathode	Electrode DJ
Pin 3-Grid No.1	Pin 11 - Deflecting
Pin 4 - Internal Con-	Electrode DJ
nection-Do	Pin 12 - No Connection
Not Use	Pin 13 - Same as Pin 4
Pin 5-Grid No.3	Pin 14 - Heater
Pin 6 - No Connection	C.CL - External Con-
Pin 7 - Deflecting	ductive Coating.
Electrode DJ	Collector, In-
Pin 8 - Deflecting	ternal Shield,
Flectrode DJ-	Flange between

## All voltages are with respect to cathode unless otherwise specified

	i .
Maximum Ratings, Absolute Values:	ĺ
BACKING-ELECTRODE-TO-GRID-No.5	1
(BARRIER-GRID) VOLTAGE:	
Backing-electrode positive with	1
respect to grid No.5 100 max. volts	
Backing-electrode negative with	ļ
respect to grid No.5 100 max. volts	1
COLLECTOR-TO-GRID-No.5 VOLTAGE:	
Positive value 100 max. volts	
Negative value 0 max. volts	
ULTOR® VOLTAGE 1500 max. volts	
GRID-No.3 VOLTAGE 500 max. volts	4
GRID-No.1 VOLTAGE:	
Negative bias value 200 max. volts	
Positive bias value 0 max. volts	
Positive peak value 2 max. volts	ŀ
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with	
respect to cathode 125 max. volts	L
Heater positive with	H
respect to cathode 10 max. volts	1
Equipment Design Ranges:	1

Pin 9 - Ultor (Grids

No.2 & No.4)

For any ultor voltage  $(E_{C_A})$  between 1000 and 1500 volts\* Backing-Electrode-to-Grid-No.5 Voltage. . . . See Note 1

The "ultor" in a storage tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 6499, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 6499, they are collectively referred to simply as "ultor" for presenting data.

\*: See next page.

TENTATIVE DATA 1

Neck and Large

Part of Tube

## RADECHON

	Collector-to-Grid-No.5 Voltage Grid-No.3 Voltage for	0 to 50	volts
	Focus with grid- No.1 volts = 0	14% to 26% of E <sub>C.</sub> .	volts
		.5% to -4.7% of E <sub>C4</sub>	volts
	grid-No.1 volto = 0 Max. Cathode Current for grid-No.1	20 to 50	$\mu$ amp
	volts = 0 Deflection Factors:	See Curve	
,	Dij and Dig 8	35 to 105 v dc/in./ 78 to 96 v dc/in./ See Note 2 See Note 3	kv of Ec4 kv of Ec4
	Examples of Use Design Ranges:		
	For ultor voltage of Grid-No.3 Voltage for focus with grid-	1000	volts
	No.1 volts = 0 Grid-No.1 Voltage for collector-current	140 to 260	volts
	cutoff	25 to47	volts
	D <sub>1</sub> and D <sub>2</sub> D <sub>3</sub> and D <sub>4</sub>	85 to 105 78 to 96	v dc/in. v dc/in.
	Maximum Circuit Values:	1 5 may	. megohms
	Grid-No.1-Circuit Resistance Resistance in Any Deflecting- Electrode Circuit*	1.0 max.	
	In general, the recommended minimum ult 1000 volts. Signal output and resoluti voltage. Secondary emission characte Limit the maximum ultor voltage to 1	ion decrease with decre	asina ultor
	It is recommended that all deflection be approximately equal.	g-electrode-circuit r	esistances
	Note 1: The backing-electrode, grid No ated at the same do putential. During electrode may be pulsed to ±60 volts v	o.5, and ultor are use the writing cycle, t with respect to grid N	he backing- 0.5.
	Note 2: The undeflected focused spot w a diameter equal to 10% of the min and having its center coincident w surface.	vill fall within a cir limum storage—surfaction oith the center of to	rcle having e diameter ne storage
	Spot position is calculated as 6.3 volts, uitor voltage of 1000 volts, collector voltage of 1050 volts, grifocus, grid-ho.1 voltage adjusted for current, each deflecting electrode com to ultor, and the tube shielded from al	grid-No.5 voltage of d-No.3 voltage adjust 15 microamperes peak tected through a 1-megol	1000 volts, ed to give collector hm resistor
	Note 3: See next page.		





## RADECHON

required to displace the beam from its undeflected position to the edge of the storage surface in the direction of each deflecting electrode are recorded as a for DJ  $_1,\ b$  for DJ  $_2,\ c$  for DJ  $_3,\ \text{and}\ d$  for DJ  $_4,\$ 

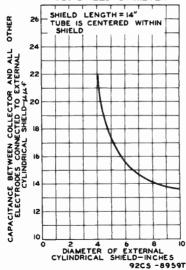
Spot Position in \$ of Storage-Surface Diameter 
$$= 1/2 \sqrt{\frac{b-a}{b+a}^2 + \left(\frac{d-c}{d+c}\right)^2} \times 100$$

Note 3: With voltages as specified in Note 2, and with a signal written into storage by applying a series of well-formed symmetrical square waves to grid No.1 such that a series of 25 equally spaced stored elements are written across a single line scan, the ratio of the maximum to minimum signal amplitude observed as the single line scan is moved across the storage surface will not exceed 1.35.

## OPERATING CONSIDERATIONS

Shielding. The use of a magnetic shield of high-permeability material surrounding the tube is recommended. This shield prevents the effect of stray fields in causing unwanted deflection of the electron beam.

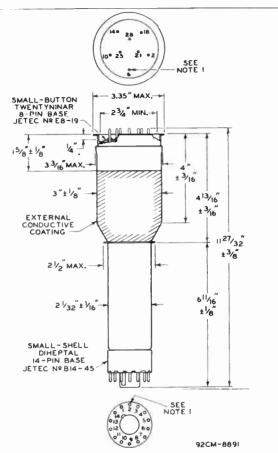
## INDICATED CAPACITANCE VS. SHIELD DIAMETER





## 6499 RADECHON





NOTE 1: THE ANGLE BETWEEN PLANE THROUGH PIN 6 OF TWENTY-NINAR BASE AND TUBE AXIS, AND PLANE THROUGH PIN 2 OF DIHEPTAL BASE AND TUBE AXIS WILL NOT EXCEED 10°. THE INDICATED PINS ARE BOTH ON THE SAME SIDE OF THE TUBE.

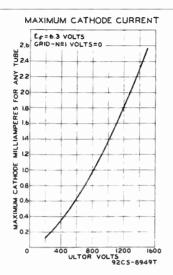
NOTE 2: DEFLECTING ELECTRODES DJ\_6DJ\_2 ARE NEARER THE TARGET. DEFLECTING ELECTRODES DJ\_3 &DJ\_4 ARE NEARER THE DIHEPTAL BASE. NOTE 3: ANGLE BETWEEN DJ\_1 & DJ\_2 DEFLECTION PATH AND DJ\_3 & DJ\_4 DEFLECTION PATH IS  $90^\circ$  ±  $3^\circ$ .

6499

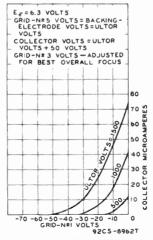
8-56



## RADECHON



## AVERAGE TRANSFER CHARACTERISTICS

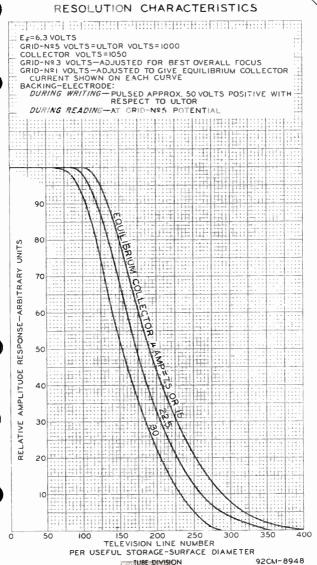


TUBE DIVISION

CE-8949T -8962T



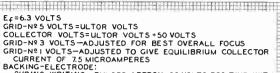
6<sub>799</sub>

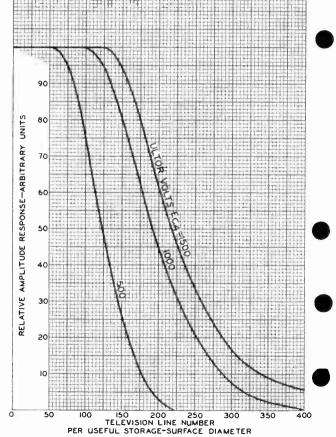




6AGG

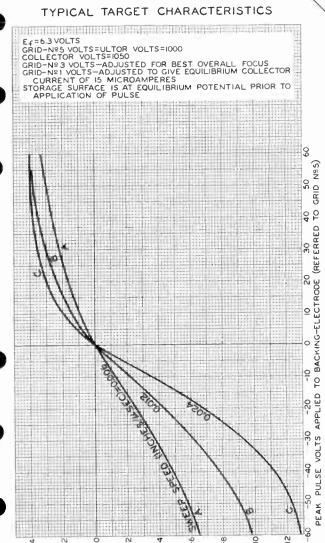
# RESOLUTION CHARACTERISTICS







# 6 NO.

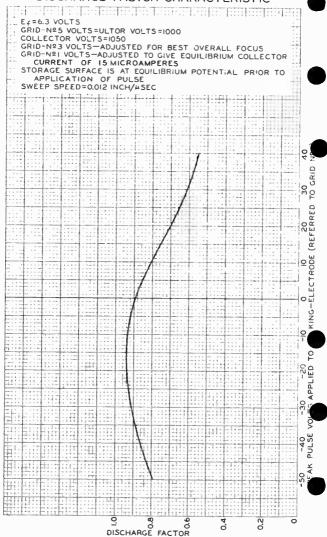


INSTANTANEOUS NET TARGET MICROAMPERÉS

6499



# APPROXIMATE DISCHARGE-FACTOR CHARACTERISTIC



92CM-8960



# 6866

# DISPLAY STORAGE TUBE

	Writing	Section	Viewing Sect	i on * *
	Equivale	nt Values	Ť	
GRID-No.4 VOLTAGE 29	900 max.*	150 max.	** 300 max.	volt
GRID-No.3 VOLTAGE IC		_	300 max.	
GRID-No.2 VOLTAGE 27	750 max.*	-	150 max.	volt
CATHODE VOLTAGE	_	-2900 max.		volt
GRID-No. I VOLTAGE:				
Negative bias value	200	max.*	100 màx.	Voits
Positive bias value	0	max.*	0 max.	volt
Positive peak value	2	max.¥	O max.	volt
PEAK VOLTAGE BETWEEN	_			
GRID No.4 AND ANY				
DEFLECTING ELECTRODE	500	max.	_	volt
PEAK HEATER-CATHODE				
VOLTAGE:				
Heater negative with				
respect to cathode	125	max.*	125 max.	volt
Heater positive with				
respect to cathode	125	max.*	125 max.	volt
٧	IEWING SE	CTION**		
Operating Values and Ty	nical Per	formance C	haractoris	tics.
Screen Voltage	5000	10000	10000	volt
C Backing-Electrode	_	5	5	volts
Voltage	5	210	150	volt
Grid-No.4 Voltage	150			
orid-No.5 Voltage"	25 to 125			
Grid-No.3 Voltage* Grid-No.2 Voltage** Grid-No.1 Voltage*	50 to 75	70 to 10		
	0 to -50			
Maximum Screen Current	350	600	350	<i>µ</i> am
Maximum Peak Backing-				
Electrode Current	1.5	2	1.5	ma 
Maximum Grid-No.4 Current.	2	3	2	m.
Maximum Grid-No.3 Current.	1.5	2	1.5	ma
Maximum Cathode Current*	3	4	3	m
Writing Speed !	3000Q0	300000	<b>3</b> 00000	in./sed
Number of Half-Tone Steps .	5	5	5	
/iewing Duration	40	20	40	se
Maximum Erasing-Uniformity				
Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Factor Fa	0.5	0.5	0.5	
Resolution	50	50	50	lines/in
Brightness ♣	275	2750	1500	f
	respect to	cathode of w	iewina Gun	
" Unitares are shown with "				
voitages are snown with r				
voitages are snown with r	nost unifor	m pattern.		id ho u c

ro. Convictions with compined adjustment or grid-No.1 voltage, 3fid-No.2 voltage, and grid-No.3 voltage to give brightest, most uniform pattern.

- Indicates a change.

<sup>• 11</sup> D & no 9 dd: See next page.





# DISPLAY STORAGE TUBE

wo	ιT	MC	SECT	LONG

Rance	Values	for	Fauinment	Design:"

With any	grid-No.2	voltage	(Ec.)	between	500	and	2750	volts	

Grid-No.4 Voltage	(E <sub>c.</sub> )			95%	to	105% of	$E_{C}$	volts
Grid-No.4 Voltage Grid-No.3 Voltage	for Focus			149	to	28% of	Ec.	volts
Maximum Grid-No. I							2	

for Cutoff of Undeflected

Focused Spot				-4.6% of Ec, volts	l
Maximum Grid-No.3 Current				-15 to +10° μamp	l
Maximum Cathode Current .		٠		See Curve	l

Deflection Factors:

DJ <sub>1</sub> and DJ,				28	to	38	٧	dc/in./kv of Ecu
DJ3 and DJ4				28	to	38	٧	dc/in./kv of Ec 4
Focused Bear Position					带带			

# Examples of Use of Design Ranges:\*

With grid-No.2 voltage of	1500	2500	volts
Grid-No.4 Voltage (E <sub>C.</sub> )	1425 to 1575	2375 to 2625	volts
Grid-No.3 voltage for Focus	210 to 420	350 to 700	volts
Maximum Grid-No. I voltage			
for Cutoff of Undeflected			
Focused Spot	-69	-115	volts

Focused Spot.....

errection ractors			
when $E_{C_{11}} = E_{C_{2}}$ :			
DU1 and DU2	42 to 57	70 to 95	v dc/in.
DI and DI	42 to 57	70 to 95	v dc/in.

# Equivalent Values for Examples of Writing-Gun Voltages Referred to Cathode of Viewing Gun:

Cathode Voltage .				-1450 to -1395	-2450 to -2395	volts
Grid-No.2 Voltage				-25 to +180	-75 to +230	volts
Grid-No.3 Voltage	for	Focus		-1240 to -975	-2100 to -1695	volts
Grid-No.4 Voltage				50 to 105	50 to 105	volts

# VIEWING SECTION and WRITING SECTION

# Circuit Values:

t = 57

or our yarden	- 1
Grid-No.1-Circuit Resistance (Either gun) 1.0 max. megohm	
Resistance in Any Deflecting-Electrode Circuit O. I max. megohn	a
Backing-Electrode-Circuit Resistance 0.005 max. megohr	١
Series Current-Limiting Resistance in Screen Circuit. 1.0 min. megohn	n I

voltages are shown with respect to cathode of Writing Gun.

Observed with an RCA-2F21 Monoscope display.

▲ DD ♣ •• \*\* See next page.

Measured under conditions of writing from just zero brightness (viewing-Deam cutoff) to maximum brightness with grid No.1 of writing Gun at -10 volts with respect to cathode of writing Gun, and grids No.2 and No.4 of Writing Gun at \*2500 volts with respect to cathode of writing Gun.

# DISPLAY STORAGE TUBE

- Expressed in terms of the time required for the orightness of the unwritten background to rise from just zero brightness (viewing-beam cutoff) to 10\$ of the maximum brightness.
- DDD period as  $(t_2 t_1)/t_2$ , where
  - t1 = time measured from start of erasing to instant at which any screen wrea is reduced to zero brightness.

    t = time measured from start of erasing to instant at which entry screen wrea is reduced to zero brightness.
- Measured by shrinking-raster method at a display brightness of 50% of saturated brightness and with grids Nn.2 and No.4 of Writing Gun at  $\star 2500$  volts with respect to cathode of Writing Gun  $^2$
- Measured with entire storage grid written to produce maximum brightness and with screen at indicated voltage.
- The cathode of the writing Gun is operated at about -2500 volts with respect to the cathode of the Viewing Gun which is usually operated at ground potential.
- at ground potential.

  \*\*\* The center of the undeflected focused beam will fall within a circle having a 10-mm radius concentric with the center of the face under the following conditions: grids No.2 and No.3 of writing Gun at +2500 volts with respect to cathode of writing Gun, grid No.3 of writing Gun at voltage to give focus, grid No.1 of writing Gun at voltage which will permit storage of a charge just sufficient to give a barely perceptible spot on screen, viewing Section operating under normal conditions, and tube shielded against extraneous fields.
- It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

#### OPERATING CONSIDERATIONS

Magnetic shielding must be provided to prevent external fields from interfering with the required accurate control of the low-velocity viewing beam. A cylindrical shield of properly annealed high-permeability material about I/16-inch thick is usually satisfactory. The screen cable should be placed outside the shield.

The metal flange at the face end of the tube requires the use of a spring-contact ring bearing against the edge of the flange.

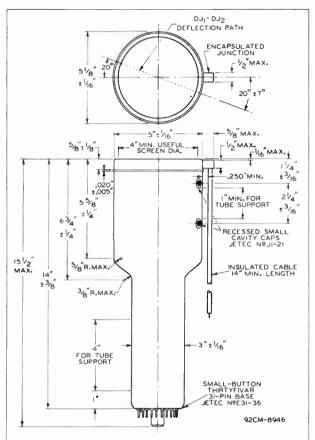
To prevent possible damage to the tube, allow the viewinggun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing beam on until the writing beam is turned off.

- Indicates a change.

# 6866

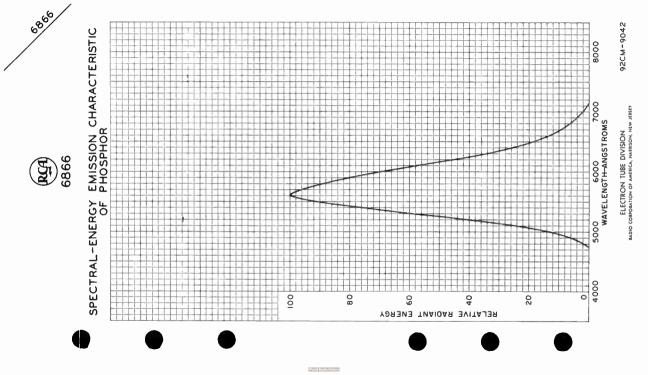
# (RCA) 6866

# DISPLAY STORAGE TUBE



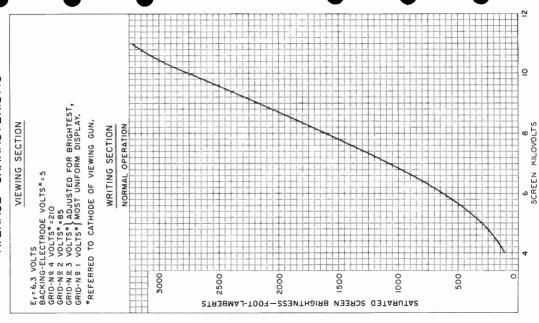
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 30 IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF FACEPLATE.

THE PLANE THROUGH TUBE AXIS AND EACH OF THE FOLLOWING ITEMS MAY VARY FROM THE DEFLECTION PATH PRODUCED BY DJ AND DJ\_0 BY THE FOLLOWING ANGULAR TOLERANCES (MEASURED ABOUT THE TUBE AXIS): PIN 27,  $\pm$  10°; EACH CAVITY CAP (ON SAME SIDE AS PIN 27',  $\pm$  17°; ENCAPSULATED JUNCTION,  $\pm$  10°. ANGLE BETWEEN DJ. – DJ2 DEFLECTION PATH AND DJ3 – DJ4 DEFLECTION PATH IS 90°  $\pm$  3°.





# AVERAGE CHARACTERISTIC



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ELECTRON TUBE DIVISION
DADIO CORPOLATION OF AMERICA, HARRISON, NEW JERSÉY

92CM-9043RI

# Display-Storage Tube

5-Inch Diameter High Display Uniformity

Improved Collimation System Design Typical Luminance of 1300 Footlamberts

For use in radar and other information-handling systems requiring bright non-flickering displays of stored information, including half-tones, for relatively long periods.

The 7183A is Directly Interchangeable with Type 7183.

CENEDAL

	GENERAL			
		Writing	Viewing	
		Section	Section	
	Heater, for Unipotential Cathode:			
		$6.3 \pm 10\%$	$6.3 \pm 10\%$	V
	Current at 6.3 volts	0.6	0.6	Α
	Cathode Heating Time (Minimum) before other electro	de		
	voltages are applied		60	8
	Direct Interelectrode		00	-
	Capacitances:			
	Grid No.1 to all other			
	electrodes	7	_	ρF
	Cathode to all other			
	electrodes	5	_	pF
	Backplate to all other			-
	electrodes	_	100	pF
	Focusing Method	Electro-	_	
_	T de les Manuel	static		
	Definition Mathed			
	Deflection Method	Magnetic	-	
	Phosphor	_	P20,	
			Aluminized	
	Minimum Useful Viewing Diame			
	Maximum Overall Length			
	Maximum Seated Length		1	1.25"
	Maximum Diameter (Excluding S	Screen		
	Connector Assembly)	. <b>.</b> . <b>.</b>		5.06"
	Bases:			
	Writing Gun	Small-Button	Neoditetrar	8-Pin
		(	JEDEC No.E	8-49)
_	Viewing Gun	Small-Butt	on Miniature	7-Pin
	-		(JEDEC No.	
	Bulb Terminals (Five)	Rece	ssed Small C	avity
			JEDEC No.J	1-21)

Screen Connector Assembly Aircraft-Marine Products, Inc., Type LGH, Part No.832692 <sup>b</sup> , or equivalent Operating Position Any Weight (Approx.) 1-3/4 lb  ABSOLUTE MAXIMUM AND MINIMUM RATINGS  All voltages are shown with respect to the cathode								
of the viewing gun unless otherwise s Minimum	pecified Maximum							
Screen Voltage:								
Peak 0	10,000 V							
DC 0	9,000 V							
Backplate Voltage:								
Peak 0	30 V	•						
DC30	10 V							
Collector (Viewing-Grid- No.5) Voltage 180	300 V							
Collimator (Viewing-Grid-	300 4							
No.4) Voltage 50	150 V							
Viewing-Grid-No.3 Voltage,								
Writing-Grid-No.4 and								
Writing-Grid-No.2 Voltage <sup>d</sup> 10	150 V							
Viewing-Grid-No.2 Voltage 100	150 V							
Viewing-Grid-No.1 Voltage 0	-100 V							
Viewing-Gun Heater-to-								
Cathode Voltage125	125 V							
Writing-Grid-No.3 Voltage 0	. 200							
Writing-Grid-No.1 Voltage200 Writing-Gun Cathode Voltage2750	(f) V 145 V							
Writing-Gun Heater-to-	145 V	_						
Cathode Voltage125	125 V							
Series Current-Limiting	-20							
Resistor (Unbypassed) in								
Screen Circuit 1	– MΩ							
Series Current-Limiting								
Resistor (Unbypassed) in								
Collector (Viewing-Grid-	0							
No.5) Circuit 0.005	_ MΩ	_						
RECOMMENDED OPERATING VALUES								
All voltages are shown with respect								
of the viewing gun unless otherwise s								
Screen Voltage	. 0000							
Backplate Voltage <sup>9</sup>								
Collimator Voltage h								
Commutor voitage	. 40 to 110							



Viewing-Grid-No.3 Voltage d,h 10 to 40 Viewing-Grid-No.2 Voltage 100 Viewing-Grid-No.1 Voltage -40 to 0 Writing-Grid-No.3 Voltage -1925 to -1675 Writing-Grid-No.1 Voltage (f,k) Writing-Gun Cathode Voltage -2500 Circuit Values:	V V V V V
Grid-No.1 circuit resistance (Either gun) 1 max. Backplate-circuit resistance 0.005 max. Series current-limiting	MΩ MΩ
resistor (Unbypassed) in screen circuit	мΩ
circuit 0.01	МΩ
PERFORMANCE DATA AND CHARACTERISTICS	
Min. Typ. Max.	
Useful Viewing Diameter       4.0       —       —         Luminance (Brightness) <sup>m</sup> —       1300       —         Viewing Duration <sup>n</sup> 10       —       —         Erase Time <sup>p</sup> —       35       200         Erasing Uniformity Factor:       —       —       0.35         For 4"diameter area <sup>q</sup> —       —       0.35         Resolution <sup>r</sup> 50       —       —       1ii	
Undeflected Spot Position (s) Screen Current	μA
Current <sup>†</sup>	mA
Cathode Current       -       2.5       4         Maximum Writing-Gun       -       2.5       5.0         Cathode Current       -       2.5       5.0	mA mA
Aircraft-Marine Products, Inc., Capitron Division, 155 F St., Elizabethtown, Pa.	
b This part mates with Aircraft-Marine Products, Inc., I No.AMP833589, ceramic terminal, or equivalent.	
d Grids No.4 and No.2 of Writing Gun and grid No.3 of View Gun are connected within the tube.	ring
e Voltages are shown with respect to cathode of Writing G	un.
f The writing-gun grid No.1 should never be more posi- than necessary to write the display to saturated brightn	



# 7183A

for a given scanning and drive condition. In no case should the writing-gun grid-No.1 voltage have a value greater than zero with respect to the writing-gun cathode.

- 9 Dynamic erasure and bright-ring elimination circuitry are recommended. Dynamic erasure is accomplished by a series of rectangular pulses. The backplate should be maintained at zero volts between erase pulses. Bright-ring elimination is accomplished by connecting an 0.1 µF, 200 VDC capacitor between the backplate electrode and the collimator electrode.
- Adjusted for brightest, most uniform, full-size pattern.
- Adjusted for the smallest, most circular spot.
- k The maximum bias-voltage value for writing-beam cutoff is -130 volts with respect to writing-gun cathode.
- m Luminance (Brightness) and screen current are measured after the entire display is written to saturated brightness. the writing gun has been turned off, and with no erasing pulse applied.
- n The time required for any 1.5-inch diameter area of the useful 4-inch diameter viewing area to spontaneously rise (with no writing or erasing) from zero brightness (viewing-beam cutoff) to 10% of saturated brightness.
- P With the display at saturated brightness, a series of rcctangular pulses 5 milliseconds in width and at a repetition frequency of 2 pps is applied to the backplate. The number of pulses required to just erase completely the center of the display is noted. This number is multiplied by 5 milliseconds to obtain the erase time. The amplitude of the erase pulses is adjusted to obtain the minimum erase time.
- 9 Determined as follows: With no erasing pulse, overscan the storage surface with writing beam to obtain maximum pattern brightness. Then cut off writing beam and adjust erasing pulse to obtain complete erasure in approximately 10 seconds. Measure time (t1) from start of erasing to the instant at which any area within the 4" diameter is reduced to background-brightness level, and time (to) from start of erasing to the instant at which the entire area within the 4" diameter area is reduced to background-brightness level. The erasinguniformity factor is defined as (to-t1)/to.
- Measured by shrinking-raster method at a display brightness of 50% of saturated brightness and with grids No.2 and No.4 of Writing Gun at about +2500 volts with respect to cathode of Writing Gun.



- <sup>5</sup> The undeflected spot position must fall within a circle having a 5/16-inch radius (maximum), 1-3/4-inches from the geometric center of the tube face, on the radius passing through the center of the neck of the writing gun.
- † With writing gun turned off, with no erasing pulse applied, and display erased to cutoff.
- Weasured with viewing-gun grid No.1 at zero volts and with all other electrodes at voltages shown under Recommended Operating Values.
- Y Measured with writing-gun grid No.1 at zero volts while writing an overscanned TV-type raster.

# ENVIRONMENTAL TESTS

The 7183A is designed to withstand the following environmental tests:

**Vibration** parallel to each of the three orthogonal axes shown in Fig.1, and as specified in the schedule below:

Axis of Vibration	Double Amplitude inches	Frequency in Hz	Cycle Duration minutes
X	0.08	30	30
Y	0.08	30	30
Z	0.08	30	30

High and Low Temperature Storage for at least 24 hours at a temperature of  $+100^{\rm O}$  C and for at least 24 hours at a temperature of  $-65^{\rm O}$  C.

Temperature and Low Pressure (Altitude) in three concurrent phases as specified below:

Phase 1. Storage for one hour at a temperature of -40° C followed by tube operation for five minutes under the conditions shown under Recommended Operating Values.

Phase 2. Temperature is increased from -40° C at a rate of 2° C per minute until a temperature of +86° C is reached. Following one hour storage at +86° C, the tube is operated for five minutes under the conditions shown under Recommended Operating Values.

Phase 3. Barometric pressure is next reduced until a pressure equivalent to an altitude of 20,000 feet is attained. The tube is then operated for five minutes under the conditions shown under *Recommended Operating Values*. Upon completion of the third phase of this test, pressure is increased and temperature decreased, at a rate of 2° C per minute, until ambient pressure-temperature conditions are reached.

# **PRECAUTIONS**

The following operating precautions must be followed to protect the 7183A from inadvertent damage —

- 1. Do not exceed maximum ratings.
- 2. Be sure to include the screen resistor.
- 3. Be sure to include the collector resistor.
- 4. Do not apply excessive writing-beam current density.
- 5. Protect against scanning failure.
- 6. Protect against loss of bias.
- 7. Apply voltages to tube in correct order.
- 8. Never write unless viewing beam is on.
- Stay within recommended viewing-grid voltage ranges.

# SCHEMATIC DIAGRAM

Showing Orthogonal Axes of 7183A Used during Environmental Tests

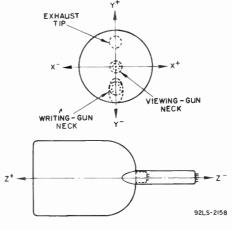
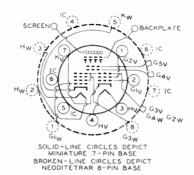


Fig.1

# TERMINAL DIAGRAM (Bottom View)



#### VIEWING SECTION

# Small-Button Miniature 7-Pin Base

Pin 1: Grid No.2 Pin 2: Grid No.1

Pin 3: Heater Pin 4: Heater

Pin 5: Internal Connection -

Do Not Use

Pin 6: Internal Connection -

Do Not Use Pin 7: Cathode

Flexible Lead (Large):

Screen

Flexible Lead (Small):

Backplate

Recessed Cavity Caps: Collector (Grid No.5) -

Located 1.25" from tube face; 15° from center line through writing and viewing gun necks away from screen connector.

Collimator (Grid No.4) — located 3" from tube face; 15° from center line through writing and viewing gun necks away from screen connector.

Located near viewing gun— Grid No.3 and Grids No.4 & No.2 of writing gun.

# WRITING SECTION

# Small-Button Neoditetrar 8-Pin Base

Pin 1: Grid No.1 Pin 6: Internal Connection =

Pin 2: Heater Do Not Use

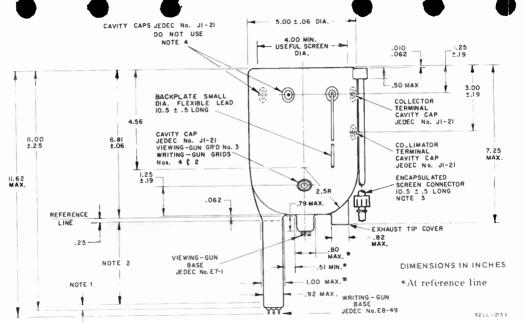
Pin 3: Heater Pin 7: Internal Connection —

n 4: Internal Connection = Do Not Use
Do Not Use Pin 8: Grid No.3

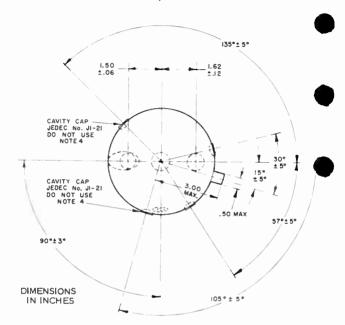
Pin 5: Cathode

Note: Grids No.4 & No.2 are connected internally to Grid No.3 of viewing gun

DATA 5 5-68



# DIMENSIONAL OUTLINE (Top View)



# NOTES FOR DIMENSIONAL OUTLINE

Note 1: Within this distance, neck diameter is .920" max.

Note 2: Within this distance, neck diameter is .950" max.

Note 3: Aircraft-Marine Products, Inc., type LGH Part No. 832692, or equivalent. This part mates with Aircraft-Marine Products, Inc., Part No.AMP833589, ceramic terminal, or equivalent.

Note 4: Do not use these cavity caps for connection. The caps are connected internally and may be at a potential which could constitute a shock hazard. It is recommended that these caps be covered with electrical insulation.

# Display-Storage Tube

	"RUGGEDIZED" TYPE TWO WRITING GUNS ONE VIEWING GUN				H-DI	-INCH D AMETER AGNETIC	DISPL	AY.
	For Use in Military and Commercial Info Where Rough Tube Usage May be Encoun laterally Interchangeable	t e r	rec	l.	The	7268A		
_	ELECTRICAL							
	Heater, for Unipotential Cathode All guns							
	Voltage (AC or DC)					6.3 ± 0.6	10%	V A
	Current at 6.3 V Cathode Heating Time					30		S
	Minimum, before other electrode voltages are applied	•	•	•	•			
	Writing Section - E	ac	h	Gun				
	Focusing Method							
	Deflecting-Electrode Arrangement	. S	ee	Di	men	sional	Outli	n e
	Direct Interelectrode Capacitances							_
	Grid No.1 to all other electrodes .							pF
	Cathode to all other electrodes Deflecting electrode DJ1 to	•	•	•	•	8	max	рF
	deflecting electrode DJ2					3	max	ρF
	Deflecting electrode DJ3 to		•		•	•		
	deflecting electrode EJ4					2		pΕ
	DJ1 to all other electrooes							pΕ
	DJ2 to all other electrodes							pF
	DJ3 to all other electrodes							pF pF
	DJ4 to all other electrodes	•	•			10	max	pr
	Viewing Section	on						
	Direct Interelectrode Capacitances Grid No.1 to all other electrodes. Cathode to all other electrodes. Backplate to all other electroses.						max	pF pF pF
_	OPTICAL							
	Phosphor				. Р	20, Alu	miniz	ed

Caps													
Base .											JEDEC	No. B25-216	
							_	_	_				=

MECHANICAL

Operating Position .

Bulb Terminals . Cans (Three)

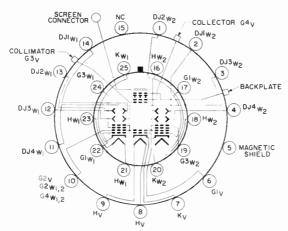
Minimum Useful Viewing Diameter. Maximum Overall Length Maximum Diameter . . . Excluding screen lead Screen-Connector Assembly.

Weight . . . . . . . . . . . . . . . .

Recessed Small-Ball (JEDEC No.JI-22)

See Dimensional Outline

# TERMINAL DIAGRAM (Bottom View)



Pin II - Dethitting that take 004 of Whiting Gun No.1 Pin I. - Dethecting that take 003 of Writing Gun No.1

of Ariting Gun No.1 Pin 12-1-theting Electrode QU2 of Ariting Gun No.1 Pin 14-0-theting Electrode QU1

Pin 14 - Or flecting Electrode DJ1 of Writing Cun No.1

Pir 1 -10 - 10 internal connection

Pin Ir - Huster of Ariting out No. . Pin I'- stid No. 1 of Ariting out No. 2

Pin 18—Heater of Writing Gun No. 2 Pin 19—Grid No. 201 Writing Gun No. 2

Pin 20 - Cathode of Writing Gun No. 2 Pin 11 - Heater of Writing Gun No. 1 Pin 12 - Or No. 1 of Mriting Gun

Pin 3-Meater of Uniting Sun No.1 Pin 34-3713 No.301 Writing Sun No.1

Pin 20 - Stros- or Writing works. I Florible Lews-worker (Encapsulared Receiver Small Ball Caps—

Over Pin No. 3 Collimator sinwing unit No. 3)

Over Pin No. 13 Collector (viewing Grid No.4)

Over Pin No. 14 Backplate



# MAXIMUM AND MINIMUM RATINGS, ABSOLUTE-MAXIMUM VALUES

All voltages are shown with respect to the cathode of the vieuing gun unless otherwise specified.

The state of the s	specifi	C 12 +	
Soroca Valtara	$M \iota n$	Max	
Screen Voltage Perr DC	0	35	V V V
Collector Voltage <sup>a</sup>	0	300	٧
Collimator Voltage <sup>b</sup>	0	300	٧
Viewing-Grid-No.2. Writing-Grid-No.4. and Writing-Grid-No.2 voltage <sup>C.d.</sup>	0	200	٧
Viewing-Grid-No.I Voltage <sup>a</sup>	-150	200	v
Viewing-Gun Heater-to-Cathode Voltage	- 125	125	v
Magnetic Shield Voltage	-200	200	v
writing-Grid-No.4, Writing-Grid-No.2 To Anv			•
Deflecting Electrode Voltage	-500	500	٧
Writing-Grid-No.3 Voltage	0	2000	٧
Writing-Grid-No.1 Voltage		(d)	٧
Writing-Gun Cathode Voltage	- 2800	0	٧
Writing-Gun Heater-To-Cathode Voltage	125	1 25	v
fair gun	-123	123	٧
Series Current-Limiting Resistor			
Unbypassed, in screen circuit	0.005	-	MΩ MΩ
RECOMMENDED OPERATING VALUES			
All voltages are shown with respect to of the viewing gun unless otherwise s	the ca	thode ed.	
Screen Voltage 100			٧
Backplate Voltage	2		v
	65		v
Viewing-grip to.: Collimator Voltagef 50 to			v
/iewing-gris No.5			
	00		٧
Viewing-Grid-No.1 Voltage <sup>†</sup> 50 t			٧
Writing-Grid-No.3 Voltage2325 to	-1975		٧
Writing-Grid-No.1 Voltage	h)		٧
Writing-Gun Cathode Voltage 240			v
Magnetic Shield Voltage	0		v
	00		v
Circuit Values			*
Grid-No.1 circuit resistance,			
either gun	1 max		$\mathbf{M}\Omega$

# Circuit Values (cont'd)

mpedince in any defl	ecting elec	t rode			
circuit <sup>K</sup>			0.01	max	M: 1
askpla:circui: res	iutance		0.005	max	MO
eries curren←limiti	ng resistor	:			
Unbypissed, in scre	en circuit.		- 1		MΩ
ribires, in coll	ector viewi	ng-grio-			
in.4 circuit '			0.01		M. i

#### CHARACTERISTICS

			Min	Typ	Max	
Useful Viewing Diameter			4	-	-	in
Brightness (Luminance)			-	2500	-	fL
Viewing Duration <sup>n</sup>			15	-	-	\$
Erase Ťime <sup>k</sup>			-	28	-	ms
Resolution <sup>q</sup>			70		-	
Undeflected Spot Position.			-	-	(r)	mm
Deflection Factors						
W1 & Wz			82	-	100	V/in
D.3 8 W4	4		B2	-	100	V/in

- These voltages should never be adjusted to values which will permit the display of a sharply-defined circular area of brightness having a diameter of less than 3.5 inches. See Oferating Procedure for the proper set-up to follow.
- 6 Grids No. 4 and No. 2 of writing gun and the grid No. 2 of viewing gun are connected within the tube.
- C Voltages are shown with respect to cathode of writing gun.
- d The writing-gun grid No.1 should never be more positive than necessary to write the display to saturated brightness for a given scanning and drive condition. In no case should the writing-gun grid-No.1 voltage have a value greater than zero with respect to the writing-gun cathode.
- e The backplate should be maintained at 2 volts between erasing pulses when dynamic grasure is employed.
- f Adjusted for brightest, most uniform, full-size pattern.
- 9 Adjusted for the smallest, most circular spot.
- h The bias-voltage value for writing-beam cutoff is between -n0 and -100 volts with respect to writing-gun cathode.
- J With respect to the viewing-gun cathode for each pair of deflecting electrodes.
- R Recommended value for minimum distortion because of viesting beam collection by the deflecting plates. Where strict display accuracy and display uniformity are not required, the irpedance value for any deflecting-electrode circuit may be as high as 0.1 megohm maximum. For optimum performance, it is recommended that the deflecting-electrode-circuit impedances be approximately equal.
- Brightness (Luminance) is measured after the entire display is written to saturated brightness, the writing gun has been turned off and with no erasing pulse applied.
- The time required for any 0.5-inch diameter area of the 1-inch-diameter viewing area to rive spontaneously (with no writing or erasing) from zero brightness (viewing-beam visual cutoff) to 10% of saturated brightness.
- Paich the display at saturated bijolities in series of rectangular pulses of all two-modes in such and at a repetition frequency of 2 per is applied to the horizonte. The number of pulses required to just erase completely the centre of the days law is noted. This number is multiplied to 5 mills seconds to obtain the erase time. The amplitude of the erase pulses is adjusted to obtain the minimum erase time.
- Weasured to the "shrinking" raster method under conditions of continuous ariting and erasing aith erasing pulses of no lisec width and a repetition frequency of 300 p.s. The amplitude of the erase pulses is adjusted to provide 3.5-second erasure and grid. No. 1 is adjusted to provide 1000 footlamberts brightness of the just "shrunken" raster.
- The undeflected spot position must fall within a square having a 15 millimeter side (maximum) centered on the tube face and parallel to a trace produced by one set of deflecting plates.



# Performance Data:

Writing Ability and Writing Uniformity characteristics are measured singly for both guns. A 3.5 x 3.5 inch raster is centered on the tube face. Vertical scanning is accomplished by an interrupted linear sawtooth waveform having a scan time of 625 microseconds and aprf of 500 p.s. Horizontal scanning is provided by a triangular waveform having a scan rate of 3.5 inches per second.

Writing Ability. The writing-gun grid No. 1 of the gun under test is driven above cutoff during the vertical scan time by white noise, of approximately 5 megacycles bandwidth. having a zero-to-peak amplitude of approximately 35 volts. The disbray brightness under these conditions shall be at least 20% of saturated brightness.

Writing Uniformity. This characteristic is determined under the same conditions as specified above except that the rms amplitude of the white noise is adjusted to produce brightness of 40% of saturated brightness of the dimmest area in the display. The measured brightness at the brightest area of the display shall be not more than 80% of saturated brightness,

#### Environmental Tests:

The 7268A is designed to withstand the following operational and non-operational environmental tests.

# Operational Tests:

Sinusoidal Vibration. This test consists of tube vibration in each of three orthogonal axes. One of these axes is in the plane passing through the major axis of the tube and the center of the tube-base key. The tube is mounted so that its major axis is parallel to the plane of the earth. A total of b cycles of swept sinusoidal vibration, from 10 to 500 and back to 10 cycles per second, is performed. The duration of a sweep cycle is 15 minutes. The frequencies of any resonant points are noted. The sinusoidal vibration schedule is shown below,

Double Amplitude inches	Peak Acceleration g's	Sweep Frequency c/s	Sweep Cycle Duration minutes
0,27	•	10 to 20	
-	4	20 to 46	
-	2	46 to 500	15
-	2	500 to 46	
-	4	46 to 20	1
0.27	-	20 to 10	

Vibration of Resonance. This test consists of tube vibration at the resonant point or points determined in Sinusoidal Vibration for a period of 30 minutes. If more than one



resonant point is noted for a given axis, the tube is vibrated for a total of 30 minutes at that resonant point in each axis most likely to produce tube failure. If no resonant points are determined in Sinusoidal Vibration, the tube is vibrated for 60 minutes at a frequency of 55 cycles per second.

Low Pressure - High Temperature. This test consists of tube storage for a period of not less than one hour at a temperature of +100 $^{\circ}\text{C}$ . At the termination of this storage period, the tube is operated with the values shown under Recommended Operating Values applied and at a pressure equivalent to an altitude of 32,000 feet. The temperature is then reduced to +53 $^{\circ}\text{C}$ . The tube is stored at this temperature for 1 hour and then is operated with normal voltages applied at a pressure equivalent to an altitude of 60,000 feet.

**Low Temperature.** This test consists of the tube being maintained at a temperature of -65  $^{\circ}$ C for 48 hours. At the end of this period and while the tube is still at -65  $^{\circ}$ C, the tube is operated with recommended voltages applied for 15 minutes.

#### Non-Operational Tests:

Temperature Cycling. This test consists of tube storage for a period of not less than 2 hours at a temperature of -65  $^{\rm oC}$  followed within 5 minutes by storage for a period of 2 hours at a temperature of +100  $^{\rm oC}$ . A minimum of five consecutive cycles are performed.

High Pressure. This test consists of tube exposure to an absolute pressure of 45 pounds persquare inch for a period of at least 60 seconds. This pressure shall be attained within 60 seconds.

Torque. This test consists of the application of a torque of 40 inch-pounds between the integral magnetic shield and the tube base.

**Salt Spray.** This test consists of tube exposure to a fine spray from a salt solution for a period of 48 hours. The ambient temperature is maintained at approximately 35 °C.

#### OPERATING PROCEDURE

The following steps should be followed when the 7208A is first placed in operation. Refer to the precautions shown under Operating Considerations in the publication ICE-277 "BCA Display-Storage Tubes". Note that all electrode in the cathode of the viewing gun unless otherwise specified.

l. Itering Gun-Apply power to the heater of the viewing gun and allow 60 seconds for the cathode to reach normal operating temperature. Next apply the following voltages to the viewing-gun electrodes: zero volts to the viewing-gun cathode, zero volts to the viewing-gun grid No.1, +100 volts to the viewing-gun grid No.2, +125 volts to the collimator, +265 volts to the collector, +2 volts to the backplate, and +10,000 volts to the screen. Except for the application of screen voltage, which may be increased, at the user's option,



from 0 volts to 10,000 volts slowly, all of the above voltage values should be applied to the tube simultaneously and without first passing through intermediate voltage values. Next apply dynamic erasing pulses to the backplate. Adjust the viewing-gun grid-No.1 voltage to a value midway between zero volts and that voltage at which the viewing diameter begins to decrease. Reduce the collimator voltage until the viewing diameter starts to decrease, and then increase the collimator voltage by 10 volts. The storage property of the tube can be observed by setting the amplitude of the dynamic erasing pulses at +12 volts for several seconds and by then reducing it to zero volts. As the erasing pulse amplitude is reduced the screen should go dark. The 7268A is now storing an overall "black picture" and stays in this condition until the screen begins to brighten as a result of the storage grid being gradually discharged by positive ionslanding on it.

2. Writing Gun—Apply power to the heater of the writing gun and allow 60 seconds for the cathode to reach normal operating temperature. Then, with reference to the typical operating values shown in the tabulated data under Recommended Operating Values, set the grid-No.l voltage to cutoff, and apply de voltages to the electrodes of the writing gun. With the screen made dark by the charging method described under (1), the grid-No.l bias is reduced until the writing heam is seen as a spot on the screen. If the beam is caused to move, either by centering adjustment or by application of deflection voltage, it should leave a bright trace. After an area has been written to full brightness, the writing-beam spot may be seen as a slightly brighter spot on the bright background. Writing-beam focus can then be optimized by adjusting the grid-No.3 voltage.

3. Final Display Adjustments - The dehias and the videosignal amplitude applied to grid No. 1 or cathode of the writing gun should be adjusted to set the black level and the highlight level in the display. These adjustments depend on the scanning rate used. Resolution decreases with increasing writing-gun beam current. Excessive writing-gun beam current will produce screen saturation and any further beam-current increase will not produce additional highlight brightness and may also decrease half-tone rendition. It is recommended that the writing-beam current always be adjusted to aminimum value to produce the best display without saturation of highlight brightness. The dynamic erasing-pulse amplitude and duty cycle should be adjusted in accordance with the information contained in ICE-277. The collimator voltage should be adjusted for optimum display uniformity. If the collimator voltage is too high, the center area of the display will tend to erase slowly. If the collimator voltage is too low, the edges of the display will tend to erase slowly.

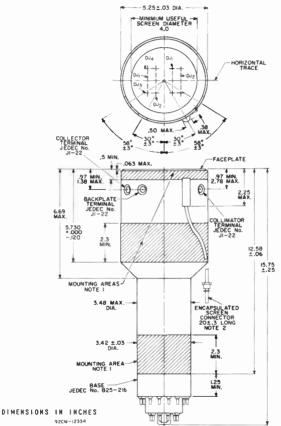
The following operating precautions must be followed to protect the  $72684\ \mathrm{from}$  inadvertent damage—

- 1. Do not exceed maximum ratings.
- 2. Be sure to include the screen resistor.
- 3. Be sure to include the collector resistor.



- 4. Do not apply excessive writing-beam current density.
- 5. Protect against scanning failure.
- 6. Protect against loss of bias.
- 7. Apply voltages to tube in correct order.
- 8. Never write unless viewing beam is on.
- 9. Stav within recommended viewing-grid voltage ranges.

# DIMENSIONAL OUTLINE



Note 1: The indicated areas are recommended for mounting purposes.

Note 2: Amp Part No. Amp 832 692-09; manufactured by Aircraft Marine Products. Inc., Harrisburg, Pa., or equivalent.

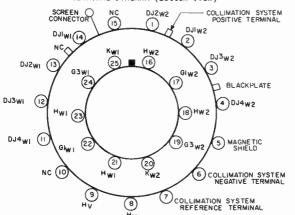


# Display-Storage Tube

	FACTORY-COLLIMATED "RUGGEDIZED" TYPE TWO WRITING GUNS ONE VIEWING GUN For Use in Military and Commercia Displays Where Rough Tube Usage May B	
	is Unitaterally Interchangeable wit	
	ELECTRICAL	
	Heater, for Unipotential Cathode (All solinge (at or DC)	6.3 ± 10% V 0.6 A 30 s
	Writing Section-Ea	ich Gun
	Focusing Method	Electrostatic
	Grid of 1 to 1' ofter electrodes. (athode to all ofter electrodes. Deflecting electrode DJ1 to deflect	8 max pF ting
	Pectrode DUZ Deflecting Piectrode DUZ to deflect electrode DUZ DUI to all other electrodes DUZ to all other electrodes DUA to all other electrodes	2 max pF 10 max pF 10 max pF 10 max pF 10 max pF 10 max pF
	Viewing Sectio	n
	Direct Interelectrode Capacitance Banksiste to sil otter electrodes.	
	OPTICAL	
	***************************************	P2O, Aluminized
	MECHANICAL	
•	Operating Position	4 in 16 in 5,28 in
_	Screen-Connector Assembly	5-1/4 lb
_	Base	



# TERMINAL DIAGRAM (Bottom View)



92LS - 1218 1 - Defiecting Electrod-Pin 17 - Grid No. 1 of Writing DJ2 of Writing Gur No. 2 2 - Deflecting Electron-Pin 18 - Heater of Writing Gun DJ1 of Writing Gir 10.2 3 - Deflecting Electrode
003 of Writing Gunt... Pin 4 - Deflecting Electrode Pir 20 - Cathoda of Writing Gun DJ4 of Writing Gun No. 2 Pin 5 - Integral Magnetic Shield Pir 21 - Heater of Writing Gur c - Co'limation System legative is min: P'n 7-Co'limation System Peference Termin 1' Pin 23 - Heater of Writing Gun 3 - Heater of liewing Gun 24 - Grid No. 3 of Writing Gun No. 1 3 - Heater of liewing Gun J - 10-10 Internal Connection Pin .5 - Cathode of Writing Gun Pin 11 - Deflecting F'ectrod DJ4 of Ariting Gur No. 1 Flexible Lead - Screen - et'esting F'estrole DUB of Ariting air No. 1 Penessed Smil' Bal' Caps -Pin 13 - Deflecting Electrode Over Pin No. 3 DJ2 of Wr ' ing Gun No. 1 NC-No Internal Connection Pir 14 - Cettecting Electron SUL of Arting Ginto. Over Pin No. 13
Co' mail on star Position Fin 10-10-10 interni Connection Over Pin No. 14

Bartil 1 :+=

Pin 16 - Hester of Writing G.:

MAXIMUM A	ND MINIMUM	RATING	iS, A	BSOL	UTE	MAX	I MUM V	ALUES	
	ages are sho								
	of the co								
specifie	d. The re	ference	tern	ina	l mu	st b	e groui	nded.	
							Win	Max	
Screen Voltage	e								
Peak							-	11500	
DC							0	11000	
C Backplate	Voltage						0	35	
Collimation S									
Past::e	r-inal vol:	taq~ .					0	300	
Negative-te							-100	-50	
Viewing-Gun H							-125	125	
Magnetic Shie							-200	200	
Deflecting-El	ectrode Vo	ltage.					-600	600	
Fach gun									
Vriting-Grid-	No.3 Volta	ge					0	2000	
Each gurb									
/riting-Grid-	No.I Volta	ge				•	-200	(c)	
Fact quab							0000	^	
Writing-Gun C	athode Vol	tage .				*	-2800	0	
Each gun		. 4 6	V = 1 + :				-125	125	
Vriting-Gun H	eater-to-C	athode	VOITE	age		*	-125	125	
Fach gun	4 (1-141	Dociet							
Series Curren	L-LIMITING	Kesisi	.or				1	_	1
Unby: is ed, Unby: in ed,	in collim	ation s				•	•		
nositive t	errinal ci	roult.					0.005	_	-
positiv									
	RECOMM	ENDED O	PERAT	ING	VAL	UES			
All voltage									
nal of the	collimatio	n syste	m un	less	o t	heru	ise sp	ecifie	í.
Screen Voltag	je						10000		
Backplate Vol	taged						2		
Collimation S	System <sup>a</sup>								
Positive-te	rminal vol	tage .					265		
Negativte							-55		
Reference :									١d
Writing-Grid-	No.3 Volta	ge				2	325 to	-1975	
Fach gure									
Writing-Grid-	No.I Volta	ge					(c.	f)	
Each gun									
Writing-Gun C						٠	-2400		
Magnetic Shie							0		
Average Defle		e Volta	age <sup>g</sup>				100	)	
Circuit Value									
Gria-No.1 c				rer	g "r	) -	ı	max	
Impedance i									
	circuith .							max	
Raukuj ije-l	incult res	rio, tudi	۵			٠	0.005	тах пах	
Serie rum	rent-' m t	13 res	irtor	:			1		
Unbypasce	ed, in scre	en cir	CHIL			•	ı		
	ed, in ro'' e 'ermin:'						0.005		

MAYIMUM AND MINIMUM RATINGS. ARSOLUTE MAXIMUM VALUES



#### CHARACTERISTICS

			Min	Typ	Max	
Useful Viewing Diameter .				-	-	in
Brightness (Luminance) .				2500	-	fL
Viewing Duration <sup>k</sup>			15	-	-	s
Erase Time <sup>m</sup>			_	28	_	ms
Resolution <sup>n</sup>			70	_	-	lines/in
Undeflected Spot Position			-	-	(p)	mm
Deflection Factors						
DJ1 A DJZ			82	-	100	V/in
DJ3 : DJ4			82	-	100	V/in

The collimation system includes a passive internal network which provides the proper voltages for all viewing gun electrodes; except screen, backplate and heater; as well as grids No.2 and 4 of the writing gun.

Voltages are shown with respect to cathode of writing gun.

The writing-gun grid No.1 should never be more positive than necessary to write the display to saturated brightness for a given scanning and drive condition. In no case should the writing-gun grid No.1 voltage have a value greater than zero with respect to the writing-gun cathode.

The backplate should be maintained at 2 volts between erasing pulses

when dynamic erasure is employed.

e Adjusted for the smallest, most circular spot.

The bias-voltage value for writing-beam cutoff is between -60 and -100 volts with respect to writing-gun cathode.

9 With respect to the reference terminal of the collimation system for each pair of deflecting electrodes.

h Recommended value for minimum distortion because of viewing-beam collection by the deflecting plates. Where strict display accuracy and display uniformity are not required, the impedance value for any deflecting-electrode circuit may be as high as 0.1 megohm maximum. For optimum performance, it is recommended that the deflecting-electrodecircuit impedances be approximately equal.

Brightness (Luminance) is measured after the entire display is written to saturated brightness, the writing gun has been turned off, and with

no erasing pulse applied.

k The time required for any 0.5-inch-diameter area of the 4-inch-diameter viewing area torise spontaneously (with no writing or erasing) from zero brightness (viewing-beam visual cutoffo) to 10° of saturated brightness.

m With the display at saturated brightness, a series of rectangular pulses 5 milliseconds in width and at a repetition frequency of 2 p/s is applied to the backplate. The number of pulses required to just erase completely the center of the display is noted. This number is multiplied by 5 milliseconds to obtain the erase time. The amplitude of the erase pulses is adjusted to obtain the minimum erase time.

Measured by the "shrinking" raster method under conditions of continuous writing and erasing, with erase pulses of 60 microseconds width and a repetition frequency of 300 ps. The amplitude of the erase pulses is adjusted to provide 3.5-second erasure and grid No.1 is adjusted to provide 1000 footlamberts brightness of the just "shrunken" raster.

P The undeflected spot position must fall within a square having a 15 millimeter side (maximum) centered on the tube face and parallel to a trace produced by one set of deflecting plates.

# Performance Data

Writing Ability and Writing Uniformity Characteristics are measured singly for both guns. A 3.5" x 3.5" raster is centered on the tube face. Vertical scanning is accomplished by an interrupted linear sawtooth waveform having a scan time of 625 microseconds and aprf of 500 p/s. Horizontal scanning is provided by a triangular waveform having a scan rate of 3.5 inches per second.

Writing Ability. The writing-gun grid No.1 of the gun under test is driven above cutoff during the vertical scan time by white noise, of approximately 5 megacycle bandwidth, having a zero-to-peak amplitude of approximately 35 volts. The display brightness under these conditions shall be at least 20% of saturated brightness.

Writing Uniformity. This characteristic is determined under the same conditions as specified above except that the rms amplitude of the white noise is adjusted to produce brightness of 40% of saturated brightness at the dimmest area in the display. The measured brightness at the brightest area of the display shall be not more than 60% of the saturated brightness.

# Environmental Tests

The 7268B is designed to withstand the following operational and non-operational environmental tests.

# Operational Tests

Sinusoidal Vibration: This test consists of tube vibration in each of three orthogonal axes. One of these axes is in the plane passing through the major axis of the tube and the center of the tube-base key. The tube is mounted so that its major axis is parallel to the plane of the earth. A total of 6 cycles of swept sinusoidal vibration, from 10 to 500 and back to 10 cycles per second, is performed. The duration of a sweep cycle is 15 minutes. The frequencies of any resonant points are noted. The sinusoidal vibration schedule is shown below.

Double Amplitude	Peak Acceleration	Sweep Frequency	Sweep Cycle Duration
inches	g¹s	c/s	minutes
0,27		10 to 20	
-	4	20 to 46	1
-	2	46 to 500	<b>(</b>
-	2	500 to 46	15
_	4	46 to 20	1
0.27	_	20 to 10	

Vibration at Resonance. This test consists of tube vibration at the resonant point or points determined in Sinusoidal Vibration for a period of 30 minutes. If more than one resonant point is noted for a given axis, the tube is vibrated for a total of 30 minutes at that resonant point in each axis most likely to produce tube failure. If no resonant points are determined in Sinusoidal Vibration, the tube is vibrated for 60 minutes at a frequency of 55 cycles per second.

Low Pressure-High Temperature. This test consists of tube storage for a period of not less than one hour at a temperature of  $\pm 100^{\circ}\text{C}$ . At the termination of this storage period, the tube is operated with the values shown under Recommended Operating Values applied and at a pressure equivalent to an altitude of 32,000 feet. The temperature is then reduced to  $\pm 53^{\circ}\text{C}$ . The tube is stored at this temperature for 1 hour and then is operated with normal voltages applied at a pressure equivalent to an altitude of 60,000 feet.

**Low Temperature.** This test consists of the tube being maintained at a temperature of  $-65\,^{\circ}\text{C}$  for 48 hours. At the end of this period and while the tube is still at  $-65\,^{\circ}\text{C}$ , the tube is operated with recommended voltages applied for 15 minutes.

#### Non-Operational Tests

Temperature Cycling. This test consists of tube storage for a period of not less than 2 hours at a temperature of -65°C followed within 5 minutes by storage for a period of 2 hours at a temperature of -100°C. A minimum of five consecutive cycles are performed.

**High Pressure.** This test consists of tube exposure to an absolute pressure of 45 pounds per square inch for a period of at least 60 seconds. This pressure shall be attained within 60 seconds.

Torque. This test consists of the application of a torque of 40 inch-pounds between the integral magnetic shield and the tube base.

Salt Spray. This test consists of tube exposure to a fine spray from a salt solution for a period of 48 hours. The ambient temperature is maintained at approximately 35°C.

# OPERATING PROCEDURE

The following steps should be followed when the 7268B is first placed in operation. Refer to the precautions shown under Operating Considerations in the publication ICE-277 "RCA Display-Storage Tubes". Vote that all electrode voltages are referred to the reference terminal of the collimation system unless otherwise specified.

Viewing Gun — Ground the collimation system reference terminal and magnetic shield. Apply power to the heater of the



viewing gun and allow 60 seconds for the cathode to reach normal operating temperature. Next apply the following voltages, in the indicated order: +2 volts to the backplate, -55 volts to the collimation system negative terminal, and +265 volts to the collimation system positive terminal (be sure a minimum resistance of 5000 ohms is in this circuit). Then increase screen voltage slowly from 0 to 10,000 volts (be sure a minimum resistance of 1 megohm is in the screen circuit). Next apply dynamic erasing pulses to the backplate.

The storage property of the tube can be observed by setting the amplitude of the dynamic erasing pulses at +8 volts for several seconds and by then reducing it to zero volts. As the erasing pulse amplitude is reduced the screen should go dark. The T268B is now storing an overall "black picture" and stays in this condition until the screen begins to brighten us a result of the storage grid being gradually discharged by positive ions landing on it.

- 2. Writing Gun Apply power to the heater of the writing gun and allow 60 seconds for the cathode to reach normal operating temperature. Then, with reference to the typical operating values shown in the tabulated data under Recommended Operating Values, set the grid-No.1 voltage to cutoff, and apply dc voltages to the electrodes of the writing gun. With the screen made dark by the charging method described under (1), the grid-No.1 bias is reduced until the writing beam is seen as a spot on the screen. If the beam is caused to move, either by centering adjustment or by application of deflection voltage, it should leave a bright trace. After an area has been written to full brightness, the writing-beam spot may be seen as a slightly brighter spot on the bright background. Writingbeam focus can then be optimized by adjusting the grid-No.3 voltage.
- 3. Final Display Adjustments The dc bias and the videosignal amplitude applied to grid No.1 or cathode of the writing gun should be adjusted to set the black level and and the highlight level in the display. These adjustments depend on the scanning rate used. Resolution decreases with increasing writing-gun beam current. Excessive writing-gun beam current will produce screen saturation and any further beam-current increase will not produce additional highlight brightness and may also decrease halftone rendition. It is recommended that the writing-beam current always be adjusted to a minimum value to produce the best display without saturation of highlight brightness. The dynamic erasing-pulse amplitude and duty cycle should be adjusted in accordance with the information contained in ICE-277.

The following operating precautions must be followed to protect the 7268B from inadvertent damage  $-\!\!\!\!-$ 

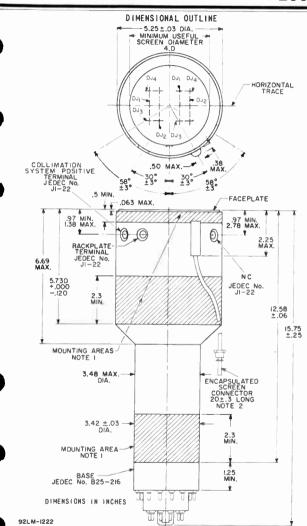
- 1. Do not exceed maximum ratings.
- 2. Be sure to include the screen resistor.



# 7268B

- Be sure to include the collimation system positive terminal resistor.
- 4. Do not apply excessive writing-beam current density.
- 5. Protect against scanning failure.
- 6. Protect against loss of bias.
- 7. Apply voltages to tube in correct order.
- 8. Never write unless viewing beam is on.





Note 1: The indicated areas are recommended for mounting purposes. Note 2: Amp Part No. AMP 832 692-0; manufactured by Aircraft Marine Products, Inc., Harrisburg, Pa., or equivalent.





DIRECT-VIEW TYPE 3.8"-DIAMETER DISPLAY

WRITING GUN: ELECTROSTATIC DEFLECTION ELECTROSTATIC FOCUS

VIEWING GUN: NO DEFLECTION NO FOCUS

	DATA							
General:								
	Writing Section	Viewing Section						
Heater, for Unipotential Cathode:								
Voltage (AC or DC)		6.3	volts					
Current		0.6	amp					
Minimum Cathode Heating Time								
before other electrode volt-								
ages are applied	-	30	sec					
Direct Interelectrode Capaci-								
tances (Approx.):0								
Grid No. I to all other								
tube electrodes	6.5	H	J4LF					
Cathode to all other								
tube electrodes	5.5	8	put					
Backplate to all other								
tube electrodes	_	116	HLF					
Deflecting electrode DJ, to								
deflecting electrode DJ2	1.9	_	144.1					
Deflecting electrode DJ <sub>3</sub> to								
deflecting electrode DJu	. 2	-	1441					
Di to all other tube elect rodes.		-	141					
DJ2 to all other tube electrodes.		-	<i>141</i> 1					
DJ3 to all other tube electrodes.		_	141					
Du to all other tube electrodes.	4.8	-	141					
Focusing Method	Electrostatic	None						
Deflection Method	Electrostatic	None						
Deflecting-Electrode Arrangement.	. See Dimen-	-						
	sional Outline							
Phosphor (For Curves, see front								
of this Section)		P20, Aluminized	1					
Fluorescence		Yellow-Green						
Phosphorescence	. –	Yellow-Green						
Minimum Useful Viewing Diameter♥			. 3.8					
Maximum Overall Length			13.64					
Seated Length		12.50" :	0.39					
Greatest Bulb Diameter		5.25"	t 0.06					
Maximum Tube Radius			2.69					
Bulb Terminals:								
Caps (Three)	Recessed Small	I Ball (JEDEC No	. J I−22					
Cap	. Recessed Small	Cavity (JEDEC No	.JI-21					
Temperature Range:								
Operating		–65 <sup>0</sup> to	+1000					
Storage		55° to	+850					
Operating Position			. An					
Weight (Approx.)		2-	3/4 lb					
Base Medium-Shell Di	heptal  4-Pin  JE	DEC Group 5, No.1	B14-38					



#### BOTTOM VIEW

Pin I - Heater of

Writing Gun

Pin 2-Grid No. I of

Writing Gun Pin 3-Grid No.3 of

Writing Gun

Pin 4-Deflecting

Electrode DJ<sub>3</sub> of Writing Gun

Pin 5 - Deflecting

Electrode DJ<sub>4</sub> of Writing Gun

Pin 6-Grid No.2 of Viewing Gun.

Grid No.2 and

Grid No.4 of Writing Gun

Pin 7-Grid No.1 of

Viewing Gun Pin 8-Grid No.3 of

Viewing Gun

Pin 9-Heater of Viewing Gun

Pin IO - Heater and

Cathode of Viewing Gun

Pin II - Deflecting Electrode DJ<sub>4</sub>

of Writing Gun Pin 12 - Deflecting

Electrode DJ<sub>2</sub> of Writing Gun SCREEN

Pin 13-Cathode of Writing Gur

Pin 14-Heater of Writing Gun

Recessed Ball Cap:

Over Pin

3 — Grid No.5 of Viewing Gun

Over Pin

12 — Grid No.4 of Viewing Gun

On Side of Tube
Opposite Base

Key — Backplate Recessed Cavity Cap:

Over Base Key — Screen

Maximum and Minimum Ratings, Absolute-Maximum Values:

For altitudes up to 10,000 feet

		Writing Se	ction	Viewin	g Section	
SC	REEN VOLTAGE.	_		11000	) max.**	volts
BA	CKPLATE VOLT-					
	AGE (Peak)	-		20	) max.**	volts
		Equivalent	Values	Equival	ent Values	
GR	ID-No.5 VOLT-					
	AGE	-		_	300 max.**	volts
1	ID-No.4 VOLT-					
		2950 max. ** 2	200 max.**	_	300 max.	volts
	1D-No.3 VOLT-				(200 max **)	1
		1200 max.* -15	50 max.	-	{200 max. **}	volts
	AK GOLTAGE				( 10	- [
1	BETWEEN GRID					
1	No.3 AND					
-	JFIDS No.2 &					
	No.4	- 29	50 max.	-	_	volts



# 135

#### DISPLAY STORAGE TUBE

	Writing Section	Viewing Section	
GRID-No.2 VOLT-			
	2950 max. ** 200 max. **	2950 max. 200 max.	volts
CATHODE VOLT-			
AGE	− −2750 max.**		volts
GRID-No. I VOLT-			
AGE:			
Negative-bias			
value	200 max."	200 max.**	volts
Pusitive-bias			1
value	O max.*	0 max.**	voits
Positive-peak			volts
value	2 max.*	0 max.""	VOITS
PEAK VOLTAGE			
BETWEEN GRIDS			
No.2 & No.4 AND ANY DE-			
FLECTING			
ELECTRODE	500 max.	_	volts
PEAK HEATER-	500 max.		*0165
CATHODE			
VOLTAGE:			
Heater nega-			
tive with			
respect to			
cathode	125 max.*	_	volts
Heater posi-			
tive with			
respect to			
cathode	125 max.*		volts

#### VIEWING SECTION\*\*

#### Operating Values and Typical Performance Characteristics:

To prevent possible damage to the tube, allow the viewing-gun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing-gun beam on till the writing beam is turned off

Screen vo	Itage								10000	10000	VOITS	
Backplate	Voltage	(DC)							2	2	volts	
Grid-No.5	Voltage								210	150	volts	
Grid-No.4	Voltage <sup>5</sup>	*							50 to 150	30 to 90	volts	
Grid-No.3	Voltage	*							10 to 50	10 to 40	volts	
Grid-No.2	√oltage'	<b>4</b>							150	125	voits	
Grid-No. I	Voltage	#							0 to -80	0 to -60	volts	
Maximum 5	creen Cui	rrent.							0.75	0.5	ma	
Maximum B	ackplate	Curr	ent	(	Pe	ak	١.		2	1.5	ma.	
Maximum G	rid-No.5	Curr	ent						3	2.5	ma	
Maximum G	rid-No.4	Curr	ert						3	2.5	ma	
Maximum G	rid-No.3	Curr	ent						5	4	ma	





Maximum Grid-No.2 Current	3	2.5	ma
Maximum Cathode Current	8	6.5	ma.
Number of Half-Tone Steps	5	5	
Viewing Duration <sup>▲▲</sup>	20	40	sec
Viewing Duration	0.45	0.4	
Resolution	50	50	lines/in.
Brightness ♣	2750	1500	fl
WRITING SECTION	ON *		
Range Values for Equipment Design:			
For any grids—No.2 & No.4 volta, 1500 and 2750 vo	ge (E <sub>C2+4</sub> lts≜	) between	
Grid-No.3 Voltage for			- 1
focus	EC2+4		voits
Voltage for cutoff			
of undeflected			
focused spot4.6% of E <sub>C</sub>	2411		volts
Maximum Grid-No.3	2+4		
Current15 to +1			μα
Maximum Cathode Current. See Curve	?		
Deflection Factors:			
OJ <sub>1</sub> & DJ <sub>2</sub>		v dc/in./kv	of Ec2+4
OJ <sub>3</sub> & DJ <sub>4</sub>		v dc/in./kv	of E <sub>C 2+4</sub>
Focused Beam Position ##			1. (.
Writing Speed <sup>††</sup> 3000			in./sec
Examples of Use of Design Ranges:* For grids-No. 2 & No. 4 voltage $(E_{C.2+\mu})^{\Delta}$		2000	volts
Grid-No.3 Voltage for focus	350	) to 750	volts
Maximum Grid-No.I Voltage for cutoff		03	volts
of undeflected focused spot Deflection Factors:		-92	VOITS
Dut & Dug	7	2 to 96	volts
DJ3 & DJ2		to 96 ) to 94	volts
003 ti 00g	7.0	,	40162
Equivalent Values of Writing-Gun Voltages to Cathode of Viewing Gun:	Referred		
Cathode Voltage1875		-1850	volts
Grid—No.3 Voltage for focus. —1125 to —	1525 -	100 to -1500	volts
Grids-No.2 & No.4 Voltage . +125		+150	volts
VIEWING SECTION and WRI	TING SE	CTION	
FICHING SCULION and WKI	11MG 3C	UIIUN	
Circuit Values:			

#### Circuit Values:

ı	Backplate-Circuit Resistance	0.005 max.	megohm
į	Series Current-Limiting Resistance in		
i	Screen Circuit,	l min.	megohm

without external shield.

Minimum useful viewing area may be eccentric with respect to the tube face.

voltages are shown with respect to cathode of viewing Gun.

voltages are shown with respect to cathode of Writing Gun.

Grids No.2 and No.4 of Writing Gun are connected together and tu grid No. 2 of Viewing Gun within the tube.

Adjusted for brightest, most uniform pattern.

n Observed with an RCA-2F21 Monoscope display.

Expressed in terms of the time required for the brightness of the unwritten background to rise from just zero brightness (viewing-beam cutoff) to 10 per cent of saturated brightness.

Outloff) to 10 per cent or saturates on  $t_{\rm s}$ . Determined as follows: With no erasing pulse, overscan the storage surface with writing beam to obtain maximum pattern brightness. Then cut off writing beam. Apply erasing pulses having an amplitude of between 8 to 10 volts and adjust duty cycle to obtain complete erasure in approximately 10 seconds. Measure time  $\{t_1\}$  from start of erasing to the instant at which any area within the minimum useful vlewing is reduced to background-brightness level, and time (t<sub>2</sub>) t of erasing to the instant at which the entire area within diameter from start of erasing to the instant at which the entire area within the minimum useful viewing-diameter area is reduced to background-brightness level. The erasing-uniformity factor is defined as (t2 - t1)/t2.

Measured by shrinking-raster method at a display brightness of 50 per cent of saturated brightness and with grids No.2 & No.4 of Writing Gun at about +2000 volts with respect to cathode of Writing Gun.

Measured with entire storage grid written to produce saturated brightness and with screen at indicated voltage.

The cathode of the Writing Gun is operated at about -2000 volts with respect to the cathode of the viewing Gun which is usually operated at

ground potential. \*\* The center of the undeflected focused beam will fall within a circle having a 10-mm radius and having its center on the Writing-Gun axis (See Dimensional Outline) under the following conditions: grids No.2 &

No. 4 of Mriting Gun at \*2000 volls with respect to cathode of Writing Gun at \*2000 volls with respect to cathode of Writing Gun at voltage to give focus, grid No. 1 of Writing Gun at voltage to give focus, grid No. 1 of Writing Gun at voltage which will permit storage of a charge just sufficient to give a barely perceptible spot on screen, Viewing Section operating under normal conditions, and tube shielded against extraneous fields.

Measured under conditions of writing from just zero brightness (viewing-beam cutoff) to maximum brightness with grid No.10f writing Gun at -10 volts with respect to cathode of Writing Gun, and grids No.2 & No.4 of Writing Gun at +2000 volts with respect to cathode of Writing Gun.

It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

#### OPERATING CONSIDERATIONS

Shielding. Magnetic shielding must be provided to prevent external fields from interfering with the required accurate control of the low-velocity viewing beam. A cylindrical shield of properly annealed high-permeability material about 1/16-inch thick is usually satisfactory.

Terminal Connections. The base pins of the 7315 fit the Diheptal 14-contact socket. The Recessed Small Ball caps and the Recessed Small Cavity cap require standard flexible-lead connectors.

# 1315



#### DISPLAY STORAGE TUBE

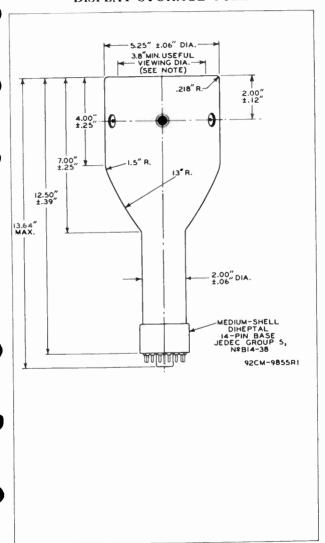
The high voltages at which the 7315 is operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Safety precautions include the enclosing of high-potential terminals and the use of interlocking switches to break the primary circuit of the power supply when access to the equipment is desired.

In the use of high-voltage tubes, it should always be remembered that high voltages may appear at normally lowpotential points in the circuit as a result of capacitor breakdown or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off, and both terminals of any capacitors a rounded.

To prevent possible damage to the tube, allow the Viewing-Gun beam current to reach normal operating value before turning on the Writing-Gun beam current, and keep the viewing beam on till the writing beam is turned off.

Failure of scanning while the writing beam is turned on may permanently damage the storage grid. Therefore, provision should be made to cut off automatically the writing-beam current in case of a scanning failure. The writing-beam current can be cut off by an electronic switch which applies -200 volts bias to grid No.1 of the Writing Gun. This switch should be actuated by a portion of the scanning voltages applied to both sets of deflecting electrodes.

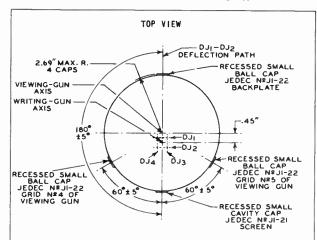




1315



#### DISPLAY STORAGE TUBE



NOTE: MINIMUM "SEFUL VIEWING AREA MAY BE ECCENTRIC WITH RESPECT TO THE TUBE FACE. THE MINIMUM USEFUL VIEWING AREA WILL HAVE DIAMETER OF 3.8".

CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN 20 IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

DEFLECTING ELECTRODES DJ: AND DJ2 ARE NEARER THE SCREEN: DEFLECTING ELECTRODES DJ AND DJ ARE NEARER THE BASE. WITH DJ1 POSITIVE WITH RESPECT TO DJ2, THE SPOT WILL BE DEFLECTED TOWARD PIN 8: LIKEWISE, WITH DJ3 POSITIVE WITH RESPECT TO DJ4, THE SPOT WILL BE DEFLECTED TOWARD PIN 4.

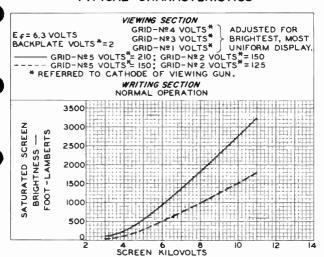
THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ, AND DJ2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE BASE KEY BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 100. ANGLE BETWEEN DJ1 - DJ2 DEFLECTION PATH AND DJ3 - DJ4 DEFLECTION PATH IS 90° ± 3°.

THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ 1 AND DJ2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE SCREEN CAP BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXISI OF ± ICC.



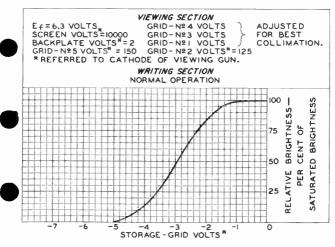


#### TYPICAL CHARACTERISTICS



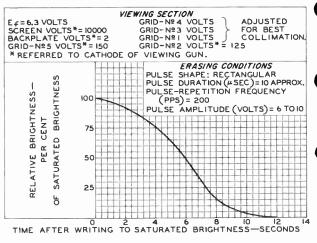
92CS-9858

#### TYPICAL STORAGE-GRID CHARACTERISTIC



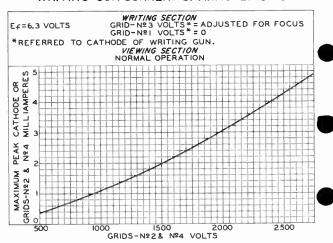


#### TYPICAL ERASURE CHARACTERISTIC



92CS-9860

#### WRITING-GUN-CURRENT CHARACTERISTIC



#### Series

## **NUMITRON** Digital Display Devices

#### Segmented Incandescent Types

#### FEATURES:

- high brightness fully adjustable
- low voltage operation
- high contrast segmented digits viewed against a dark background
- compatible with IC Decoder/Drivers such as the RCA CD2500E family
- high-reliability rugged construction
- wide-spectrum light emission permits unlimited filter selection
- DR2200 Series have a recommended DC segment operating voltage range of 1.5 to 3V
- wide viewing angle
- void of "clutter"

MECHANICAL

- solderable base pins permits direct PC board mounting
- DR2000 Series fits popular low cost 9-pin miniature socket
- DR2100 and DR2200 Series fit popular TO-5 style, 10-pin socket
- DR2100V1 and DR2200V1 Series have formed lead to facilitate direct PC-board mounting

DR2000

Series

DR2100

DR2200

Series

DR2100V1

DR2200V1

Series

Mounting Position	in, in, ( min, (	Any 1.660 in. 1.450 in. 0.485 in. 3-pin, 0.230 in. pin circle	Any 1.705 in 1.540 in 0.485 in 9-pin, 0.380 in pin circle	
CHARACTERISTICS	DR2000 Series	DR2100 Series	DR2200 Series	
ELECTRICAL Recommended DC Segment Operating Voltage Range DC Segment Voltage unless	3.5 to 5.0	3.5 to 5.0	1.5 to 3.0	V
otherwise specified	4.5 24	4.5 24	2.5 14	/ mA
(at 95% confidence)	100 k	100 k	100 k	h
Viewing Angle (including angle) Segment Luminance (typ.)	140 7000	120 7000	120 4000	o fL
Ascent to Visibility (typ.)	15	15	8	ms

Contrast Ratio ....

Descent to 50% of Luminance . . .

Maximum Segment Deflection From a Straight Line . . . . . .

ms

ın

° <10

0.004

20:1

<20

0.004

30:1

0.005

30:1

#### Mechanical Characteristics DR2000 and DR2100 Series

TEST	CONDITIONS	DC Segment Volts					
SHOCK* a) b)	100g, 1 ms, Half-Sine Wave 50g, 11 ms, Half-Sine Wave	4.5 Not Applied					
VIBRA- TION a) b) c) d) e)*	Variable Frequency: 10 to 44 Hz, 0.1-inch DA Variable Frequency: 44 to 200 Hz, 10g Variable Frequency: 200 to 800 Hz, 1g Variable Frequency: 800 to 2000 Hz, 10g Fatigue: 25 Hz, 2.5g, 96 hr	4.5 4.5 4.5 4.5 4.5					

#### **DR2200** Series

SHOCK* a) b)	200g, 1 ms, Half-Sine Wave 50g, 11 ms, Half-Sine Wave	2.5 Not Applied
VIBRA- TION a) b) c)*	Variable Frequency: 5 to 60 Hz, 0.1-inch DA Variable Frequency: 60 to 500 Hz, 20g Fatigue: 25 Hz, 2.5g, 96 hr	2.5 2.5 2.5

<sup>\*</sup> Performed in Accordance with MIL-E-1F

The NUMITRON digital display devices will meet the Specifications for operational and crash safety tests; standard environmental vibration for instrument panel location in all types of aircraft, as set by the Radio Technical Commission for Aeronautics (RTCA). Document No. DO-138 Dated June 27, 1968.

DR2000 Series

DR 2200 Series

## Base Pin Number And Segment Designation Chart

			Segment Designations A-H								
					Base	Pin Nur	nber				
Display	Туре	1	2	3	4	5	6	7	8	9	
	DR2000 DR2100 DR2200	NC	<b>↑</b>	E	D	С	G	Α	В	F	
with decimal	DR2010 DR2110 DR2115 DR2210 DR2215	н	COMMON	E	D	С	G	А	В	F	
1	DR2020 DR2120 DR2220	NC	00	NC	NC	NC	D	В	С	А	
1	DR 2030	NC		NC	NC	NC	В	NC	А	NC	
1	DR2130 DR2230	NC	<b>\</b>	NC	NC	NC	NC	В	NC	А	

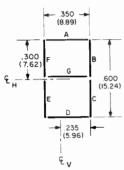
NC = no connection - may be used as tie point.

DR2100 Series

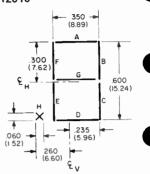
DR2200 Series

Seament Dimensions and Designations

#### DR2000



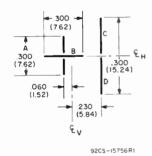
DR2010



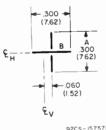
92CS-15755RI

#### DR2020

DR2030



92CS-15754RI



92CS-15757R1

\$\psi\_H = \text{Horizontal center line of display (bulb outline} dimension F) with pin No. 3 toward viewer. Segment "G is 0.030" above \$ \( \mu \).

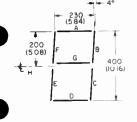
t<sub>H</sub> = Vertical center line of device.

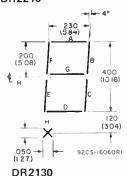
DR2100 and DR2200 series; vertical center line of display coincides with vertical center line of device.

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated.

#### Segment Dimensions And Designations - Cont'd

**DR2100** DR2200 **DR2110** DR2210

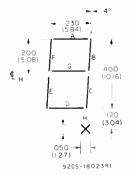


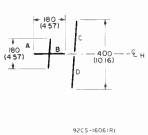


**DR2115** 

**DR2230 DR2215** 

92CS 16059RI





DR2120

DR 2220 + 180 -(457) 180 (457)÷

9205-16062RI

#### OPERATING CONSIDERATIONS

#### Integrated Circuit Decoder/Driver

The NUMITRON series devices are compatible with the RCA Integrated Circuit Decoder/Driver types CD2500E and CD2501E. The integrated circuit decoder/driver accepts four inputs in BCD (8-4-2-1 code) and decodes them into outputs representing a decimal number from 0 to 9 on a 7-segment display. For basic interconnection of decoder/driver and the NUMITRON display devices see Fig. 4.

#### Mounting Arrangements

The NUMITRON devices are designed for mounting in either commercially available sockets or directly on printed circuit boards. The DR2000 series devices fit into a standard 9-pin miniature electron tube socket. A commercial PC board socket which permits 0.8-inch center-to-center mounting is available. (See Hardware and Accessories.) The DR2100 and DR2200 series devices are available in two versions: straight leads and V1 versions with formed leads: The straight lead versions may be mounted on 0.5-inch centers directly on PC boards or may be used with standard TO-5 style, 10-pin sockets. The V1 versions facilitate direct PC board mounting on 0.5-inch centers. To use the light shield, DR3000+, the center-to-center mounting must be increased to 0.515-inch.

Figure 5 shows the base diagram and pin-circle dimensions for the various NUMITRON devices.

#### Character Formation

The following chart gives the base pin connections for forming the various character displays for each device. Pin No. 2 is the common connection for all segments in each device. For example, to form a numeral one using type DR2000, connect the segment voltage between pin No. 2 (common) and pin Nos. 5 and 8.



Series

#### Digital Character Formation

	Device Pin Number						
	F	in No. 2 C	ommon F	or All Typ	18s		
Display	DR2000 DR2100 DR2200	DR2010 DR2110 DR2115 DR2210 DR2215	DR2020 DR2120 DR2220	DR2030	DR2130 DR2230		
	3,4,5,7, 8,9	3,4,5,7, 8,9					
	5,8	5,8	6,8				
2	3,4,6, 7,8	3,4,6, 7,8					
3	4,5,6, 7,8	4,5,6, 7,8					
	5,6,8,9	5,6,8,9					
	4,5,6, 7,9	4,5,6, 7,9					
<b>(E)</b>	3,4,5,6, 7,9	3,4,5,6, 7,9					
	5,7,8	5,7,8					
8	3,4,5,6, 7,8,9	3, <b>4</b> ,5,6, 7,8,9					
9	4,5,6,7, 8,9	4,5,6,7, 8,9					
+			7,9	6,8	7,9		
			7	6	7		
decimal		1					

DR2000 DR2100 DR2200 Series Series Series

#### Power Supply Requirements

The NUMITRON Series devices do not require critical voltage regulation over the useable operating range. As is the case with any incandescent type device, dc voltage operation above the recommended value may result in reduced life expectancy. For multiplex operation, segment voltage above the normal range may be used provided that the appropriate duty factor is observed. (See NUMITRON Display Device Booklet, NUM-421).

#### Display

Because these NUMITRON devices have a wide-band light spectrum emission, filters can be used to produce any desired color display. (See Hardware and Accessories.) A display having a broader stroke can be obtained with an etched glass such as "Trusite"\* or a diffused filter. For a larger size display, a Fresnel lens may be used.

#### Hardware and Accessories

#### Sockets

Noval 9-pin Types

DR2000 Series

- Methode Electronics, Inc., M8610 (For 0.8-inch centers) and P460 (standard)
- Cinch Mfg, Co., 121-51-00-040 (standard)

TO-5 10-Lead Types

DR2100, DR2200 Series

- Methode Electronics, Inc., M8620
- Cinch Mfg. Co., 133-99-92-054 and 133-99-92-065 133-99-92-065 (spread-lead socket)

#### **Filters**

Polaroid Corp., Cambridge Mass. 02139

Circular Polarizer:

Standard and Diffused Surface for Broader Stroke Panelgraphic Corp., West Caldwell, N.J. 07006 Chromafilter CF-131: Anti-Reflection Filters

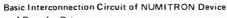
#### Plastic Light Shield to Reduce Side Reflections

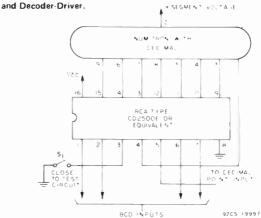
DR2100, DR2200 Series

RCA DS3000

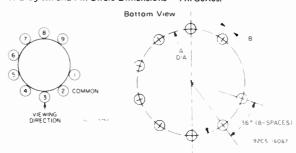


<sup>\*</sup>Trademark "Trusite" Dearborn Glass Co., Chicago, Illinois.





### Base Diagram and Pin Circle Dimensions - All Series.

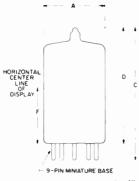


NUMITRON	DIMENSION	(INCHE	S)
SERIES	A		3
SCHIES	NOMINAL	MIN.	MAX.
DR2000	0.468	0 038	0.042
DR2100 and	0.220	0.010	
DR2200	0 2 3 0	0 0 1 8	0 022
DR2100V1		-	
and	0 380	0.018	0 022
DR2200V1			

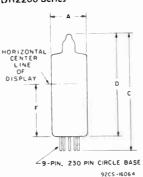
DR2000 DR2100 DR2200 Series Series Series

#### Dimensional Outlines





DR2100, DR2200 Series

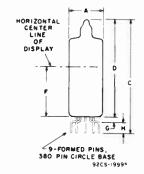


DI-		DR20	00 Series				100 and 00 Series		
MEN-	INC	HES	MILLIN	ETERS	IN	CHES	MILLIMETERS		
SION	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
A		0.800		20.32		0.485		12.32	
С		1.875		47.62		1.660		42.16	
D		1.625		41.27		1,450		36.83	
F	0.700	0.730	17.78	18.54	0.625	0.655	15.87	16.64	

MILLIMETER DIMENSION DERIVED FROM INCH DIMENSION

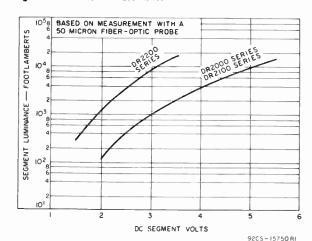
#### Dimensional Outlines - Cont'd

DR2100V1, DR2200V1 Series

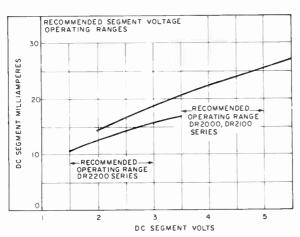


DI- MEN-	DR2100V1 and DR2200V1 Series								
SION	IN	CHES	MILLIMETERS						
31014	MIN.	MAX.	MIN.	MAX.					
Α		0.485		12.32					
С		1.705		43.30					
D		1.450		36.83					
F	0.625	0.655	15.87	16.64					
G	0.060	0.090	1.52	2.28					
н	0.135	0.165	3.43	4.19					

#### Segment Luminance Characteristics

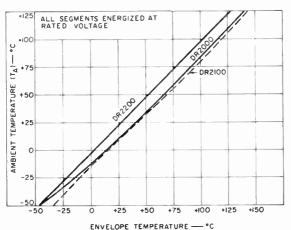


#### Segment Current Characteristics



#### 92CS-15758RI

#### **Envelope Temperature Characteristics**



92CS-16063R2



DIRECT-VIEW TYPE 3.8"-DIAMETER DISPLAY

WRITING GUN: ELECTROSTATIC DEFLECTION ELECTROSTATIC FOCUS

VIEWING GUN: NO DEFLECTION NO FOCUS

PRO

	DATA		
General:			
	Writing Section	Viewing Section	
Heater, for Unipotential Cathode:	-	_	
Voltage (AC or DC)	6.5	6.3	volta
Current	0.6	0.6	amo
Minimum Cathode Heating Time		***	
before other electrode volt-			
ages are applied	_	30	sec
Direct Interelectrode Capaci-			
tances (Approx.):0			
Grid No. I to all other			
tube electrodes	6.5	11	дда1
Cathode to all other			
tube electrodes	5.5	8	μμŧ
Backplate to all other			
tube electrodes	_	116	μμί
Deflecting electrode DJ, to			7-
deflecting electrode DJ2	1.9	_	μμί
Deflecting electrode DJ <sub>3</sub> to			,,,
deflecting electrode DJm	2	_	μμί
DJ, to all other tube electrodes.	6	_	щи
DJ2 to all other tube electrodes.	7	_	, uut
DJ <sub>3</sub> to all other tube electrodes.	5.5		1411
Du to all other tube electrodes.	4.8	_	µµt
Focusing Method	Electrostatic	None	
Deflection Method	Electrostatic	None	
Deflecting-Electrode Arrangement.		_	
	sional Outline		
Phosphor (For Curves, see front			
of this Section)	_	P20, Aluminized	
Fluorescence	-	Yellow-Green	
Phosphorescence	-	Yellow-Green	
Minimum Useful Viewing Diameter♥.			. 3.8"
Maximum Overall Length			13.64"
Seated Length		12.50" ±	
Greatest Bulb Diameter		5.25" ±	0.06"
Maximum Tube Radius			2.69"
Bulb Terminals:			
Caps (Three)			
Cap	Recessed Small C	avity (JEDEC No.,	11-211
Temperature Range:			
Operating			
Storage		65 <sup>0</sup> to +	100 <sub>0</sub> C
			Any
Weight (Approx.)		2-3	/4 lbs
Base Medium-Shell Dih	eptal I4-Pin (JED	EC Group 5, No. 8	14-381



BOTTOM VIEW

Pin I-Heater of Writing Gun

Pin 2-Grid No. I of

Writing Gun Pin 3-Grid No.3 of Writing Gun

Pin 4-Deflecting
Electrode DJ<sub>3</sub>

of Writing Gun Pin 5-Deflecting Electrode OJu

of Writing Gun
Pin 6-Grid No.2 of
Viewing Gun,
Grid No.2 and
Grid No.4 of

Writing Gun Pin 7-Grid No.1 of Viewing Gun

Pin B-Grid No.3 of Viewing Gun

Pin 9-Heater of Viewing Gun

Pin 10-Heater and Cathode of Viewing Gun

Pin II - Deflecting
Electrode DJ
of Writing Gun

Pin 12-Deflecting
Electrode DJ<sub>2</sub>
of Writing Gun



SCREEN

Pin 13-Cathode of Writing Gun

Pin 14-Heater of Writing Gun

Recessed Ball Cap:

Over Pin g-Grid No.5 of

Viewing Gun Over Pin

12-Grid No. 4 of

Viewing Gun
On Side of Tube

Opposite Base
Ney-Backplate
Recessed Cavity Cap:

Over Base

Key--Screen

#### Maximum and Minimum Ratings. Absolute-Maximum Values:

For altitudes up to 10.000 feet

	Writing	Section	on	Yie	wing Section	
SCREEN VOLTAGE.		_		1	1000 max.**	voits
BACKPLATE VOLT-						
AGE (Peak)		_			20 max. **	voits
	Equivale	nt Vali	ues	Equit	valent Values	
GRID-No.5 VOLT-						
AGE	-	-			300 max.**	voits
GRID-No.4 VOLT-				ļ		
AGE	2950 max. *▲	200	max. **	-	300 max.**	volts
GRID-No.3 VOLT-					(200 max. *1	η
AGE	1200 max.*	-1550	max.	-	∫200 max.*1 10 min.*1	voits
PEAK VOLTAGE					(	′
BETWEEN GRID						
No.3 AND						
GRIDS No.2 &						
No.4		2950	max.	-		volts



	Writing Section	Viewing Section	
GRID-No.2 VOLT-		-	
AGE	2950 max. ** 200 max. **	2950 max.** 200 max.**	volts
CATHODE VOLT-			
AGF,	<ul><li>−2750 max,**</li></ul>		volts
GRID-No. I VOLT-			
AGE:			
Negative-bias			
value	200 max.*	200 max.**	volts
Positive bias			
value	U max.*	U max.**	voits
Positive-peak			
value	2 max.	0 max.**	volts
PEAK VOLTAGE			
BETWEEN GRIDS			
No.2 & No.4			
AND ANY DE-			
FLECTING			
ELECTRODE	500 max.	_	voits
PEAK HEATER-			
CATHODE			
VOLTAGE:			
Heater nega-			
tive with			
respect to			
cathode	125 max.*	_	volts
Heater posi-			
tive with			
respect to			
cathode	125 max.*	_	volts

#### VIEWING SECTION\*\*

#### Operating Values and Typical Performance Characteristics:

To prevent possible damage to the tube, allow the viewing-gun beam current to reach normal operating value before turning on the writing-gun beam current, and keep the viewing-gun beam on till the writing beam is turned off

10000

0010011 40	· rage · ·		•						10000	10000	401.00
Backplate	Voltage	(DC	) .						2	2	volts
Grid-No.5									210	150	volts
Grid-No.4									50 to 150	30 to 90	volts
Grid-No.3									10 to 50	10 to 40	volts
Grid-No.2	Voltage*	١							150	125	volts
Grid-No.1	Voltage <sup>#</sup>	۴							0 to -80	0 to -60	volts
Maximum S	creen Cur	rent	t.						0.75	0.5	ma
Meximum B	ackplate	Curi	ren	t i	Pe	ak	1.		2	1.5	ma
Maximum G	rid-No.5	Curi	ren	t.					3	2.5	ma
Maximum G	rid-No.4	Curi	ren	t.					3	2.5	ma
Maximum G	rid-No.3	Curi	ren	t.					5	4	ma
l											

- PAG

Screen Voltage





Maximum Grid-No.2 Current	. 3	2.5	ma
Maximum Cathode Current	. 8	6.5	ma
Waximum Cathode Current Number of Half-Tone Steps	. 5	5	
Viewing Duration ♣	. 20	40	sec
Maximum Erasing-Uniformity Factor	. 0.45	0.4	
Resolution	. 50		lines/in.
Brightness	. 2750	1500	fi
WRITING SECT	I ON®		
Range Values for Equipment Design:"			
For any grids-No.2 & No.4 vol 1500 and 2750 i		y) between	
Grid-No.3 Voltage for			
focus 17.5% to 37.5% Maximum Grid-No.! Voltage for cutoff	of E <sub>C2+4</sub>		volts
of undeflected focused spot4.6% of E Maximum Grid-No.3	C <sub>2+4</sub>		volts
Current15 to +  Maximum Cathode Current. See Cur			μα
Deflection Factors: DJ <sub>1</sub> & DJ <sub>2</sub>	0	v dc/in./kv	-4.5
DJ <sub>3</sub> & DJ <sub>4</sub>		v dc/in./k	/ Of EC2+4
Focused Beam Position. ##		V 00/111./K	, U1 LC 2+4
Writing Speedtt 30000	0		in./sec
Examples of Use of Design Ranges:			
For grids-No.2 & No.4 voltage (Ec <sub>2+u</sub> )▲		2000	volts
Grid-No.3 Voltage for focus Maximum Grid-No.1 Voltage for cutoff	350	to 750	voits
of undeflected focused spot Deflection Factors:		-92	volts
DJ <sub>1</sub> & DJ <sub>2</sub>		to 96	volts
DJ <sub>3</sub> & DJ <sub>4</sub>		to 94	volts
Equivalent Values of Writing-Gun Voltages to Cathode of Viewing Gun:	Referred		
Cathode Voltage1850	0	-1875	voits
Grid-No.3 Voltage for focus1100 to	-1500 -	1125 to -1526	volts
Grids-No.2 & No 4 Voltage⁴ +150	-	+125	volts
VIEWING SECTION and WR	NITING SE	CTłon	
Circuit Values:		vn	

8-59



#### 7448

# P<sub>P</sub>

#### DISPLAY STORAGE TUBE

Backplate-Circuit Resistance	 	 . 0.005 max.	megohm
Screen Circuit		 . I min.	megohm

Without external shield.

- Hinimum useful viewing area may be eccentric with respect to the tube face.
- \*\* Voltages are shown with respect to cathode of Viewing Gun.
- Voltages are shown with respect to cathode of writing Gun.
- Grids No. 2 and No. 4 of Writing Gun are connected together and to grid No. 2 of Viewing Gun within the tube.
- Adjusted for brightest, most uniform pattern.

with writing beam cut off. Since grid No.2 of the viewing Gun and grids No.2 and No.8 of the writing Gun are connected together within the tube, the maximum total current collected by these electrodes is essentially equal to the sum of the maximum grid-No.2 current of the Viewing Gun and the maximum cathode current of the Writing Gun (See Writing-Gun-Current-Characteristic Curve).

- Observed with an RCA-2F21 Monoscope display.
- Expressed in terms of the time required for the brightness of the unwritten background to rise from just zero brightness (viewing-beam cutoff) to 10 per cent of saturated brightness.
- Determined as follows: With no erasing pulse, overscan the storage surface with writing beam to obtain maximum pattern brightness. Then cut off writing beam. Apply rectangular erasing pulses having an amplitude of between 8 to 10 volts and adjust duty cycle to obtain complete erasure in approximately 10 seconds. Measure time (t) from start of erasing to the instant at which any area within the minimum useful viewing diameter is reduced to background-brightness level. The ending within the minimum useful viewing diameter area is reduced to background-brightness level. The erasing-uniformity factor is defined as (t2 t1)/t2.
- Measured by shrinking-raster method at a display brightness of 50 per cent of saturated brightness and with grids NO.2 & No. % of writing Gun at about \*2000 volts with respect to cathode of Writing Gun.
- Measured with entire storage grid written to produce saturated brightness and with screen at indicated voltage.
  - The cathode of the writing Gun is operated at about -2000 volts with respect to the cathode of the Viewing Gun which is usually operated at ground potential.
  - The center of the undeflected focused beam will fall within a circle having a 10-mm radius and having its center on the writing-gun axis (See Bimenstonal Outline) under the following conditions: grids No.2 & No.4 of Writing Gun at \*2000 volts with respect to cathode of writing Gun, grid No.3 of writing Gun at voltage which will permit storage of a charge just sufficient to give abarely perceptible spot on screen, viewing Section operating under normal conditions, and tube shielded against extraneous fields.
  - Measured under conditions of writing from just zero brightness (viewingbeam Cutoff) to maximum brightness with grid No.1 of writing Gun at -10 volts with respect to cathode of writing Gun, and grids No.2 & No.4 of Writing Gun at +2000 volts with respect to cathode of Writing Gun.
    - It is recommended that the deflecting-electrode-circuit resistances be approximately equal.

#### OPERATING CONSIDERATIONS

Shielding. Magnetic shielding must be provided to prevent external fields from interfering with the required accurate control of the low-velocity viewing beam. A cylindrical shield of properly annealed high-permeability material about I/I6-inch thick is usually satisfactory.





Terminal Connections. The base pins of the 7448 fit the Diheptal 14-contact socket. The Recessed Small Ball caps and the Recessed Small Cavity cap require standard flexible-lead

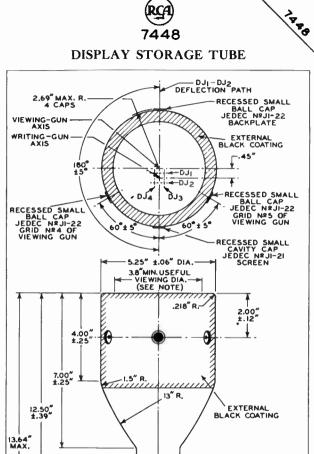
The high voltages at which the 7448 is operated may be very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltages. Safety precautions include the enclosing of high-potential terminals and the use of interlocking switches to break the primary circuit of the power supply when access to the equipment is desired.

in the use of high-voltage tubes, it should always be remembered that high voltages may appear at normally low-potential points in the circuit as a result of capacitor breakdown or incorrect circuit connections. Therefore, before any part of the circuit is touched, the power-supply switch should be turned off, and both terminals of any capacitors arounded.

To prevent possible damage to the tube, allow the Viewing-Gun beam current to reach normal operating value before turning on the Writing-Gun beam current, and keep the viewing beam on till the writing beam is turned off.

Failure of scanning while the writing beam is turned on may permanently damage the storage grid. Therefore, provision should be made to cut off automatically the writing-beam current in case of a scanning failure. The writing-beam current can be cut off by an electronic switch which applies -200 volts bias to grid No.l of the Writing Gun. This switch should be actuated by a portion of the scanning voltages applied to both sets of deflecting electrodes.





92CM-9855R2

2.00" DIA.

-MEDIUM-SHELL DIHEPTAL 14-PIN BASE JEDEC GROUP: NºB14-38

7448



#### DISPLAY STORAGE TUBE

NOTE: MINIMUM USEFUL VIEWING AREA MAY BE ECCENTRIC WITH RESPECT TO THE TUBE FACE. THE MINIMUM USEFUL VIEWING AREA WILL HAVE DIAMETER OF 3.B".

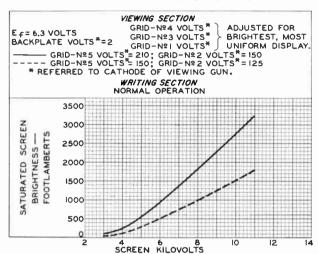
CENTER LINE OF BULB WILL NOT DEVIATE MORE THAN  $2^{\rm O}$  IN ANY DIRECTION FROM PERPENDICULAR ERECTED AT CENTER OF BOTTOM OF BASE.

DEFLECTING ELECTRODES  ${\rm DJ_1}$  AND  ${\rm DJ_2}$  ARE NEARER THE SCREEN: DEFLECTING ELECTRODES  ${\rm DJ_3}$  AND  ${\rm DJ_4}$  ARE NEARER THE BASE. WITH  ${\rm DJ_1}$  POSITIVE WITH RESPECT TO  ${\rm DJ_2}$ , THE SPOT WILL BE DEFLECTED TOWARD PIN B; LIKEWISE, WITH  ${\rm DJ_3}$  POSITIVE WITH RESPECT TO  ${\rm DJ_4}$ , THE SPOT WILL BE DEFLECTED TOWARD PIN 4.

THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ\_1 AND DJ\_2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE BASE KEY BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm$  10°. THE ANGLE BETWEEN THE DEFLECTION PATH PRODUCED BY DJ\_1 AND DJ\_2 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND THE SCREEN CAP BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm$  10°. ANGLE BETWEEN DJ\_1 - DJ\_2 DEFLECTION PATH AND DJ\_3 - DJ\_4 DEFLECTION PATH IS 90°  $\pm$  3°.



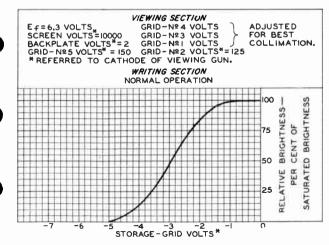




92CS-9858

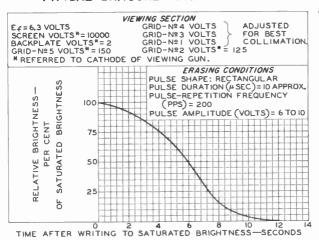
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#### TYPICAL STORAGE-GRID CHARACTERISTIC



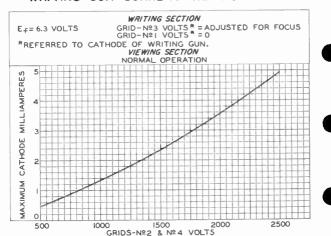
74 A B 74 4

#### TYPICAL ERASURE CHARACTERISTIC



92CS-9860

#### WRITING-GUN-CURRENT CHARACTERISTIC



ELECTRON TUBE DIVISION RADIO CORPORATION OF AMERICA HARRISON, NEW JERSEY

92CS-9859RI

